The Atari User's Encyclopedia

Gary Phillips and Jerry White

THE
ATARI USER'S
ENCYCLOPEDIA

by Gary Phillips and Jerry White

Preface

The Atari User's Encyclopedia is your one definitive reference book for your Atari Computer. By deciding to own it, you have made an investment in your computing future. It will save you hundreds of hours by bringing material from many sources into a single, easy-to-use, alphabetical reference handbook.

Much of the material is not available anywhere else. Here you will find the essential background material you will need to answer questions and solve problems on the family of Atari Computers. All available information on the new XL models and the new DOS 3.0 are included.

Your *User's Encyclopedia* guides you through machine operation, BASIC programming, and what's available in software and hardware. Your *Encyclopedia* will quickly pay for itself through product information alone. And it is a comprehensive source of information about the whole area of microcomputers. The entries are short, clear, self-contained, and understandable. Should you desire additional information, hundreds of cross-references point you to related entries in the *Encyclopedia*. You will find it the most frequently used and most highly treasured book in your personal computer library.

While your *User's Encyclopedia* was written in simple language so beginning users can understand it, you will continue to find it indispensable as your knowledge of computers grows. It does not offer a detailed coverage of the internal electronic details of the Atari Computer. It does, however, provide a complete reference on BASIC programming, general operation of the computer and its accessories, and available products.

You will usually use your *Atari User's Encyclopedia* as a quick reference source. You will probably keep it right by your computer, instantly available when you encounter difficulties or want a more complete understanding of what your Atari Computer is doing. You will also enjoy just browsing through its many short, easy-to-read entries. This will allow you to easily and casually increase your knowledge of the Atari Computer, and microcomputers in general. *The Atari User's Encyclopedia* was produced for you by Gary Phillips & Associates. Gary Phillips & Associates also provides *User's Encyclopedias* for the IBM PC, Apple, TI-99, and many other personal computers. *The Atari User's Encyclopedia* will serve as your first reference source for most questions. Manuals from Atari and other books provide a valuable backup to the *User's Encyclopedia*—when you have time to explore a topic in the traditional book presentation. But when time is pressing and you want information fast, you will rely on *The Atari User's Encyclopedia*. *The Atari User's Encyclopedia* is organized alphabetically, with numbers and special symbols following "Z." Here are some special pointers for understanding the format of the *Encyclopedia*:

Variable types in various statements and commands are placed between arrow brackets. For example, <line number> means you would use a specific line number from your BASIC program. Similarly, <variable> indicates any variable you are using in your program. For example, the statement to display a variable's value is PRINT <variable>. To print out the contents of the variable Count, you would replace <variable> with Count, giving PRINT Count. Parentheses () around an item in a command or instruction should be typed by the user at the keyboard. However, brackets [] indicate only that the enclosed material is optional; these brackets should not be entered into the computer. Also, q.v. is used after a word or phrase to direct you to other entries that you may want to see for additional information (q.v. from the Latin quo vide, "which see"). The names and addresses of all software and hardware manufacturers are listed alphabetically in the Vendors List at the end of the book.

We have made every effort to make your *Atari User's Encyclopedia* complete, accurate, and up-to-date. The descriptions of products are identified by an "*" following the product name. These may be either reviews or brief descriptions to help you find products you may want and acquire further information. You will need to check with the manufacturer or a retail outlet to verify the suitability of the product for your needs and to determine its price and availability. Similarly, you should verify any technical information in the *Encyclopedia* before relying on it for

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Manufacturers of hardware or software who would like to be included in the next revision of *The Atari User's Encyclopedia* may send review copies and descriptive literature to the same address.

Congratulations on deciding to own the one definitive reference source for the Atari Computer. We know you will enjoy and profit from it in the months to come.

Gary Phillips
Jerry White
Staff of Gary Phillips & Associates

Beginner's Tutorial for Atari BASIC

TABLE OF CONTENTS

Overview

This section consists of text instruction and Atari BASIC tutorial programs. An Atari computer and the Atari BASIC cartridge are required. A minimum of 16K RAM and one Atari 410 program recorder to run programs from diskette.

You will learn how to communicate with the computer and write programs in Atari BASIC. Atari 810 will be needed The instruction section uses analogies and illustrations to explain computer jargon and contains printed listings of the demonstration programs. Using these listings interactively with the programs will teach you how to produce the results you desire, and how to debug the program if you don't get exactly what you want. Again, have patience. All this comes with practice and experience, but you'll enjoy each step of the process.

The documentation will help you get the maximum benefit possible from interaction among the program, the computer, and yourself. It will make it easier for you to visualize an effect on the screen (or any output device), and write the commands that will yield the exact result you anticipated.

Introduction

No Experience Necessary

This tutorial will help you learn to communicate with your Atari computer. All you need is an Atari computer, the literature that came with it, an Atari BASIC language cartridge, and a desire to learn. No prior experience with computers is required.

The only reading we ask of you before you begin using this tutorial is your Operator's Manual. Read it carefully, follow the instructions, and try all the examples provided. Then begin this tutorial.

If you are already a bit confused, don't be alarmed. We hope to eliminate the confusion and provide answers to your questions. The most important thing to remember is that computers are logical and obedient machines. There is always a reason for everything that happens. When the computer appears to have done something illogical, the problem is really figuring out what is wrong with your instructions. Of course, there is always the very slight possibility that the computer has malfunctioned, but this is rarely the case.

Many beginners think that a computer is an intelligent machine. This is not true. A computer is only as smart as the people and programs that control it.

To help you understand some of the terminology used in the computer world, we will use analogies. It is not important that you understand what microprocessor chips are right now. You need only know that they exist somewhere inside your Atari, along with a board labeled OPERATING SYSTEM ROM. For the sake of simplicity, we will consider the chips and the ROM cartridge to be "The Computer." The unit that contains the computer, along with the keyboard, buttons, and ports, will be called "The Console."

Think of the computer as a large corporation, and you are its principal owner. Your company has extremely fast and efficient workers, who are on duty twenty-four hours a day and are paid only with electricity (the executive's dream). As soon as you turn the computer on, your workers are ready to do your bidding. When you turn it off, they take a much deserved nap.

There is at least one other cartridge inside the console. It is called RAM (Random Access Memory). Think of RAM as a temporary storage warehouse. The difference between RAM and ROM (Read-Only Memory) is that ROM stores information for the computer's use, so we can't use that warehouse space. We can store things in RAM, but only until we turn off the power. What the computer has stored in ROM is permanent. We can borrow things from ROM, but we can't put things in. RAM can be used both ways.

Using BASIC

Consider your computer as a corporation you own in a foreign country. To communicate with the various companies and departments of your foreign corporation, you need an

interpreter. You have hired someone called BASIC. BASIC does speak some English, and he is very good at communicating with your workers. You have decided to learn to communicate with BASIC, so he can express your commands to the computer.

Although BASIC understands many of the words in the English language, we cannot speak to him as if we were having a conversation with another human being. We must be careful in our choice of words and phrase our commands in a way that BASIC understands. If we have many commands to transmit, we break them up into numbered units to be transmitted serially. Such a set of commands is called a program. If we have made sure that BASIC understands each and every command in the program, he will see to it that the computer executes the entire program as we intended. We will explain more about commands and programs later on.

Peripheral Devices

Now we have defined everything inside the console, but we still have to define all the things on the outside, such as the keyboard, screen, disk drive, and printer. They might be considered satellite companies. They are called peripheral devices. There are two types of devices: input and output. Some devices are both input and output (I/O). An input device is one that supplies the computer with information, such as the keyboard. An output device is one that takes information from the computer, such as a printer. A cassette recorder, disk drive, or even the screen, can be used for both input and output.

The concepts in the last few paragraphs are very important. Be sure you understand them before you go on. Look through the literature supplied with your computer, but don't think you must understand everything you read. This tutorial will supply you with examples to demonstrate most of the commonly used BASIC instructions, as well as devices such as your keyboard. You won't be doing much in the way of programming right away, so don't try to learn too much in one day.

Primer for Programmers

Learning to Crawl

Before you take your first step in any endeavor, you must learn to crawl. If you want to write computer programs, you must develop certain skills and understandings that involve simple commands. We will have you learn and practice these until you are comfortable with them. After the first hesitant ABC's, the words and phrases will come more easily and fluently.

Certain concepts mentioned in this PRIMER will be explained more fully in succeeding sections. In the meantime, if you require the meaning of a word, phrase, or idea, refer to the encyclopedia entry for that subject.

Experiment freely! There is no way you can do any damage to your hardware by typing on your keyboard or pressing the console buttons. The worst that can happen is that your program will "bomb." This means that your computer "locks up" and doesn't respond to any keys. If this should happen, you must reboot and start over. There is no damage whatsoever to your computer.

Direct Mode

First, we'll use commands in the immediate (direct) mode. This means that the computer obeys our command or commands, if correctly given, immediately upon our pressing the <RETURN> key. This, of course, assumes that the computer is powered up, with the BASIC Language Cartridge properly installed in its slot. We can also choose to have our commands obeyed in the deferred (programmed) mode. The computer will carry out a series of orders, sequentially, at some future time, when we give it a specific command to do so. More about the deferred mode later.

Turn your monitor (TV screen) on, make sure your BASIC Language Cartridge is properly placed in its receptacle, and power up your computer. You should get the "READY" prompt. Now type the following:

                    PRINT 3+4

Check on your screen that your statement is identical to that given above in every respect, including capital letters and spacing. Now press the <RETURN> key. If all went well, your electronic wizard did as requested and printed a 7, which is the result of adding 4 to 3.

If you don't get the right result, don't blame the computer. All programmers learn, sooner or later, that unexpected results are almost never the fault of the machine, but of the operator. Swallow your pride and try again, paying attention to every detail, and you will most assuredly learn that, with proper input, the correct result is inevitable.

Now try this:

$$? 15+3$$

and then press <RETURN>. Notice the correct result again. ? is the abbreviation for PRINT that is recognized by BASIC. You may use it or not, as you please. However, when you can save keystrokes by using abbreviations, then do so. For one thing, fewer keystrokes means fewer chances for error; fewer keystrokes save time. From here on, we will frequently use abbreviations, including <R> to mean "Press the <RETURN> key."

Practice the print command with several addition and subtraction problems. Include some with more than two terms and with a negative answer, such as:

$$?24+22-33+2-18<R>$$

and

$$?-50+16+14<R>$$

Were you aware that in these last two examples there was no space between the PRINT command (?) and the following character? Was the command obeyed correctly? Very often, the insertion or deletion of a space is not critical in issuing an order. Be wary, however, of using spaces at random, because sometimes the space, or lack of it, can make a big difference. Experience is an infallible teacher in this respect.

Now, try division and multiplication. The symbol for "divided by" is the slash (/). The symbol for "multiplied by" is the asterisk (*). Here are some samples:

$$?6/2<R>; ?3*7<R>; ?5*6+4<R>; ?6+4*5<R>$$

Priority of Calculations

You may have noticed from the last two examples that the order of calculation is important. The Atari computer, like algebra, gives priority to division and multiplication over, addition and subtraction. The last exercise, therefore, multiplied 4 by 5 first and added the product to 6.

Had we wished to print out the result of adding 4 to 6, and multiply the sum by 5, we could have instructed our math whiz as follows:

$$?(6+4)*5<R>$$

and gotten the proper result. Here again, as in algebra, priority is given to the operations within a set of parentheses before anything else.

Another, method for achieving the same result is to assign the results of operations to variables, and have the variables undergo the final operations. Give the command:

$$A=6+4<R>$$

The screen will show "READY" to indicate that the command has been obeyed and that BASIC is ready to accept other commands. How can you be sure? Type:

$$?A<R>$$

and you will see that the variable "A" now has the value 10. Continue by typing:

$$B=2+3<R>$$

Again your command is obeyed. Now type:

$$?A*B<R>$$

Variables and Multiple Commands

Now is as good a time as any to show why A and B here were called variables and to introduce the ability of our computer to handle several commands at one time. Try typ-

ing the following commands exactly as shown. Please note that each command is set off from the next by a colon (:); that there is no colon after the last command; and that the <RETURN> key is not pressed until all the commands are given.

A=9/3:B=10-6:C=A*B:?C<R>

Well, how about that! Four orders at once and impeccably executed.

Scrolling and the Logical Line

You must have noticed, as you were typing and the computer answering, that each statement appeared on your screen below the last one. When the screen was full, the statements at the top disappeared and those below went up,to leave room at the bottom for printing the latest statements. This is called "Scrolling." Should you ever need, or want, a fuller screen to start with, you can type the command:

?CHR$(125)<R>

There is a limit to how much information your machine can digest from BASIC at any one time. This is known as a logical line, which is equivalent to three physical lines on your screen, or 120 characters (spaces included). If you ever go that far, a warning buzz will be heard 6 characters before the end of the logical line. It is also wise to remember that the logical line includes the full keywords and spacing for your commands so that, if you have been using valid abbreviations, you may run over the logical line inadvertently.

Printing Text

To continue our work with the PRINT command, let us change from arithmetic operations to printing text. Let's ask BASIC to tell our Atari to print a name. Type the following:

?TOM ROSS<R>

Well, now, what's this? A stupid, inanimate bunch of hardware telling us that we've made a mistake! Don't fret. This is one of the best things the Atari does for us. It tells us not only when and where we've erred, but also, in many cases, what kind of a mistake we've made. This feature, in a long program, can save hours of "debugging" time. In our present example, we are being reminded that, when we want a specific series of characters printed, we must use delimiters to tell the machine where to start printing and where to stop. The delimiters for printing text are quotation marks (").

Let's try again:

?"TOM ROSS"<R>

Voila! Instant success (hopefully). Now let's practice mixing text with numbers. Ross, a candidate for President of the Student Council, received 58 freshman votes, 75 sophomore votes, 122 junior votes, and 125 senior votes. We'll print the total result of this count as follows:

FR=58:SO=75:JR=122:SR=125:?"ROSS: ";FR+SO+JR+SR;" VOTES."<R>

It would seem from this example that we can successfully print combinations of numbers and text (a form of appending). Certain precautions must be noted. The quotes (delimiters) must be used for all text to be printed. We can account for all spaces required within the quotes. No quotes must be used for the results of numerical calculations. It is not necessary to repeat the PRINT (?) command within the same statement. The colon (:) within the quotes is part of the text to be printed and does not indicate the end of a statement. Note also the use of the semicolon (;). It is necessary to keep the printing on one line. Without the semicolon, each new PRINT, whether number or text, would require a colon and a separate print command, and would go to the next line.

A great deal of practice is recommended for mixed printing commands and for text printing commands that exceed one line. In the latter case, you may have to count characters to keep your text from breaking in the middle of a word at the end of a line.

Deferred Mode

Now let's give the same series of commands we gave above, but with one exception. We'll allocate a separate line for each command, and prefix the command with a

number. Type the following: (Remember not to type <R>; that simply means to press <RETURN> whenever it occurs.)

        10 FR=58<R>
        20 SO=75<R>
        30 JR=122<R>
        40 SR=125<R>
        50 ?"ROSS: ";FR+SO+JR+SR;" VOTES."<R>

Notice that none of our orders were obeyed when <RETURN> was pressed? When there is a number before any statement, the computer will not carry out the statement directly, as it did before. Execution of the command will be deferred. This is called deferred mode.

Give the command to have the computer carry out the list of orders we just typed:

                            RUN<R>

The computer has responded just when we wanted it to, and not before. The entire series of statements (10 through 50 above) is your first program. Congratulations!

Running the program did not remove it from the computer's memory (RAM). We can demonstrate this by asking for a listing of the program residing in RAM by issuing the following order:

                            L.<R>

Notice that the new listing that came up is identical to what we typed.

Let us suppose that, upon recounting the votes, it was discovered that the Freshmen had given Ross 10 more votes than previously recorded, while the Seniors had actually given him 5 less. To correct the program, type as follows:

        15 FR=FR+10<R>
        45 SR=SR-5<R>
        L.<R>

Notice that the last command, being in the direct mode, was obeyed immediately, and we have the new listing. The commands 15 and 45 were in deferred mode and are still on hold. Notice, too, that in the latest listing of the program in RAM, regardless of the order in which the statements were typed, the computer has arranged all the lines in numerical order. Now, again, type:

                            RUN<R>

and the corrected count is printed. Perhaps it is easier now to see why quantities like FR and SR are called "variables."

Now let's clear the computer's memory by typing:

                            NEW<R>

Verify that nothing now resides in RAM by typing:

                            L.<R>

You could, of course, also have cleared the machine by turning it off. Turning it on again gives a fresh start. But there's no need to wear out the on/off switch.

Now a little information on the IF...THEN loop and the FOR...NEXT loop:

The Atari can provide us, upon demand, with many mathematical functions and calculations. It does not, however, automatically provide the factorial (N!) of a number (N). We can, however, program our computer to do this for us, using either of the two loops mentioned above. We'll show both methods by giving you the listings to type in for yourself. You can learn about the loops and compare the two on your own, and use them for *other simple* applications. (A factorial, if you've forgotten, is the product of all positive integers up to and including the specified number. Thus, if N = 4, N! = 1 X 2 X 3 X 4 = 24. If N = 7, N! = 1 X 2 X 3 X 4 X 5 X 6 X 7 = 5040. N! = 1 X 2 X 3 X 4... X N.)

REM statements will be used to explain new concepts. When you type the programs, you can skip lines that have only REMs after the line number.

FACTORIAL 1, using the IF...THEN loop:

```
10 GR.0:POKE 752,1<R>
20 REM GR.0 sets the text mode; POKE 752,1 makes the cursor invisible.
30 POS.4,3<R>
40 REM POS.n,n tells the computer where to position the cursor.
50 ?"TYPE N (ANY POSITIVE INTEGER NOT"<R> 60 POS.4,4:?"GREATER THAN 68),
PRESS <RETURN>"<R>
70 POS.9,5:?"AND I WILL GIVE YOU N!"<R>
80 POS.10,8:?"WHAT IS YOUR NUMBER";<R>
90 I.N<R>
100 REM I. asks the computer to wait for you to type a number and press <RE-
TURN> before it continues with the program.
110 A=N<R>
120 IF N=1 THEN POS.15,12:?"N!=";A:END<R>
130 REM If N is not=1 then the balance of line 120 is ignored by the computer.
140 REM END terminates the running of the program, but leaves it intact in RAM.
150 A=A*(N-1):N=N-1:G.120<R>
160 REM G. tells the computer to go to a specific line number and continue execut-
ing commands from there.
170 REM when N becomes 1 and the factorial is printed (line 120) the program ends.
180 REM Type RUN<R> if you want another factorial. Of course you must have had
to do the same thing after typing the program to get the first factorial.
190 REM larger numbers will print out in scientific (exponential) notation.
```

FACTORIAL 2, using the FOR...TO loop:

```
10 GR.0:POKE 752,1<R>
20 POS.4,3:?"TYPE N (ANY POSITIVE INTEGER NOT"<R>
30 POS.4,4:?"GREATER THAN 68), PRESS <RETURN>"<R>
40 POS.9,5:?"AND I WILL GIVE YOU N!"<R>
50 POS.10,8:?"WHAT IS YOUR NUMBER";:I.N:A=1<R>60 FOR Z=1 TO N:A=A*Z:-
NEXT Z<R>
70 REM This tells the computer to perform the operation between the colons N
times.
80 POS.15,12:?"N=";A:END<R>
```

Run and/or rerun this program as in the previous one.

We hope you have learned to comfortably use some fundamental commands. Please read the rest of this tutorial before striking out completely on your own. You will soon realize that you have at your command a new language, a new discipline, and a completely new means of personal expression. At that time, you will be truly ready to do successful programming on your own. In the meantime, the key is patience.

Using the Programs

First the Basics

Although you are probably anxious to start writing programs, it is important that first you fully understand the basics. You will be using the computer and this tutorial at the same time. If at any time you find that what is printed here does not correspond to what appears on your screen, back up a step or two and try again.

Your Atari Operator's Manual explains how to set up the computer and plug it in. If you have a disk drive connected right now, disconnect it from the side of the console and turn the computer on. The word "READY" should appear in the upper left part of the screen, in white letters on a blue background. If this is not the case, go back to your Operator's Manual and read the set up instructions again. If you have an 800, make sure your Atari BASIC cartridge is installed in the left slot.

Directly under the first letter of the word "READY" is a little white block. This is the cur-

sor. The cursor tells you where the next character will appear on the screen. When the computer is turned on, it looks to see if a cartridge is in the left slot. If a disk drive is available, it will immediately begin reading from the diskette on drive number one. Depending on the instructions the computer gets when it reads the diskette, it may either continue executing the instructions it reads, or turn control over to BASIC. If no disk is available, and the START key was not pressed when the computer was turned on, control will be given to BASIC. BASIC tells you it is ready with the previously described "READY" prompt.

A prompt is a message that provides the current status of things, or requests input or commands. Most prompts ask a question.

If you still haven't gone through your Operator's Manual, following the instructions and trying all the examples, please do so now. It is important that you become familiar with the keyboard, since it will be your way of communicating with BASIC and with many programs. To help you understand this powerful means of communication, our first program will demonstrate the keyboard modes and special functions.

What Is a Program? Where Does it Live?

First, you must understand what, and where, a program is. A program is a series of instructions to be executed by the computer. Programs are stored on cassette tape or diskette. Although we have a warehouse called RAM, it is too small to store all of our programs at the same time. We solve this by keeping our programs on tape or disk, and load them into RAM when we want to use them. When a program is read from tape or disk, it is copied into RAM. Once this process is completed, we have two programs: one on the tape or disk, and a copy in RAM. If we make any change to the program in RAM, it does not affect the tape or disk version. If we turn off the computer, or load another program, whatever is in RAM will be lost. If we want to keep a new version of a program currently in RAM, it must be SAVEd on a tape or disk.

If the same tape is used to save the new version, we will be writing on top of the old one, and only the new version will remain on the tape. The same thing will happen if we save a program on to the same diskette, and specify the identical program or file name. The computer just does what it's told. It's up to you to decide where you want to permanently store your programs, and by what name. Remember, the computer cannot deal with two programs with the same name on the same storage media. When a program is saved, it is copied from RAM onto tape or disk, again providing two copies. Remember that the copy in RAM is only temporary. It is lost when a new program is loaded, or when the power is turned off.

Sample Programs
and Instructions

Keyboard Program

Find the program listing called KEYBOARD starting on the next page. You must type it in to your computer, exactly as it appears on the page, just as you typed the earlier sample programs. The only difference is that KEYBOARD is longer. Don't type in returns where the lines break in the printed version, unless you're beginning the next line with a new line number. When you finish, type the word RUN and <RETURN>. If the program does not run, read through what you typed again to be sure you typed it correctly.

The first screen display you see is the Atari keyboard in its normal state. By normal, we mean the state of the keyboard when the computer is turned on and before any keys are pressed.

Notice that the screen display isn't exactly the same as what you see printed on the keys. In order to fit this display on the screen, we had to abbreviate some words. For example, in the upper right corner of the displayed keyboard, you see the letters "BRK". This is just an abbreviation we used instead of the word BREAK. But what's that little triangle doing to the left of BRK? That's the ASCII (American Standard Code for Information Interchange) character of the DELETE BACK S key.

DELETE BACK Space is a special function key. In other words, unlike the key with the big capital A printed on it which produces a letter A, DELETE BACK Space performs a special function. It is used to delete the character currently under the cursor, and backspace one position. But it also has a character representation, an up arrow. Confused? Don't worry about it right now. After we go through this program together and experiment with the keyboard a bit, it will all begin to make sense to you.

The special function keys are activated by pressing the ESC key immediately before the special function key.

Study this screen for a moment. In this, the normal state of the keyboard, you have uppercase letters, and numbers from 0 through 9. These keys with two or more symbols will normally display the character at the bottom. For example, in normal mode, the equal sign is displayed when that key is pressed.

Each keyboard mode will be displayed, one at a time, by this program. Take the time to study each screen and notice the changes. To continue on to the next screen, press the yellow START button.

The screen should change the moment you release the START button. Notice that near the bottom of the screen are the words SHIFTED KEYBOARD. You are looking at the characters that will be displayed if you hold down one of the SHIFT keys, while typing another key. You will still get capital letters for each letter key, but notice the changes, particularly along the top row of keys. For example instead of the number 1, you will get an exclamation point (!). On those keys with three symbols or words, you will get the one to the upper right on each key. For example, instead of the equal sign, if you hold down the SHIFT key and press that same key, you will see a single vertical line. Don't try to memorize all this. Just try to understand it for now. With a bit of practice, you will soon understand and remember it all. It's really not as complicated as it seems at first.

Press START again and the display will change to the lowercase keyboard. In this mode, everything is the same as in normal mode, except that lowercase letters are displayed instead of uppercase.

Press the START key again, and the program displays inverse video. Except for some special function keys which do not change in the inverse mode, you will notice that everything that used to be light is now dark, and everything that used to be dark is now light. Do NOT attempt to communicate with BASIC using inverse mode. BASIC will not understand inverse characters, nor do most programs. Inverse video should only be used to accent certain things, like the word START at the bottom of your screen.

The next two screens are also inverse video. They are shifted inverse and lowercase inverse. To get into and out of inverse modes, press the key with the Atari logo on it. This

```
KEYBOARD BY JERRY WHITE

0 GOTO 9000:REM KEYBOARD 1/4/83 (c) 19
82 Jerry White
1 REM BEGINNER'S TUTORIAL DEMO
2 REM
10 POSITION X,Y:? STRING$;:POSITION 5,
19:RETURN
20 FOR Y=19 TO 23:POSITION 0,Y:? B$;:N
EXT Y:RETURN
30 POKE 540,JIF:FOR BUZZ=0 TO 8 STEP 4
:POKE 53279,BUZZ:NEXT BUZZ
32 IF  NOT PEEK(540) THEN RETURN
34 POKE 77,0:GOTO 32
90 STRING$="┌─────────────────────┐":X=10:
Y=1:GOSUB 10
92 STRING$="| ATARI  KEYBOARD |":X=10:
Y=2:GOSUB 10
94 STRING$="└─────────────────────┘":X=10:
Y=3:GOSUB 10:IF FLAG THEN RETURN
99 REM NORMAL
100 STRING$=" E 1 2 3 4 5 6 7 8 9 0 <
> ◄ BRK":X=2:Y=6:GOSUB 10
110 STRING$="TAB Q W E R T Y U I O P -
 = RETURN":X=2:Y=8:GOSUB 10
120 STRING$="CTRL A S D F G H J K L ;
+ ✳ CAPS":X=2:Y=10:GOSUB 10
130 STRING$="SHIFT Z X C V B N M , . /
 ATR SHIFT":X=2:Y=12:GOSUB 10:RETURN
199 REM SHIFT
200 STRING$=" E ! ":STRING$(LEN(STRING
$)+1)=CHR$(34)
205 STRING$(LEN(STRING$)+1)=" # $ % &
' @ ( ) ◄ ◘ ◙ BRK":X=2:Y=6:GOSUB 10
210 STRING$="SET Q W E R T Y U I O P _
 | RETURN":X=2:Y=8:GOSUB 10
220 STRING$="CTRL A S D F G H J K L :
\ ^ CAPS":X=2:Y=10:GOSUB 10
230 STRING$="SHIFT Z X C V B N M [ ] ?
 ATR SHIFT":X=2:Y=12:GOSUB 10:RETURN
299 REM LOWER
300 STRING$=" E 1 2 3 4 5 6 7 8 9 0 <
> ◄ BRK":X=2:Y=6:GOSUB 10
310 STRING$="TAB q w e r t y u i o p -
 = RETURN":X=2:Y=8:GOSUB 10
320 STRING$="CTRL a s d f g h j k l ;
+ ✳ LOWR":X=2:Y=10:GOSUB 10
330 STRING$="SHIFT z x c v b n m , . /
 ATR SHIFT":X=2:Y=12:GOSUB 10:RETURN
399 REM NORMAL INVERSE
400 STRING$=" E ▉▉▉▉▉▉▉▉▉▉▉
▉ ◄ BRK":X=2:Y=6:GOSUB 10
410 STRING$="TAB ▉▉▉▉▉▉▉▉▉▉▉
▉ RETURN":X=2:Y=8:GOSUB 10
```

key, represented on your screen, by the letters ATR, is acting as a "toggle."

To "toggle" is to change from off to on, to off, to on, as with a light switch. When you are in normal video and press the Atari key, you instantly go into inverse video. Press it again and you are back to normal. To press this key again and again is to toggle between normal video and inverse video.

The last two modes of display are normal control and inverse control. You will only use the latter for specific graphic displays, but normal control mode activates many of what we call control or special function characters.

The keys on the top row are not displayed because they have no function in control modes, with two exceptions: the key between the ESC key (that funny-looking double E character) and the inverse bent arrow key; and the key immediately to the right of that same bent arrow. They are also known as CONTROL-1 and CONTROL-3. Their strange little characters are not on the screen because they have no display characters.

By holding down the CTRL key and pressing the number 1 key, you make the screen display pause. This will temporarily pause a program listing on the screen or, in most cases, actually stop a program from running. By pressing those same keys again, the display will continue. That's right, CTRL-1 toggles the screen display. At the end of this program, our friend Mr. BASIC will list this program on the screen. If you wish to pause this display, use CTRL-1; then do it again to continue.

So what does CTRL-3 do? It causes lots of problems, that's what. Although it does have a function called END OF FILE, you won't be using it. Pressing CTRL-3, in most cases, will confuse BASIC, so try to avoid pressing CTRL-3 until you've had a chance to study its uses.

After displaying the inverse control keyboard and pressing START again, you will have two messages at the bottom of the screen. If you'd like to review what we've done so far, press the OPTION button. If you'd like to continue, press the START button.

Next, we will demonstrate some of the special function keys. In most cases, special functions require a combination of keys to be pressed. The program will blink the key or keys that can be demonstrated sequentially. After five blinks, you can either press the START key to proceed to the next demonstration, or press the OPTION button to see a demonstration of the special function keys that are blinking. In each demonstration, the cursor will be positioned at the far left of the screen, and on the same line as the special function description.

The program will first briefly display the appropriate control character, then demonstrate its function. After each demonstration, the original screen will be restored. This will give you a chance to see each demonstration as many times as you wish. At least for now, press OPTION to see each demonstration at least once. If you don't quite understand everything that happens, press OPTION again. To go on to the next demonstration, you should, of course, press START.

```
420 STRING$="CTRL ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ ⬛ CAPS":X=2:Y=10:GOSUB 10
430 STRING$="SHIFT ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛⬛⬛ SHIFT":X=2:Y=12:GOSUB 10:RETURN
499 REM SHIFT INVERSE
500 STRING$=" ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ ⬛ BRK":X=2:Y=6:GOSUB 10
510 STRING$="SET ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ RETURN":X=2:Y=8:GOSUB 10
520 STRING$="CTRL ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ ⬛ CAPS":X=2:Y=10:GOSUB 10
530 STRING$="SHIFT ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛⬛⬛ SHIFT":X=2:Y=12:GOSUB 10:RETURN
599 REM LOWER INVERSE
600 STRING$=" ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ ⬛ BRK":X=2:Y=6:GOSUB 10
610 STRING$="TAB ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ RETURN":X=2:Y=8:GOSUB 10
620 STRING$="CTRL ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ ⬛ LOWR":X=2:Y=10:GOSUB 10
630 STRING$="SHIFT ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛⬛⬛ SHIFT":X=2:Y=12:GOSUB 10:RETURN
699 REM NORMAL CTRL
700 STRING$=" ⬛     ⬛                    ⬛
⬛ ⬛ BRK":X=2:Y=6:GOSUB 10
710 STRING$="⬛⬛⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ RETURN":X=2:Y=8:GOSUB 10
720 STRING$="CTRL ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ ⬛ CAPS":X=2:Y=10:GOSUB 10
730 STRING$="SHIFT ⬛ ⬛ ⬛ ⬛  ⬛ ⬛ ⬛ ⬛ ⬛
 ATR SHIFT":X=2:Y=12:GOSUB 10:RETURN
799 REM INVERSE CTRL
800 STRING$=" ⬛     ⬛                    ⬛
⬛ ⬛ BRK":X=2:Y=6:GOSUB 10
810 STRING$="⬛⬛⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ RETURN":X=2:Y=8:GOSUB 10
820 STRING$="CTRL ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛ ⬛ CAPS":X=2:Y=10:GOSUB 10
830 STRING$="SHIFT ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛ ⬛
⬛⬛⬛ SHIFT":X=2:Y=12:GOSUB 10:RETURN
900 POKE 540,240:POSITION 7,22:? "PRES
S ⬛START⬛ TO CONTINUE";
905 FOR ME=0 TO 8 STEP 4:POKE 53279,ME
:NEXT ME
910 POKE 77,0:REVIEW=0:BUTTON=PEEK(532
79):IF  NOT PEEK(540) THEN POSITION 0,
22:? B$:GOTO 900
911 IF FLAG THEN 950
915 IF BUTTON<>6 THEN 910
920 GOTO 970
950 BUTTON=PEEK(53279):IF BUTTON=6 THE
N REVIEW=0:GOTO 970
960 IF BUTTON<>3 THEN 910
965 REVIEW=1
```

```
970 BUTTON=PEEK(53279):IF BUTTON<>7 TH
EN 970
980 RETURN
990 POKE 540,240:POSITION 7,21:? "PRES
S OPTION TO DEMONSTRATE":GOTO 900
1000 POSITION 5,19:? "        NORMAL KEY
BOARD":GOSUB 900
1100 GOSUB 200:? "        SHIFTED KEYBOA
RD":GOSUB 900
1200 GOSUB 300:? "       LOWER CASE KEYBO
ARD":GOSUB 900
1300 GOSUB 400:? "     NORMAL INVERSE KEY
BOARD":GOSUB 900
1400 GOSUB 500:? "     SHIFTED INVERSE KE
YBOARD":GOSUB 900
1500 GOSUB 600:? "LOWER CASE INVERSE K
EYBOARD":GOSUB 900
1600 GOSUB 700:? "    NORMAL CONTROL KEY
BOARD      ":GOSUB 900
1700 GOSUB 800:? "    INVERSE CONTROL KE
YBOARD     ":GOSUB 900
1800 POSITION 7,21:? "PRESS OPTION TO
  REVIEW       ":FLAG=1:GOSUB 900
1810 IF REVIEW THEN RUN
1820 GOSUB 20:POSITION 10,17:? "SPECIA
L FUNCTIONS:";
2000 JIF=15:GOSUB 20:GOSUB 200:POSITIO
N 5,19:? "SHIFT + CLEAR = CLEAR SCREEN
"
2010 FOR ME=1 TO 5:POSITION 25,6:? "█"
;:POSITION 2,12:? "▁▁▁▁▁";:POSITION 32
,12:? "▁▁▁▁▁";:GOSUB 30
2020 POSITION 25,6:? "K";:POSITION 2,1
2:? "SHIFT";:POSITION 32,12:? "SHIFT";
:GOSUB 30:NEXT ME:GOSUB 990
2025 IF   NOT REVIEW THEN 2100
2030 JIF=60:POSITION 0,19:? "K";:GOSUB
 30:POKE 766,0:? "K":POKE 766,1:GOSUB
30:GOSUB 9100:GOTO 2000
2100 JIF=15:GOSUB 20:GOSUB 200:POSITIO
N 5,19:? "SHIFT + INSERT = INSERT LINE
"
2110 FOR ME=1 TO 5:POSITION 27,6:? "█"
;:POSITION 2,12:? "▁▁▁▁▁";:POSITION 32
,12:? "▁▁▁▁▁";:GOSUB 30
2120 POSITION 27,6:? "▓";:POSITION 2,1
2:? "SHIFT";:POSITION 32,12:? "SHIFT";
:GOSUB 30:NEXT ME:GOSUB 990
2125 IF   NOT REVIEW THEN 2200
2130 JIF=60:POSITION 0,19:? "▓";:GOSUB
 30:POKE 766,0:? "▓";:POKE 766,1:GOSUB
 30:GOTO 2100
2200 JIF=15:GOSUB 20:GOSUB 200:POSITIO
N 5,19:? "SHIFT + DELETE = DELETE LINE
"
```

```
2210 FOR ME=1 TO 5:POSITION 29,6:? "█"
;:POSITION 2,12:? "███████";:POSITION 32
,12:? "██████";:GOSUB 30
2220 POSITION 29,6:? "▛";:POSITION 2,1
2:? "SHIFT";:POSITION 32,12:? "SHIFT";
:GOSUB 30:NEXT ME:GOSUB 990
2225 IF  NOT REVIEW THEN 2300
2230 JIF=60:POSITION 0,19:? "▛";:GOSUB
 30:POKE 766,0:? "▛":POKE 766,1:GOSUB
 30:GOTO 2200
2300 JIF=15:GOSUB 20:GOSUB 200:POSITIO
N 5,19:? "SHIFT + SET = SET TAB STOP
"
2310 FOR ME=1 TO 5:POSITION 2,8:? "████
";:POSITION 2,12:? "███████";:POSITION 3
2,12:? "██████";:GOSUB 30
2320 POSITION 2,8:? "SET";:POSITION 2,
12:? "SHIFT";:POSITION 32,12:? "SHIFT"
;:GOSUB 30:NEXT ME:GOSUB 990
2325 IF  NOT REVIEW THEN 2400
2330 JIF=60:POSITION 0,19:? "█  ▛";:GOS
UB 30:POSITION 0,19:? "    █":GOSUB 30:G
OTO 2300
2400 JIF=15:GOSUB 20:GOSUB 200:POSITIO
N 5,19:? "SHIFT + CAPS = UNSET LOWERCA
SE"
2410 FOR ME=1 TO 5:POSITION 31,10:? "█
█████";:POSITION 2,12:? "███████";:POSITIO
N 32,12:? "███████";:GOSUB 30
2420 POSITION 31,10:? "CAPS";:POSITION
 2,12:? "SHIFT";:POSITION 32,12:? "SHI
FT";:GOSUB 30:NEXT ME:GOSUB 990
2425 IF  NOT REVIEW THEN 3000
2430 JIF=60:GOSUB 300:GOSUB 30:GOSUB 1
00:GOSUB 30:GOTO 2400
3000 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 5,19:? "CTRL + CLEAR = CLEAR SCREEN"
3010 FOR ME=1 TO 5:POSITION 25,6:? "█"
;:POSITION 2,10:? "██████";:GOSUB 30
3020 POSITION 25,6:? "▛";:POSITION 2,1
0:? "CTRL";:GOSUB 30:NEXT ME:GOSUB 990
3025 IF  NOT REVIEW THEN 3100
3030 JIF=60:POSITION 0,19:? "▛";:GOSUB
 30:POKE 766,0:? "▛":POKE 766,1:GOSUB
30:GOSUB 9100:GOTO 3000
3100 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 3,19:? "CTRL + INSERT = INSERT CHARA
CTER"
3110 FOR ME=1 TO 5:POSITION 27,6:? "█"
;:POSITION 2,10:? "██████";:GOSUB 30
3120 POSITION 27,6:? "▛";:POSITION 2,1
0:? "CTRL";:GOSUB 30:NEXT ME:GOSUB 990
3125 IF  NOT REVIEW THEN 3200
3130 JIF=60:POSITION 0,19:? "▛";:GOSUB
 30:POKE 766,0:? "▛":POKE 766,1:GOSUB
30:GOTO 3100
```

```
3200 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 5,19:? "CTRL + ▉ = CLEAR TAB STOP"
3210 FOR ME=1 TO 5:POSITION 2,8:? "▉
";:POSITION 2,10:? "▉";:GOSUB 30
3220 POSITION 2,8:? "CLR";:POSITION 2,
10:? "CTRL";:GOSUB 30:NEXT ME:GOSUB 99
0
3225 IF  NOT REVIEW THEN 3300
3230 JIF=60:POSITION 0,19:? "▉ ◲";:GOS
UB 30:POSITION 0,19:? "      C▉";:GOSUB
 30:GOTO 3200
3300 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 5,19:? " CTRL + ↑ = MOVE CURSOR UP"
3310 FOR ME=1 TO 5:POSITION 26,8:? "▉"
;:POSITION 2,10:? "▉";:GOSUB 30
3320 POSITION 26,8:? "↑";:POSITION 2,1
0:? "CTRL";:GOSUB 30:NEXT ME:GOSUB 990
3325 IF  NOT REVIEW THEN 3400
3330 JIF=60:POSITION 0,19:? "▉";:GOSUB
 30:POSITION 0,19:? " ";:POSITION 0,18
:? "▉";:GOSUB 30
3340 POSITION 0,18:? " ";:GOTO 3300
3400 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 5,19:? "CTRL + ↓ = MOVE CURSOR DOWN"
3410 FOR ME=1 TO 5:POSITION 28,8:? "▉"
;:POSITION 2,10:? "▉";:GOSUB 30
3420 POSITION 28,8:? "↓";:POSITION 2,1
0:? "CTRL";:GOSUB 30:NEXT ME:GOSUB 990
3425 IF  NOT REVIEW THEN 3500
3430 JIF=60:POSITION 0,19:? "▉";:GOSUB
 30:POSITION 0,19:? " ";:POSITION 0,20
:? "▉";:GOSUB 30:GOTO 3400
3500 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 5,19:? "CTRL + ← = MOVE CURSOR LEFT"
3510 FOR ME=1 TO 5:POSITION 27,10:? "▉
";:POSITION 2,10:? "▉";:GOSUB 30
3520 POSITION 27,10:? "←";:POSITION 2,
10:? "CTRL";:GOSUB 30:NEXT ME:GOSUB 99
0
3525 IF  NOT REVIEW THEN 3600
3530 JIF=60:POSITION 1,19:? "▉";:GOSUB
 30:POSITION 1,19:? " ";:POSITION 0,19
:? "▉";:GOSUB 30:GOTO 3500
3600 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 5,19:? "CTRL + → = MOVE CURSOR RIGHT
"
3610 FOR ME=1 TO 5:POSITION 29,10:? "▉
";:POSITION 2,10:? "▉";:GOSUB 30
3620 POSITION 29,10:? "→";:POSITION 2,
10:? "CTRL";:GOSUB 30:NEXT ME:GOSUB 99
0
3625 IF  NOT REVIEW THEN 3800
3630 JIF=60:POSITION 0,19:? "▉";:GOSUB
 30:POSITION 0,19:? " ";:POSITION 1,19
:? "▉";:GOSUB 30:GOTO 3600
```

```
3700 REM
3800 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 3,19:? "   CTRL + 2 = SOUND BUZZER/BE
LL       "
3810 FOR ME=1 TO 5:POSITION 7,6:? "█";
:POSITION 2,10:? "██████";:GOSUB 30
3820 POSITION 7,6:? "░";:POSITION 2,10
:? "CTRL";:GOSUB 30:NEXT ME:GOSUB 990
3825 IF  NOT REVIEW THEN 4000
3830 JIF=60:POSITION 0,19:? "░";:GOSUB
 30:POKE 766,0:? "░":POKE 766,1:GOSUB
30:GOTO 3800
4000 JIF=15:GOSUB 20:GOSUB 700:POSITIO
N 3,19:? "CTRL + 1 = PAUSE/CONTINUE DI
SPLAY"
4010 FOR ME=1 TO 5:POSITION 5,6:? "█";
:POSITION 2,10:? "██████";:GOSUB 30
4020 POSITION 5,6:? " ";:POSITION 2,10
:? "CTRL";:GOSUB 30:NEXT ME:JIF=30:GOS
UB 30
4030 FOR ME=1 TO 3:POSITION 3,19:? "CT
RL + 1 = PAUSE/CONTINUE DISPLAY";:GOSU
B 30
4040 JIF=60:POSITION 3,19:? "CTRL + 1
= PAUSE/CONTINUE DISPLAY";:GOSUB 30:NE
XT ME
8000 GRAPHICS 0:POKE 766,0:POKE 82,2:?
 :LIST :? :? "BASIC":? "IS";:END
9000 GRAPHICS 0:POKE 752,1:DIM STRINGS$
(40),B$(39):STRINGS$="    "
9010 POKE 82,0:POKE 83,39:POKE 710,240
:JIF=10:POKE 766,1:B$=STRINGS$(1,39)
9100 GOSUB 90:STRINGS$="▛▔▔▔▔▔▔▔
▔▔▀":X=9:Y=14:GOSUB 10
9110 STRINGS$="▙▁▁▁▁▁▁▁▁▁▁▟":X=9
:Y=15:GOSUB 10
9120 IF  NOT REVIEW THEN 1000
9130 RETURN
```

Buttons Program

The BUTTONS program will show you how the PEEK command is used to determine if someone is pressing the OPTION, SELECT, and/or START button. Enter and RUN this program now.

A simple GRAPHICS 0 display is used to show the three console buttons on the screen. The only way to get the status of the console buttons is by PEEKing into ROM location 53279. If none of these buttons is pressed, PEEK (53279)=7.

Press the START key. Notice that the value at the bottom of the screen changes to 6 while the button is down. Try pressing the other console buttons. Try pressing more than one at a time, and watch the screen. To exit or END this program, press the ESC key.

This program is rather simple and contains more REMark statements than anything else, so we won't go through a line-by-line description of it. Instead, we'll explain how to use the PEEK command to check for certain situations when BASIC provides no other way.

Let's assume that you want your program to wait until the user presses any key before it clears the screen. The words "any key" should not be taken literally. Any key means only those that can normally be displayed by pressing only one key. Our routine will include the console buttons, but not SYSTEM RESET, BREAK, CTRL, SHIFT, or CAPS/LOWER. In other words, we want to create a situation where the user can simply lay a hand on the keyboard without having to press a specific key. The space bar will do, as well as the START or SELECT buttons.

Before we look at the BASIC routine to accomplish this, you must understand one more command. POKE is the opposite of PEEK. Instead of looking at a specific location, POKE puts any integer value (a round number, not a fraction) between 0 and 255 into a specific location. Here's the routine:

```
100 POKE 764,255
110 IF PEEK(764)=255 AND PEEK(53279)=7 THEN GOTO 110
120 REM when the program gets here, we know that a key was pressed
```

Location 764 stores the internal value of the last key pressed. The internal value is not the same as the ASCII value, but we'll explain that later. Line 100 tells the computer that the last key pressed was null. In English, that's like telling the computer that nobody has ever pressed a key. This does not include console buttons, by the way.

In line 110, we tell the computer that, if nobody has pressed a key or button, it should go back and check again. In computer jargon, this is called a loop. BASIC will execute line 110 over and over until one of those conditions is no longer true. Therefore, when we get past line 110, we know a key was pressed, and we go on to do whatever is next.

Location 82 contains the current left margin setting of a standard GRAPHICS 0 screen. Location 83 contains the current right margin. If they have not been changed by a program or command (PEEK(82)=X and PEEK(83)=Y), the default setting is 2 for the left and 39 for the right. Default conditions are the settings the computer will use automatically if you or the program do not change them. For example, the default condition of the American system of justice is innocence. A suspect remains innocent, until he is proven guilty by a court of law. PEEK(82)=2, unless changed; thus, we say that the default value of location 82 is 2.

There are 40 positions across the screen, numbered from 0 through 39. To use the full width, POKE 82,0. This moves the left margin to the far left. To put it back the way it was, POKE 82,2. To change the right margin, POKE 83 with a number less than 39, but greater than the number in location 82 (PEEK(82) to find out this number). Use the PEEK command anytime you want to see how the margins are currently set:

? PEEK(82):? PEEK(83)

If the margins are set at their default values, BASIC will respond with:

2
39
READY

```
BUTTONS BY JERRY WHITE

100 REM BUTTONS 1/4/83 (c) 1983 by Jer
ry White
101 REM BEGINNER'S TUTORIAL DEMO
108 REM
109 REM INHIBIT CURSOR & SET DARK BROW
N BACKGROUND
110 GRAPHICS 0:POKE 752,1:SETCOLOR 2,1
5,0:BUTTON=53279
118 REM
119 REM YELLOW$ & WORD$ ARE 10 POSITIO
NS AND INVERSE VIDEO
120 DIM YELLOW$(10),WORD$(10):YELLOW$=
"          ":GOTO 400
128 REM
129 REM SUBROUTINES (Y=VERTICAL SCREEN
 POSITION)
130 WORD$="   OPTION   ":Y=6:SOUND 0,0,0
,0:GOTO 200
140 WORD$="   SELECT   ":Y=10:SOUND 1,0,
0,0:GOTO 200
150 WORD$="   START    ":Y=14:SOUND 2,0,
0,0
198 REM
199 REM UPDATE SCREEN SUBROUTINE
200 POKE 77,0:POSITION 14,Y:? WORD$;:P
OSITION 25,18:? PRESS;:RETURN
398 REM
399 REM SCREEN SETUP (POKE 82,LEFT MAR
GIN)
400 POKE 82,11:? :? "CONSOLE BUTTONS "
450 POKE 82,14:? :POSITION 14,5:FOR Y=
5 TO 15 STEP 2:? YELLOW$:? :NEXT Y
500 POSITION 13,18:? "PEEK(53279)=7";
550 POSITION 12,20:? "PRESS ESC TO END
";
598 REM
599 REM *** MAIN PROGRAM LOOP 600-640
***
600 GOSUB 130:GOSUB 140:GOSUB 150
608 REM
609 REM GET BUTTON AND KEYPRESS INFO
610 PRESS=PEEK(BUTTON):KEY=PEEK(764):P
OSITION 25,18:? PRESS
618 REM
619 REM IF ESC AND BUTTONS ARE NOT PRE
SSED THEN JUST WAIT
620 IF PRESS=7 AND KEY<>28 THEN GOTO 6
10
628 REM
629 REM IF ESC KEY THEN END PROGRAM
630 IF KEY=28 THEN POKE 764,255:POKE 8
2,2:GRAPHICS 0:END
638 REM
```

```
639 REM A BUTTON HAS BEEN PRESSED TO G
O TO THE APPROPRIATE  SUBROUTINE
640 GOSUB PRESS*10+1000:GOTO 600
998 REM
999 REM OPTION+SELECT+START (PRESS=0)
1000 GOSUB 1030:GOSUB 1050:GOSUB 1060:
RETURN
1008 REM
1009 REM OPTION+SELECT (PRESS=1)
1010 GOSUB 1030:GOSUB 1050:RETURN
1018 REM
1019 REM OPTION+START (PRESS=2)
1020 GOSUB 1030:GOSUB 1060:RETURN
1028 REM
1029 REM "OPTION"=NORMAL VIDEO (PRESS=
3)
1030 WORD$="█ OPTION █":Y=6:SOUND 0,0,
2,2:GOSUB 200:RETURN
1038 REM
1039 REM SELECT+START (PRESS=4)
1040 GOSUB 1050:GOSUB 1060:RETURN
1048 REM
1049 REM "SELECT"=NORMAL VIDEO (PRESS=
5)
1050 WORD$="█ SELECT █":Y=10:SOUND 1,1
,2,2:GOSUB 200:RETURN
1058 REM
1059 REM "START"=NORMAL VIDEO (PRESS=6
)
1060 WORD$="█ START █":Y=14:SOUND 2,2
,2,2:GOSUB 200:RETURN
```

Demonstration Program

Four of the programs in this tutorial are strictly of the "look-and-learn" variety. Relax and watch them run. You will undoubtedly learn a great deal and will certainly enjoy the show.

The GRAPHICS program is completely self-explanatory. It carries you through graphic modes 0 through 8, showing their basic differences and similarities. Text windows, screen sizes, and resolution capabilities are demonstrated. Colors and luminances, for background, border, and text (or foreground) are clearly explained for all modes using SETCOLOR.

The MODE7DEM, MODE8DEM and GTIADEMO programs display, in an artful manner, the beautiful, practical, and entrancing effects possible in the graphic modes. These demonstrations, under the right circumstances, have an almost hypnotic effect.

```
GRAPHICS BY JERRY WHITE

0 REM GRAPHICS (MODE DEMO) 1/4/83 (c)
1983 by Jerry White
1 REM THE BEGINNER'S TUTORIAL
10 SIX=6:GOTO 100
50 COLOR 1
52 PLOT 0,0:REM UPPER LEFT CORNER
54 DRAWTO 39,0:REM DRAW TO THE LEFT
56 DRAWTO 39,19:REM DRAW DOWN
58 DRAWTO 0,19:REM DRAW TO THE RIGHT
60 DRAWTO 0,0:REM BACK WHERE WE STARTE
D
62 GOTO 95
70 POKE 540,JIFFY
71 IF PEEK(540) THEN 71
72 RETURN
90 POSITION 8,23:? "PRESS START TO CON
TINUE";:POKE 77,0
91 FOR BUZZ=0 TO 8:POKE 53279,BUZZ:NEX
T BUZZ
92 IF PEEK(53279)<>SIX THEN 92
93 IF PEEK(53279)=SIX THEN 93
94 ? CHR$(125);:RETURN
95 ? "          PRESS START TO CONTINUE"
;:POKE 77,0:GOTO 91
100 GRAPHICS 0:POKE 82,0:POKE 83,39:PO
KE 752,1
110 ? :? "▶This is GRAPHICS mode 0."
120 ? :? " This mode can display 40 ch
aracters":? :? " per line, and a total
 of 24 lines."
130 ? :? " A full screen display = 40*
24=960."
140 ? :? " The screen border color is
changed":? :? " by the SETCOLOR 4,C,L
statement"
150 ? :? " where C=Color (0-15) and L=
Luminence":? :? " (0-15). SETCOLOR 4,
9,4 will make the"
```

```
160 ? :? " the border equal to the bac
kground":? :? " color you now see on y
our screen.":GOSUB 90
200 SETCOLOR 4,9,4:? :? "▶This program
 just executed the":? :? " command SET
COLOR 4,9,4.  The border"
210 ? :? " and background colors shoul
d now be":? :? " a medium blue color,
and this text"
220 ? :? " should be extremely light b
lue that":? :? " appears to be white.
 We can make the"
230 ? :? " text brighter with a SETCOL
OR 1,C,L":? :? " command.  The color C
 will always be"
240 ? :? " the same as the background
color.  If":? :? " L is increased, the
 text will become"
250 ? :? " brighter.":GOSUB 90
300 SETCOLOR 1,9,15:? :? "▶This progra
m just executed the":? :? " command SE
TCOLOR 1,9,15.  The text"
310 ? :? " on your screen should now b
e a very":? :? " brilliant white.  The
 background can"
320 ? :? " be set to a lighter color i
f you like,":? :? " so that text can b
e displayed in a"
340 ? :? " color other than white.  Ju
st make":? :? " sure there is a differ
ence of at least"
350 ? :? " 6 between the luminance you
 use in":? :? " your SETCOLOR register
s 1 & 2.":GOSUB 90
400 SETCOLOR 2,0,8:SETCOLOR 4,0,8:SETC
OLOR 1,0,2
405 POSITION 2,2:? "▶This color combin
ation":? :? " was created by using th
e following":? :? "  SETCOLOR commands
:"
410 FOR KULLER=0 TO 15:SETCOLOR 2,KULL
ER,8:SETCOLOR 4,KULLER,8:SETCOLOR 1,KU
LLER,2
420 POSITION 2,8:? "SETCOLOR 2,";KULLE
R;",8:REM BACKGROUND"
430 ? :? "  SETCOLOR 4,";KULLER;",8:RE
M BORDER"
440 ? :? "  SETCOLOR 1,";KULLER;",2:RE
M TEXT"
450 PITCH=KULLER+10:GOSUB 5000:JIFFY=6
0:GOSUB 70:NEXT KULLER
500 FOR KULLER=0 TO 15:SETCOLOR 2,KULL
ER,2:SETCOLOR 4,KULLER,2:SETCOLOR 1,KU
LLER,10
```

```
520 POSITION 2,8:? "SETCOLOR 2,";KULLE
R;",2:REM BACKGROUND   "
530 ? :? "   SETCOLOR 4,";KULLER;",2:RE
M BORDER   "
540 ? :? "   SETCOLOR 1,";KULLER;",8:RE
M TEXT   "
550 PITCH=KULLER+10:GOSUB 5000:JIFFY=6
0:GOSUB 70:NEXT KULLER
1000 GRAPHICS 1:POKE 752,1
1010 ? #SIX:? #SIX;"   GRAPHICS MODE 1"
:? #SIX:? #SIX;"  IS A SPLIT SCREEN":?
#SIX:? #SIX;"      TEXT MODE."
1020 ? #SIX:? #SIX;"     THE COMMAND":?
 #SIX:? #SIX;"      ? #6;";CHR$(34);"TEX
T";CHR$(34)
1030 ? #SIX:? #SIX;"  IS USED TO PRINT
":? #SIX:? #SIX;"      UP HERE."
1040 ? " The normal PRINT or ? command
 is used":? " to PRINT down here in th
e text window.":GOSUB 95
1100 GRAPHICS 1:POKE 752,1
1110 ? #SIX:? #SIX;"   YOU CAN DISPLAY"
:? #SIX:? #SIX;" 4 DIFFERENT COLORS":?
 #SIX:? #SIX;"  OF TEXT BY USING"
1120 ? #SIX:? #SIX;"   NORMAL UPPERCASE
":? #SIX:? #SIX;"   normal lowercase"
1130 ? #SIX:? #SIX;"  INVERSE UPPERCASE
":? #SIX:? #SIX;"  inverse lowercase"
1140 GOSUB 95
1200 GRAPHICS 1:POKE 752,1
1210 ? #SIX:? #SIX;"   IN GRAPHICS 1":
? #SIX:? #SIX;"   THERE IS ROOM"
1220 ? #SIX:? #SIX;" FOR 20 LINES OF 2
0":? #SIX:? #SIX;" CHARACTERS IN THIS"
1230 ? #SIX:? #SIX;"   GRAPHICS WINDOW"
:? #SIX:? #SIX;"    AND 4 LINES"
1240 ? #SIX:? #SIX;"  OF 40 CHARACTERS
":? #SIX:? #SIX;"    BELOW IN THE"
1250 ? #SIX:? #SIX;"    TEXT WINDOW.":
GOSUB 95
1300 GRAPHICS 2:POKE 752,1
1310 ? #SIX;"   IN GRAPHICS 2":? #SIX;
"   THERE IS ROOM"
1320 ? #SIX;" FOR 10 LINES OF 20":? #S
IX;" CHARACTERS IN THIS"
1330 ? #SIX;"   GRAPHICS WINDOW":? #SIX
;"    AND 4 LINES"
1340 ? #SIX;"  OF 40 CHARACTERS":? #SI
X;"    BELOW IN THE"
1350 ? #SIX;"    TEXT WINDOW.":GOSUB 9
5
1400 GRAPHICS 17:POSITION 0,3:? #SIX;"
  BY ADDING 16 TO":? #SIX:? #SIX;"   EI
THER GRAPHICS"
```

```
1410 ? #SIX:? #SIX;"    MODES 1 OR 2":?
  #SIX:? #SIX;"  THE TEXT WINDOW"
1420 ? #SIX:? #SIX;"   IS ELIMINATED."
  :? #SIX:? #SIX:? #SIX:? #SIX;"      TH
IS IS"
1430 ? #SIX:? #SIX;" GRAPHICS 17 (1+16
)"
1440 ? #SIX:? #SIX:? #SIX:? #SIX;"
PRESS START":GOSUB 91
1500 GRAPHICS 18:POSITION 0,3:? #SIX;"
       THIS IS":? #SIX:? #SIX;" GRAPHIC
S 18 (2+16)"
1540 ? #SIX:? #SIX:? #SIX:? #SIX;"
PRESS START":GOSUB 91
1600 GRAPHICS 0:POKE 752,1:SETCOLOR 2,
15,0
1610 ? :? "▶GRAPHICS modes 3 thru 8":?
 :? " are not text modes, although the
y do"
1620 ? :? " have text windows at the b
ottom of":? :? " the screen.  Again, t
ext windows can"
1630 ? :? " be eliminated by adding 16
 to the mode":? :? " number.  To demon
strate the graphics"
1640 ? :? " resolution of these modes,
 we will run":? :? " the same little p
rogram or routine"
1650 ? :? " in each GRAPHICS mode.":GO
SUB 90
1700 ? :? "▶This routine will draw a":
? :? " box using color 1, in GRAPHICS
modes"
1710 ? :? " 3 thru 8.  You will notice
 that modes":? :? " 4 and 5 draw the s
ame size rectangle."
1720 ? :? " Modes 6 and 7 are also ide
ntical in":? :? " resolution.  They di
ffer only in the"
1730 ? :? " number of colors they can
display."
1750 POKE 82,1:? CHR$(128):LIST 50,60:
GOSUB 90
1800 FOR MODE=3 TO 8:GRAPHICS MODE:SET
COLOR 2,0,0:POKE 752,1:? "
GRAPHICS MODE ";MODE
1810 SETCOLOR 2,0,0:GOSUB 50:NEXT MODE
2000 GRAPHICS 0:POKE 82,2:LIST :? :? "
BASIC":? "IS";:END
5000 FOR VOL=8 TO 0 STEP -4:SOUND 0,PI
TCH,10,VOL:NEXT VOL:RETURN
```

```
MODE7DEM BY JERRY WHITE

0 REM MODE7DEM 1/4/83 (c) 1983 by Jerr
y White
1 REM THE BEGINNER'S TUTORIAL
2 REM
1000 REM POKES INHIBIT CURSOR & INSURE
 NO KEY PRESSED
1100 GRAPHICS 7:POKE 752,1:POKE 764,25
5
1200 ? ,"GRAPHICS MODE 7":? "PRESS ANY
 KEY TO END THIS PROGRAM"
1300 SETCOLOR 2,8,0:Y=39:X=79:DEG
1400 FOR L=0 TO 359:REM 360 DEGREES
1500 KULLER=INT(RND(0)*15)+1:REM GET A
 WHOLE NUMBER FROM 1-15
1600 REGISTER=INT(RND(0)*3)+1:REM GET
A WHOLE NUMBER FROM 1-3
1700 IF REGISTER=2 THEN 1900
1800 SETCOLOR REGISTER,KULLER,KULLER
1900 IF PEEK(764)<>255 OR PEEK(53279)<
>7 THEN GRAPHICS 0:LIST :? "BASIC":? "
IS";:END
2000 COLOR KULLER:PLOT 80,40
2100 DRAWTO 80+X*SIN(L),40+Y*COS(L)
2200 POKE 77,0:NEXT L
2300 X=Y:GOTO 1400
```

```
MODE8DEM BY JERRY WHITE

0 REM MODE8DEM 1/4/83 (c) 1983 by Jerr
y White
1 REM BEGINNER'S TUTORIAL DEMO
2 REM
40 GRAPHICS 8:SETCOLOR 2,0,0:COLOR 1:?
 "K";:POKE 752,1
50 ? "        RECTILINEAR POLYGONS (YES!)
 ":GOSUB 300
70 ? "        triangle";:GOSUB 300
80 PLOT 0,0:DRAWTO 160,0:DRAWTO 80,80:
DRAWTO 0,0
90 ? "          square":GOSUB 300
100 PLOT 240,0:DRAWTO 319,0:DRAWTO 319
,80:DRAWTO 240,80:DRAWTO 240,0
110 ? "        rectangle";:GOSUB 300
120 PLOT 0,90:DRAWTO 100,90:DRAWTO 100
,139:DRAWTO 0,139:DRAWTO 0,90
130 ? "          trapezoid";:GOSUB 300
140 PLOT 190,90:DRAWTO 270,90:DRAWTO 3
19,159:DRAWTO 160,159:DRAWTO 190,90
150 FOR X=0 TO 319 STEP 10:PLOT X/2,0:
DRAWTO 80,80
160 PLOT 240+X/4,X/4:DRAWTO 319,0:PLOT
 240+X/4,X/4:DRAWTO 240,80
170 PLOT X*0.315,90:DRAWTO 50,115:PLOT
 100,90+X*0.157:DRAWTO 50,115
180 PLOT X*0.315,140:DRAWTO 50,115:PLO
T 0,90+X*0.157:DRAWTO 50,115
190 PLOT 160+X*0.345,159-X*0.22:DRAWTO
 190,90:PLOT 160+X*0.345,159-X*0.22:DR
AWTO 319,159:NEXT X
195 ? "        PRESS ANY KEY TO EXIT   "
;
200 POKE 764,255:FOR BUZZ=0 TO 8:POKE
53279,BUZZ:NEXT BUZZ
210 IF PEEK(53279)=7 AND PEEK(764)=255
 THEN 210
220 POKE 764,255:GRAPHICS 0:POKE 752,0
:? :? "BASIC":? "IS";:END
300 FOR VOLUME=15 TO 0 STEP -0.5:SOUND
 0,0,2,VOLUME:NEXT VOLUME:RETURN
```

```
GTIADEMO BY JERRY WHITE

0 REM GTIADEMO 1/4/83 (c) 1983 by Jerr
y White
1 REM BEGINNER'S TUTORIAL
100 GOTO 780
110 REM GRAPHICS MODE 9 DEMO
120 JW=15:GRAPHICS 9:SETCOLOR 4,JW,0
130 FOR Y=55 TO 0 STEP -10:FOR X=0 TO
24:C=X:IF X>11 THEN C=24-X
140 C=C+3:Z=Y+(X):D=INT(SQR(144-(X-12)
*(X-12)))/2:COLOR 15-C:PLOT Z,Y+7-D:DR
AWTO Z,Y+7+D:COLOR C:DRAWTO Z,180-Y+D
150 NEXT X:NEXT Y
160 JW=JW-1:IF JW=0 THEN 250
170 SETCOLOR 4,JW,0:READ P
180 FOR ME=8 TO 0 STEP -0.5:SOUND 0,P,
10,ME:SOUND 1,P-1,10,ME:SOUND 2,P+1,10
,ME:SOUND 3,P+2,10,ME:NEXT ME
190 POKE 540,30
200 IF PEEK(540)<>0 THEN 200
210 GOTO 160
220 REM DATA FOR SOUND ROUTINE
230 DATA 243,230,217,204,193,182,173,1
62,153,144,136,128,121,60
240 REM GRAPHICS MODE 11 DEMO
250 GRAPHICS 11:DIM ML$(21):FOR ME=1 T
O 21:READ IT:ML$(ME,ME)=CHR$(IT):NEXT
ME
260 REM DATA FOR MACHINE LANGUAGE SHIF
T COLOR ROUTINE
270 DATA 104,162,0,172,193,2,189,194,2
,157,193,2,232,224,8,144,245,140,200,2
,96
280 FOR I=1 TO 8:READ A:POKE 704+I,A+2
24:NEXT I
290 REM DATA FOR COLOR REGISTER POKES
300 DATA 2,4,6,8,6,4,2,2
310 FOR I=0 TO 38:COLOR Q:X=I:Y=I*2:PL
OT X,Y
320 DRAWTO 79-X,Y:PLOT X,Y+1:DRAWTO 79
-X,Y+1:DRAWTO 79-X,190-Y
330 DRAWTO X,190-Y:PLOT 79-X,190-Y+1:D
RAWTO X,190-Y+1:DRAWTO X,Y
340 Q=Q+1:IF Q>8 THEN Q=1
350 NEXT I:JW=0:ME=JW
360 X=USR(ADR(ML$)):SOUND 0,JW,2,2:SOU
ND 1,16-JW+10,12,2:SOUND 2,JW,0,2
370 JW=JW+1:IF JW>15 THEN JW=0:ME=ME+1
380 SOUND 0,0,0,0:SOUND 1,0,0,0:SOUND
2,0,0,0
390 IF ME>12 THEN 420
400 SETCOLOR 1,JW,6:GOTO 360
410 REM GRAPHICS MODE 10 DEMO
```

```
420 GRAPHICS 10:JW=-2:FOR ME=705 TO 71
2:JW=JW+18:POKE ME,JW:NEXT ME
430 NUM=1:FOR Y=0 TO 191:COLOR NUM:PLO
T 0,Y:DRAWTO 79,191-Y:NUM=NUM+0.4167:I
F NUM>8 THEN NUM=1
440 NUM=NUM+1:NEXT Y
450 FOR X=79 TO 0 STEP -1:COLOR NUM:PL
OT X,0:DRAWTO 79-X,191:NUM=NUM+1:IF NU
M>8 THEN NUM=1
460 NEXT X
470 JW=-2:FOR ME=705 TO 712:JW=JW+18:P
OKE ME,JW:NEXT ME
480 FOR ME=0 TO 359 STEP 2:NUM=8:READ
X,Y:COLOR 0:PLOT X,Y:IF ME<181 THEN 52
0
490 FOR JW=1 TO 45:LOCATE X,Y+JW,IT:IF
 IT=0 THEN POP :GOTO 520
500 COLOR NUM:PLOT X,Y+JW:NUM=NUM-1:IF
 NUM<1 THEN NUM=8
510 NEXT JW
520 NEXT ME:KULR=10
530 JW=USR(ADR(ML$)):SOUND 0,0,0,0:SOU
ND 1,0,0,0:SOUND 2,0,0,0:SOUND 3,0,0,0
:POKE 77,0
540 IF PEEK(764)<>255 OR PEEK(53279)<>
7 THEN 580
550 P=P+5:IF P<249 THEN SOUND 0,P,10,2
:SOUND 1,P+2,10,2:SOUND 2,P+4,10,2:SOU
ND 3,P+6,10,2:GOTO 530
560 P=0:KULR=KULR+1:IF KULR>15 THEN KU
LR=1
570 SETCOLOR 1,KULR,6:GOTO 530
580 GRAPHICS 0:POKE 764,255:LIST :? :?
 "BASIC":? "IS";:END
585 REM DATA FOR MODE 10 DISPLAY
590 DATA 60,96,60,97,60,98,60,99,60,99
,60,100,60,101,60,101,60,102,60,103
600 DATA 59,103,59,104,59,105,58,105,5
8,106,58,106,57,107,57,108,57,108,56,1
09
610 DATA 56,109,55,110,55,110,54,111,5
4,111,53,112,53,112,52,113,52,113,51,1
13
620 DATA 50,114,50,114,49,114,49,115,4
8,115,47,115,47,116,46,116,45,116,45,1
16
630 DATA 44,116,43,116,43,116,42,116,4
1,116,40,116,40,116,39,116,38,116,38,1
16
640 DATA 37,116,36,116,36,116,35,116,3
4,116,34,115,33,115,32,115,32,114,31,1
14
650 DATA 31,114,30,113,29,113,29,113,2
8,112,28,112,27,111,27,111,26,110,26,1
10
```

```
660 DATA 25,109,25,109,24,108,24,108,2
4,107,23,106,23,106,23,105,22,105,22,1
04
670 DATA 22,103,21,103,21,102,21,101,2
1,101,21,100,21,99,21,99,21,98,21,97
680 DATA 20,96,21,96,21,95,21,94,21,94
,21,93,21,92,21,92,21,91,21,90
690 DATA 22,90,22,89,22,88,23,88,23,87
,23,87,24,86,24,85,24,85,25,84
700 DATA 25,84,26,83,26,83,27,82,27,82
,28,81,28,81,29,80,29,80,30,80
710 DATA 31,79,31,79,32,79,32,78,33,78
,34,78,34,77,35,77,36,77,36,77
720 DATA 37,77,38,77,38,77,39,77,40,77
,40,76,41,77,42,77,43,77,43,77
730 DATA 44,77,45,77,45,77,46,77,47,77
,47,78,48,78,49,78,49,79,50,79
740 DATA 50,79,51,80,52,80,52,80,53,81
,53,81,54,82,54,82,55,83,55,83
750 DATA 56,84,56,84,57,85,57,85,57,86
,58,87,58,87,58,88,59,88,59,89
760 DATA 59,90,60,90,60,91,60,92,60,92
,60,93,60,94,60,94,60,95,60,96
770 REM CHECK FOR GTIA CHIP
780 POKE 709,0:POKE 710,0:POKE 623,64:
POKE 53278,0:POKE 53261,255:POKE 53248
,53:POKE 53278,0:FOR ME=1 TO 99:NEXT M
E
790 JW=PEEK(53252):POKE 623,0:POKE 532
61,0:IF  NOT JW THEN 120
800 GRAPHICS 0:? :? "I'M SORRY BUT YOU
  HAVE THE CTIA CHIP.":? :? "THIS PROGR
AM REQUIRES THE GTIA CHIP.":END
```

STRINGS Program

The STRINGS program starting below, although an amusing little game in its own right, is included in this package as a tutorial for string programming. Expressions are requested by the computer and stored as strings. These are combined with preset words and phrases to form statements. These statements are displayed on the screen, one by one. Finally, they are incorporated into a paragraph and displayed. When running the program, remember to press <RETURN> after answering each prompt.

To learn from this game, use its program listing after going through the game enough to become familiar with it. Press the <BREAK> key at any point, and then type "L.<R>." Toggle CTRL-1 to continue, pause, etc. If you want to look at one line, type "L.<n> <R>," where <n> is the number of the desired line. If you want to see a group of lines, type "L.<f>,<l> <R>", where <f> is the number of the first line and <l> is the number of the last line.

There are ample REMarks in the program listing to give you valuable information on the creation, structure, and manipulation of strings; and on related aspects of the program. Notice particularly the DIMensioning of each string to be used, and how each item entered is assigned to its proper string.

```
STRINGS BY JERRY WHITE

0 REM STRINGS 1/4/83 (c) 1983 by Jerry
  White
1 REM BEGINNER'S TUTORIAL DEMO
2 REM
90 REM CLEAR SCREEN, MAKE SURE MARGINS
  ARE SET NORMALLY
100 GRAPHICS 0:POKE 82,2:POKE 83,39:SE
TCOLOR 2,9,0
110 DIM ANIMAL1$(20),THING1$(20),NAME1
$(20),PLACE1$(20),PLACE2$(20),NAME2$(2
0)
120 DIM SUBSTANCE1$(20),NAME3$(20),OCC
UPATION1$(20),BUSINESS1$(20)
130 DIM THING2$(20),THING3$(20),WORDS$
(40),SCREEN$(1000),LINE$(38)
200 ? :? "PLEASE ENTER THE FOLLOWING I
TEMS:"
210 ? :? "ANIMAL";:INPUT ANIMAL1$:ANIM
AL1$(LEN(ANIMAL1$)+1)=","
220 ? "THING";:INPUT THING1$:THING1$(L
EN(THING1$)+1)=","
230 ? "NAME";:INPUT NAME1$:NAME1$(LEN(
NAME1$)+1)="!"
240 ? "PLACE";:INPUT PLACE1$
250 ? "PLACE";:INPUT PLACE2$
260 ? "NAME";:INPUT NAME2$:NAME2$(LEN(
NAME2$)+1)=","
270 ? "SUBSTANCE";:INPUT SUBSTANCE1$
280 ? "NAME";:INPUT NAME3$:NAME3$(LEN(
NAME3$)+1)=","
290 ? "OCCUPATION";:INPUT OCCUPATION1$
300 ? "BUSINESS";:INPUT BUSINESS1$:BUS
INESS1$(LEN(BUSINESS1$)+1)=","
```

```
310 ? "THING";:INPUT THING2$:THING2$(L
EN(THING2$)+1)=","
320 ? "THING";:INPUT THING3$:THING3$(L
EN(THING3$)+1)=","
500 GRAPHICS 0:SETCOLOR 2,3,0:GOTO 200
0
599 REM
600 REM SUBROUTINE TO READ DATA INTO T
HE STRING WORDS$ AND ADD ONE SPACE
610 READ WORDS$:WORDS$(LEN(WORDS$)+1)=
" ":RETURN
699 REM
700 REM SUBROUTINE TO ADD ONE SPACE TO
 SCREEN$
710 SCREEN$(LEN(SCREEN$)+1)=" "
720 REM ADD WORD$ TO SCREEN$
730 SCREEN$(LEN(SCREEN$)+1)=WORDS$:RET
URN
799 REM
1000 DATA Look up in the sky
1010 DATA it's a
1020 DATA it's a
1030 DATA it's
1040 DATA A strange visitor from
1050 DATA who came to
1060 DATA with powers and abilities
1070 DATA far beyond those of
1080 DATA who can change the course
1090 DATA of mighty rivers
1100 DATA bend
1110 DATA in his bare hands
1120 DATA and who disguised as
1130 DATA mild mannered
1140 DATA for a great metropolitan
1150 DATA fights a never ending
1160 DATA battle for
1170 DATA and the American way.
1900 REM
1910 REM ROUTINE TO ADD USER RESPONSES
 TO PROGRAM DATA AND DISPLAY
2000 READ WORDS$:? WORDS$
2010 GOSUB 610:WORDS$(LEN(WORDS$)+1)=A
NIMAL1$:? WORDS$
2020 GOSUB 610:WORDS$(LEN(WORDS$)+1)=T
HING1$:? WORDS$
2030 GOSUB 610:WORDS$(LEN(WORDS$)+1)=N
AME1$:? WORDS$
2035 ? NAME1$
2040 GOSUB 610:WORDS$(LEN(WORDS$)+1)=P
LACE1$:? WORDS$
2050 GOSUB 610:WORDS$(LEN(WORDS$)+1)=P
LACE2$:? WORDS$
2060 READ WORDS$:? WORDS$
2070 GOSUB 610:WORDS$(LEN(WORDS$)+1)=N
AME2$:? WORDS$
```

```
2075 ? NAME1$
2080 READ WORDS$:? WORDS$
2090 READ WORDS$:? WORDS$
2100 GOSUB 610:WORDS$(LEN(WORDS$)+1)=S
UBSTANCE1$:? WORDS$
2110 READ WORDS$:? WORDS$
2120 GOSUB 610:WORDS$(LEN(WORDS$)+1)=N
AME3$:? WORDS$
2130 GOSUB 610:WORDS$(LEN(WORDS$)+1)=O
CCUPATION1$:? WORDS$
2140 GOSUB 610:WORDS$(LEN(WORDS$)+1)=B
USINESS1$:? WORDS$
2150 READ WORDS$:? WORDS$
2160 GOSUB 610:WORDS$(LEN(WORDS$)+1)=T
HING2$:? WORDS$
2170 ? THING3$
2180 READ WORDS$:? WORDS$
2400 REM
2410 REM WAIT FOR HUMAN TO READ THE SC
REEN
2500 ? :? "PRESS START TO REFORMAT THE
   SCREEN";
2600 IF PEEK(53279)<>6 THEN 2600
2680 REM
2690 REM THE START KEY WAS PRESSED TO
I'LL GET BACK TO WORK
2700 GRAPHICS 0:SETCOLOR 2,0,0:? :? "W
ORKING...";
2900 REM
2910 REM READ DATA INTO SCREEN$ ALONG
WITH USER RESPONSES
3000 RESTORE :READ SCREEN$
3010 READ WORDS$:GOSUB 710:WORDS$=ANIM
AL1$:GOSUB 710
3020 READ WORDS$:GOSUB 710:WORDS$=THIN
G1$:GOSUB 710
3030 READ WORDS$:GOSUB 710:WORDS$=NAME
1$:GOSUB 710
3035 GOSUB 710
3040 READ WORDS$:GOSUB 710:WORDS$=PLAC
E1$:GOSUB 710
3050 READ WORDS$:GOSUB 710:WORDS$=PLAC
E2$:GOSUB 710
3060 READ WORDS$:GOSUB 710
3070 READ WORDS$:GOSUB 710:WORDS$=NAME
2$:GOSUB 710
3075 WORDS$=NAME1$:GOSUB 710
3080 READ WORDS$:GOSUB 710
3090 READ WORDS$:GOSUB 710
3100 READ WORDS$:GOSUB 710:WORDS$=SUBS
TANCE1$:GOSUB 710
3110 READ WORDS$:GOSUB 710
3120 READ WORDS$:GOSUB 710:WORDS$=NAME
3$:GOSUB 710
```

```
3130 READ WORDS$:GOSUB 710:WORDS$=OCCU
PATION1$:GOSUB 710
3140 READ WORDS$:GOSUB 710:WORDS$=BUSI
NESS1$:GOSUB 710
3150 READ WORDS$:GOSUB 710
3160 READ WORDS$:GOSUB 710:WORDS$=THIN
G2$:GOSUB 710
3170 WORDS$=THING3$:GOSUB 710
3180 READ WORDS$:GOSUB 710
3400 REM
3410 REM CLEAR THE SCREEN AND DISPLAY
IN A MORE CONVENTIONAL FORMAT
3500 GRAPHICS 0:SETCOLOR 2,12,0:? :?
3900 REM
3910 REM SET TRAP SO THAT WE GO TO LIN
E 5000 WHEN WE RUN OUT OF DATA
3920 REM CURPOS=CURRENT POSITION IN OU
R STRING
4000 TRAP 5000:CURPOS=1
4100 LINE$=SCREEN$(CURPOS,CURPOS+36)
4200 FOR CHECK=LEN(LINE$) TO 1 STEP -1
4300 IF LINE$(CHECK,CHECK)<>" " THEN 4
500
4400 LINE$=LINE$(1,CHECK):CURPOS=CURPO
S+CHECK:POP
4410 FOR CHARACTER=1 TO LEN(LINE$)
4420 ? LINE$(CHARACTER,CHARACTER);
4430 PITCH=ASC(LINE$(CHARACTER,CHARACT
ER)):FOR VOLUME=8 TO 0 STEP -2:SOUND 0
,PITCH,10,VOLUME:NEXT VOLUME
4440 NEXT CHARACTER
4450 ? :GOTO 4100:REM DO IT AGAIN
4500 NEXT CHECK
4900 REM
4910 REM DISPLAY THE LAST LINE AND RET
URN CONTROL TO BASIC
5000 ? SCREEN$(CURPOS,LEN(SCREEN$)):EN
D
```

Mathquiz Program

This program, starting on the next page, can be extremely useful for drilling youngsters on addition and subtraction. It is certainly a lot more fun than flash cards, and your children *will learn about* computers at the same time. The main reason we've included this program is to teach beginning programmers about the mechanics of its creation. The explanations are given on a line-by-line basis below. The program listing itself is also profusely REMarked for further instruction. To relate the lines discussed here to the actual statements in the program, refer to the program listing. For your convenience, we will review the commands for doing this.

Make sure the program is in RAM and that BASIC is READY, or that you have just pressed BREAK while the program was running. To list the entire program, type:

L.<R>

To pause and/or continue the listing, toggle CTRL-1.

To list only line number <n>, type:

L.<n><R>

To list only the lines between line numbers <f> and <l> type:

L.<f>,<l><R>

Here are the line-by-line explanations:

Line 100—Go to a subroutine that begins at line 500. This CLEAR SCREEN SUBROUTINE is used to set GRAPHICS mode 0 and set the background color of the screen to dark brown.

Line 110—Set aside four areas in RAM for strings. Reserve an area having one position and label it CHOICE$. Reserve an area of fifteen positions and label it NAME$. Reserve an area of fourteen positions and label it SUBJECT$. Lastly, reserve an area having two positions and label it ANSWER$.

Line 130 thru line 150—Print to skip one screen line, then print what is found between quotation marks.

Line 180—Skip one screen line, then print the words, "YOUR CHOICE." The semicolon will keep the cursor positioned on the current line. The INPUT CHOICE$ command will cause a question mark to be displayed, and the program will wait until someone types something and presses the RETURN key. Since we set aside only one position for the string CHOICE$, the first key typed will be stored as the string CHOICE$.

Line 190—If CHOICE$ contains an uppercase "A," then store the word ADDITION in the string SUBJECT$, and go to line 300.

Line 200—If CHOICE$ contains an uppercase "S," then store the word SUBTRACTION in the string SUBJECT$, and go to line 400.

Line 230—If we got here, it means CHOICE$ does not contain a valid character. Go to the clear screen subroutine, then display the words "I AM CONFUSED" on the screen. Then go back to line 140 and try again.

Line 300—Since we are here, we know that the user selected addition. If we had gone to line 400, then the user selected subtraction. In either case, go to the subroutine beginning at line 800.

Line 800—A REMark statement, so go to the next line.

Line 810—Go to the clear screen subroutine, then skip a line and display the words, "WHAT IS YOUR NAME". Again, the semicolon will keep the cursor at its current position. Wait for someone to type something followed by the RETURN key. Store the results in the string NAME$.

MATHQUIZ BY JERRY WHITE

```
0 REM MATHQUIZ 1/4/83 (c) 1983 by Jerr
y White
1 REM BEGINNER'S TUTORIAL DEMO
100 GOSUB 500
105 REM DIMENSION STRINGS
110 DIM CHOICE$(1),NAME$(15),SUBJECT$(
14),ANSWER$(2)
120 ? :? "SAMPLE PROGRAM NUMBER 1"
130 ? :? "ARITHMETIC QUIZ"
140 ? :? "PLEASE TYPE A FOR ADDITION"
150 ? :? "          OR S FOR SUBTRACTIO
N"
170 REM GET HUMAN'S CHOICE
180 ? :? "YOUR CHOICE";:INPUT CHOICE$
190 IF CHOICE$="A" THEN SUBJECT$="ADDI
TION":GOTO 300
200 IF CHOICE$="S" THEN SUBJECT$="SUBT
RACTION":GOTO 400
230 GOSUB 500:? :? "I AM CONFUSED.":GO
TO 140
300 GOSUB 800:REM ADDITION QUIZ
310 FOR QUIZ=1 TO 10:? :? "PROBLEM #";
QUIZ
320 RANDOM1=INT(RND(0)*11):RANDOM2=INT
(RND(0)*11)
330 ? RANDOM1;"+";RANDOM2;"=";:INPUT A
NSWER$
340 TOTAL=RANDOM1+RANDOM2
350 IF LEN(ANSWER$)=0 THEN ? RANDOM1;"
+";RANDOM2;"=";TOTAL:GOTO 380
360 TRAP 390:ANSWER=VAL(ANSWER$):IF AN
SWER=TOTAL THEN ? "CORRECT":RIGHT=RIGH
T+1:GOTO 380
370 ? "THE CORRECT ANSWER WAS ";TOTAL
380 NEXT QUIZ:GOTO 2000
390 GOSUB 1000:GOTO 330
400 GOSUB 800:REM SUBTRACTION QUIZ
410 FOR QUIZ=1 TO 10:? :? "PROBLEM #";
QUIZ
420 RANDOM1=INT(RND(0)*6)+5:RANDOM2=IN
T(RND(0)*RANDOM1)
430 ? RANDOM1;"-";RANDOM2;"=";:INPUT A
NSWER$
440 TOTAL=RANDOM1-RANDOM2
450 IF LEN(ANSWER$)=0 THEN ? RANDOM1;"
-";RANDOM2;"=";TOTAL:GOTO 380
460 TRAP 490:ANSWER=VAL(ANSWER$):IF AN
SWER=TOTAL THEN ? "CORRECT":RIGHT=RIGH
T+1:GOTO 380
470 ? "THE CORRECT ANSWER WAS ";TOTAL
480 NEXT QUIZ:GOTO 2000
490 GOSUB 1000:GOTO 430
```

Line 820—Check to see if the length of the string NAME$ is equal to 0. If so, the user simply pressed the RETURN key without entering a name. Insist on at least a one-position name by going back to line 810.

Line 830—Since we are here, we know that we have something stored in NAME$. Go to the clear screen subroutine, then skip one line, print the word "HELLO" followed by one space, and display whatever we have in NAME$, all on the same screen line.

Line 900—A REMark statement, so go on to the next line.

Line 910 to line 950—Tell the user what to do by displaying instructions on the screen, then RETURN from this subroutine.

Line 310—Set up a FOR...NEXT loop to take us through the following routine 10 times. Skip one line; then display the current problem number.

Line 320—Select two random numbers. Use the integer (INT) function to insure that these numbers do not contain fractions. Since Atari BASIC will round off to the lower integer, multiply it by 11 to insure a number between 0 and 10. Store one random number as the variable RANDOM2.

Line 330—Display the number stored as RANDOM1, then the + symbol, then the number stored as RANDOM2, then the = symbol, then wait for the user to type an answer, followed by RETURN. Store what is typed as ANSWER$.

Line 340—Compute the correct answer, and store it as the variable called TOTAL.

Line 350—Check to see if the length of ANSWER$ is equal to zero. If this is true, then no answer was given. In this case, display the problem and the solution, then go to line 380.

Line 360—Set a TRAP so that we go to line 390 if BASIC detects an error condition. Find the numeric value of what is stored in ANSWER$. If BASIC finds non-numeric data, the trap will be activated. If we have numeric data, it is now stored as the variable ANSWER. Compare ANSWER to TOTAL. If they are equal, display the word CORRECT, using inverse video, and add 1 to whatever is stored in the variable called RIGHT. Then go to line 380.

Line 370—If we got here, ANSWER did not equal TOTAL, so tell the user the correct answer.

Line 380—When we reach NEXT QUIZ, the value of QUIZ will increment by one. If QUIZ is less than or equal to 10, go back to line 310 and do it again. If QUIZ is greater than 10, the FOR...NEXT is complete. Go to line 2000.

Line 390—If we got here, then go to the subroutine at line 1000 which tells the user what happened. In this case, the program was expecting a number and received something else, so go back to line 330 and ask the question again.

Line 400—We got here if the subtraction option was selected. The following FOR...NEXT loop is the same as the addition routine with the following exceptions:

Line 420—We want to make sure that the answer to our subtraction problem will not be a negative number, so we must make sure that our first random number is equal to or greater than the second random number. RANDOM1 will be equal to an integer from 0 to 5 plus 5. In other words, RANDOM1 will not be less than 5 or greater than 10. By making RANDOM2 equal to an integer of RANDOM1, RANDOM2 will become an integer at least 1 less than RANDOM1. The rest of this routine is similar to the addition routine, except the logical adjustments have been made to reflect subtraction.

Line 2000—Since we are here, the question and answer session is over.

Line 2010—Tell the user the number of correct answers we counted.

Line 2020—Ask if they want to try again.

```
500 REM CLEAR SCREEN SUBROUTINE
510 GRAPHICS 0:SETCOLOR 2,15,0:RETURN
800 REM GET HUMAN'S NAME
810 GOSUB 500:? :? "WHAT IS YOUR NAME"
;:INPUT NAME$
820 IF LEN(NAME$)=0 THEN GOTO 810
830 GOSUB 500:? :? "HELLO ";NAME$
900 REM DISPLAY INSTRUCTIONS
910 ? :? "HERE ARE 10 ";SUBJECT$;" PRO
BLEMS."
920 ? :? "ENTER YOUR ANSWER THEN PRESS
 RETURN."
930 ? :? "IF YOU DON'T KNOW AN ANSWER,
"
940 ? :? "THEN JUST PRESS RETURN."
950 RETURN
1000 ? "YOUR ANSWER WAS NOT NUMERIC TR
Y AGAIN":RETURN
2000 REM DISPLAY RESULTS
2010 ? :? NAME$;" HAD ";RIGHT;" CORREC
T ANSWERS."
2020 ? :? "WOULD YOU LIKE TO TRY AGAIN
?"
2030 ? :? "TYPE Y FOR YES OR N FOR NO"
2040 REM PROVIDE RERUN OPTION
2050 ? :? "THEN PRESS RETURN";:INPUT C
HOICE$
2060 IF CHOICE$="Y" THEN RUN
2070 IF CHOICE$<>"N" THEN GOTO 2030
2080 GRAPHICS 0:? :? "BASIC":? "IS";:E
ND
10000 REM PROGRAMMER'S NOTES:
10010 REM
11000 REM STRING DEFINITIONS:
11010 REM CHOICE$=HUMAN'S SELECTED OPT
ION
11020 REM NAME$=HUMAN'S NAME
11030 REM SUBJECT$=ADDITION OR SUBTRAC
TION
11040 REM ANSWER$=HUMAN'S ANSWER TO PR
OBLEM
12000 REM NUMERIC VARIABLES:
12010 REM QUIZ=CURRENT QUESTION NUMBER
12020 REM RANDOM1=FIRST RANDOM NUMBER
12030 REM RANDOM2=SECOND RANDOM NUMBER
12040 REM TOTAL=SOLUTION OF PROBLEM
12050 REM ANSWER=NUMERIC VALUE OF HUMA
N'S SOLUTION
12060 REM RIGHT=TOTAL CORRECT ANSWERS
```

Line 2030—Tell the user to type a Y or N.

Line 2040—Remind the user to press the RETURN key, and wait for a response.

Line 2060—CHOICE$ = "Y" to RUN this program again.

Line 2070—CHOICE$ was not "Y" or "N," so go to line 2030 and ask again.

Line 2080—If we got here, CHOICE$ = "N," so execute a GRAPHICS 0 command to clear the screen, then let the user know that this program is no longer in control.

For additional information, read the programmer's notes, found in the REM statements beginning at line 10000.

Appendix: Keywords

We can communicate with our friend Mr. BASIC using English, but he has to look up everything we say in his dictionary. Unfortunately, he has a very small dictionary. He also gets very confused if we don't format our instructions in a way that he understands.

The following is a list of keywords that BASIC will understand, along with an explanation in English that will help you understand. Using this section in conjunction with the programs should prove helpful. We will skip over words that BASIC interprets the same way as Mr. Webster, such as "OR," as well as most trigonometric functions. If you understand trigonometry, the functions of these keywords will be obvious. Keywords appear in all capital letters, followed by an abbreviation, if there is one; then there is an explanation of what each keyword actually tells BASIC to do. For more details and examples, see the appropriate encyclopedia entries.

ABS   Give me back the following value as a positive number. If it's negative, make it positive.

ADR   Tell me exactly where you've stored the following string in your RAM warehouse.

ASC   Give me the American Standard Code for the following character.

BYE (B.)   Put the Atari MEMO PAD on the screen.

CLOAD (CLOA.)   Load a BASIC program from your 410 cassette recorder into RAM.

CHR$ Give me the character that corresponds to the following ASCII number.

CLOSE (CL.)   I am finished using the following file number.

CLR   Forget about all previously defined strings, arrays, and variables.

COLOR (C.)   Use this number to select the color for the following PLOT and DRAWTO commands.

COM   See DIM.

CONT (CON.)   I stopped you with a STOP command or by pressing the BREAK key. Continue now, starting at the beginning of the next line of instructions.

CSAVE   Store the program you now have in RAM onto the tape in your 410 Program Recorder.

DATA (D.)   The following is not an instruction, it is information that may be accessed using a READ statement.

DEG (DE.)   Until further notice, perform all trigonometric functions in degrees instead of radians.

DIM (DI.)   Set aside the stated amount of room in the RAM warehouse for the following strings or arrays.

DOS (DO.)   Load the Disk Operating System program called DUP.SYS from the disk in drive number one into RAM.

DRAWTO (DR.)   Draw a line from where you are now, to the X,Y coordinates that follow.

END   You have finished the tasks required by the program in RAM. Close all files, turn off all sounds, and let me know when you are READY for further instructions.

ENTER (E.)   Use the device specified to read the following ASCII format file into RAM. Files must have previously been stored on that device using a LIST command.

EXP   Raise this value to the specified power.

FOR (F.)   Execute whatever instructions you find between here and the corresponding NEXT command, the specified number of times.

FRE   How much room is left in the RAM warehouse?

GET (GE.)   Fetch one character of data.

GOSUB (GOS.)   Make a note of where you are right now, then go to the following line number. As soon as you find a RETURN instruction, come back here.

GOTO (G.)   Go directly to the line number that follows. Do not pass GO. Do not collect $200.00.

GRAPHICS (GR.)   Set up the screen in the Graphics mode that follows.

IF   If the following condition is true, THEN execute all of the instructions on this line. If not, go on to the next line immediately.

INPUT (I.)   Fetch data from the specified device, and store it in the variable or string that follows.

INT   Round off the following value downward and return a whole number.

LEN   Give me the current length of the string that follows.

LET (LE.)   Use the following label to store the specified data.

LIST (L.)   Store the program currently in RAM onto the specified device, exactly the way it was typed in. If I don't give you a device, display the program on the screen.

LOAD (LO.)   Read into RAM a program which has previously been SAVEd, from the specified device.

LOCATE (LOC.)   Get the value you find at the following coordinates on the screen, and store them as the last variable.

LPRINT (LP.)   Use your printer to output the following.

NEW   Erase the program and data currently stored in RAM.

NEXT (N.)   See FOR.

NOTE (NO.)   See DOS Manual.

ON   Based on the following value, go to the specified line number.

OPEN (O.)   Setup a line of communication using the following information, to the specified device.

PADDLE   Get me the value of the following paddle number.

PEEK   Get me the value stored in the following RAM location.

PLOT (PL.)   Store the current COLOR in the X,Y screen coordinates that follow.

POINT (P.)   See DOS Manual.

POKE (POK.)   Put the specified value into the following RAM location.

POP   We are about to make an abnormal exit from a FOR/NEXT loop or subroutine, so throw away that RETURN address.

POSITION (POS.)   Place the cursor at the following X,Y coordinates.

PRINT (?)   Use the following device to output the specified information. If I didn't give you a device number, use the screen.

PTRIG   Get me the value of the following paddle trigger.

PUT (PU.)   Output one character to the specified device.

RAD   Use radians rather than degrees for all trigonometric functions until further notice.

READ (REA.)   Read the next DATA item(s) and store it (them) as the following string(s) or variable(s).

REM (R.)   Go on to the next line. This is just a remark which has been put here by a programmer to remind him of something, help others understand the program, or chastise a nosey snooper.

RESTORE (RES.)   Move your DATA statement pointer to the following line number. The next time I tell you to READ, start reading from here.

RETURN (RET.)   You are finished with this subroutine. Go back to the instruction that follows the GOSUB that sent you here.

RND   Pick a random number of at least zero but less than one.

RUN   Use the information that follows to LOAD and RUN the specified program. If I didn't give you that information, RUN the program you currently have in RAM.

SAVE (S.)   Save the program currently in RAM, using the device and file name that follow. This command is used to save programs on diskettes, as CSAVE is used to save programs on tape. Never leave your computer, or enter data for a long period of time, without saving your program or data files. Be prepared for a power failure or similar catastrophe, and use the SAVE or CSAVE commands often. Remember, there's always the chance that some friend will walk in and decide to remove your BASIC cartridge because he feels that it is more important to watch some little round creature that does nothing but gobble dots for a living.

SETCOLOR (SE.)   Use the following color register to store the specified color and luminance information.

SOUND (SO.)   Use the following information to output the appropriate noise.

STATUS (ST.)   Give me an update on the progress of the specified device.

STEP   Use the following value for each increment or decrement of a FOR/NEXT loop.

STICK   Give me the value of the specified joystick.

STRIG   Give me the value of the specified joystick trigger.

STOP (STO.)   Temporary halt; cool it.

STR$ Place the following numeric value into the specified string as an ASCII character.

THEN   See IF.

TRAP (T.)   In case something has gone wrong, don't bother me with your silly error number display. Instead, go right to the specified line number.

USR   I have gone over your head and developed a program in Machine language. Give control to the program that begins at the following address.

VAL   Give me the numeric equivalent of the following string.

XIO (X.)   Execute an input/output routine based on the following information.
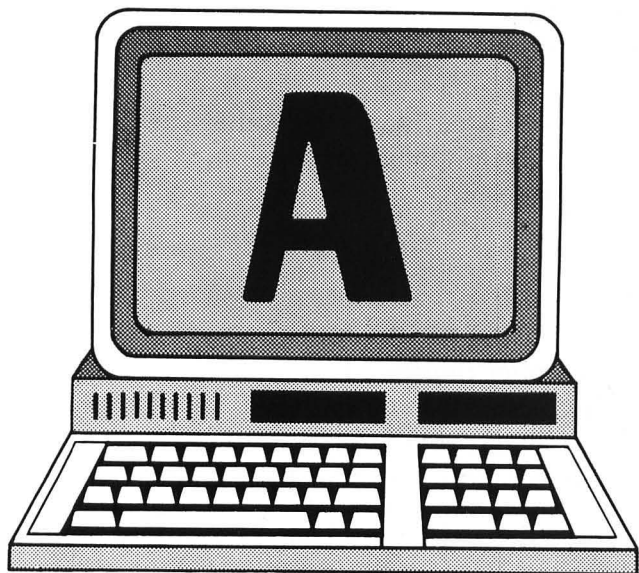
A Codes. ATASCII = 65, HEX = 41. a—ATASCII = 97, HEX = 61.

A Diagram symbol for Accumulator Also stands for Address line; and the hexadecimal sign for the decimal integer 10.

A See DOS Options.

A DOS 3.0 commands to Access DOS 2.0S

Å Symbol for angstrom, equaling one billionth of a meter (one nanometer).

A+ Programming: Learning BASIC on Your Atari A beginning course in BASIC programming on the Atari 400 and 800. The conversational style and workbook format make learning BASIC fun. Classroom-tested with outstanding success. Reston Publishing Company.

A2-PB1 Pinball* Pinball lovers will be delighted by this realistic simulation. Features coin slots, flippers, bumpers, and free games. Fun for the whole family! 32K; disk. Sublogic Communications Group.

ABC A BASIC Compiler. An excellent compiler for Atari BASIC! ABC can make your Atari BASIC programs run from four to twelve times faster, possibly while using less memory.

ABC reads tokenized Atari BASIC programs from diskette, translates them into p-code, then writes a compiled run-time version onto diskette. To use the compiled version of your program, you simply remove your Atari BASIC cartridge, and binary load it from DOS 2.0S.

To insure that the compiled version is relocatable and will run under various system configurations,

you compile a second time using a different load address, then run a second program that will generate completely relocatable code. If you are simply compiling programs for your own use, these two steps are not required.

The speed and size of your compiled program will vary, depending on the condition of your original program. During testing on a 48K system, the compiled program was always considerably faster and used less memory than the original. As a general rule, the increase in speed and decrease in RAM usage will be greater in large programs. On a 48K system, about 4K of the cartridge area is recovered since the compiled programs run with no cartridge present. On systems of less than 48K, compiled programs may or may not require more RAM than the original BASIC version. This will vary from program to program.

For example, a BASIC program called Masher which decreases the RAM requirements of your BASIC programs was run through ABC. It was one of the slowest running programs imaginable. Although it occupied only forty-one sectors on the diskette, Masher required 32K RAM, due in part to its extensive use of arrays. The compiled version of Masher uses approximately 7.5K less RAM on a 48K system, and runs an average of 5.2 times faster. In the majority of the other programs, the compiled versions did not save as much RAM but ran much faster.

Much of the increased speed is due to the elimination of floating-point math. If your program uses floating-point, you will have to change it to integers. ABC permits 3-byte integers, and a range between negative and positive eight million.

The well-written, twenty-page ABC manual provides examples to show you how to convert from floating-point to integer routines. The lack of floating-point math prevents the use of the following functions: ATN, CLOG, COS, EXP, LOG, RND, SIN, SQR. Fortunately, these functions can be simulated. For example, the following routines will both return a random number from zero to three. The first example would not be permitted, since the RND instruction is not accepted by the compiler. The second example would provide the same result without using RND.

Example 1:

$$RAND=INT(RND(0)*4)$$

Example 2:

$$RAND=INT(PEEK(53770)*4/256)$$

Since the compiled version of your program runs

without the BASIC cartridge, you will have to live without a few other commands. This is a small price to pay in return for the speed and efficiency of a compiled program. You will have to remove the following commands from your programs before you compile:LIST, BYE, DEG, LOAD, RAD, DOS, CSAVE, ENTER, CONT, NEW, SAVE, RUN, LPRINT, CLOAD.

Since a compiled program will execute much faster than the original BASIC version, you can be reasonably certain that you will have to make at least some changes to most programs. Sound loops may require adjustment because sound changes drastically depending on duration. In order to compensate, you would be wise to add a clocked delay subroutine to your program, then use a GOSUB to this routine as needed. For example, the following sound routine normally produces a "ping" sound:

```
10 FOR VOLUME=15 TO 0 STEP-1:SOUND
    0,0,2,VOLUME:NEXT VOLUME
```

In a compiled program, the fifteen sound commands generated by this routine are executed so rapidly that you barely hear anything at all. To compensate and delay for the specified number of jiffies (60ths of a second), you could insert "JIFFY= 1:GOSUB 30000" within your sound loops, and add the following subroutine.

```
30000 POKE 540,JIFFY
30001 IF PEEK(540) THEN 30001
30002 RETURN
```

You can't just compile your existing BASIC programs and expect to get the desired results. You must start with a bug-free program that does not rely on quirks in the BASIC cartridge, avoid the use of floating-point routines and unsupported functions, and make the necessary timing adjustments. Once your program has been compiled, it runs as if it were written in C or FORTH, and you get "protected" or unreadable code as a bonus.

ABC is quite friendly and easy to use. It is highly recommended for professional software developers and hobbyists alike.

Some pre-release, unprotected copies of ABC have been circulated. The pre-release version was not bug free. The user is urged to purchase ABC in order to ensure vendor support and error-free computing. ABC is well worth its $69.95 price tag. 40K; diskette. This review was adapted from an article in *Antic*—the Atari resource magazine. Monarch Data Systems.

Abort   To end a program which has encountered an error condition, and to return control to the operator or operating system. For the Atari, this is accomplished by pressing BREAK, or SYSTEM RESET.

ABS   Atari BASIC function. Returns the absolute value of the arithmetic expression.

Format:
$$ABS<aexp>$$
Example:
```
10 NUMBER=-1
20 PRINT ABS(NUMBER)
```
The number returned is always positive, whether (aexp) is positive or negative. In the example above, the number 1 will be printed.

Absolute Value   The value of a number expressed as a positive number. It is denoted by enclosure in vertical bars (|). Thus, if a number is positive or zero, $|x| = x$. If x is negative $|x| = -x$. See ABS.

A-Bus   The primary internal source-bus to the Arithmetic Logical Unit in any processor.

Abuse*   Now is your chance to get back at your computer for all the nasty things it's done. You input insults to the program which it will try and top (in a somewhat random fashion). 40K; disk. Don't Ask Software.

AC   Alternating electrical Current; or ACcess time; or ACcumulator.

ACC   ACCumulator, or ACCess Time.

Access Time   The time it takes to get a byte of information from memory.

Accessories   See AC Line Transient Protector; Atari Light Pen; Atari Numerical Keypad; Command Control Joystick; Command Control Trackball; Disk Fix Kit; Elephant Floppies; Filing Systems for Diskettes; Happy 810 Enhancement; IEEE-488 Interface; Joystick; Magnum Isolator ISO-17; Mark I Epson Reinker; Mark II Epson Reinker; MicroFazer; Mxplus; Paddles; PerfectData Head Cleaning Kit; Perfect Data Micro Maintenance Kit; PerfectData Tech Maintenance Kit; PerfectData Type Element Cleaning Kit; PerfectData Video Display Cleaning Kit; Printout Basket; RAMCRAM Plus 48K; Starplex Controller; Voice Box II.

Accounts Receivable*   Tracks small business accounts receivable. This is a limited yet flexible package. You can customize it in a number of ways to meet your business's requirements. The main limitations are that it handles only a small number of customers (thirty per disk), with fifteen transactions each, and totals are limited to $9,999.99. This is a program for the truly "small" business. Customi-

zation requires BASIC programming skills. 48K; 810 disk drive or 410 program recorder; BASIC cartridge; and optional line printer. Disk or cassette. The Computer Seen.

Accumulator   A register in which the results of arithmetic operations are stored. More than one accumulator can be present in a central processor. The AX register of the Atari's 6502 often functions as an accumulator.

ACE   Atari Computer Enthusiasts. This name is being adopted by many Atari user groups in the U.S. One of the first and largest groups to use this name is ACE of Eugene, Oregon. An excellent newsletter and many fine public domain disks are available to members. The address is ACE, 3662 Vine Maple Drive, Eugene, OR 97405. See User Groups.

Acey-Deucey*   Challenge your friends or the computer with two variations of this famous casino game. Features detailed graphics. 16K; disk or cassette. L & S Computerware.

ACIA   Asynchronous Communication Interface Adapter.

ACK   ACKnowledge character in ASCII,06 16. This is used in communications to complete a handshaking sequence. The ACK signal indicates that the information has been accepted.

ACM   Association for Computing Machinery
11 W. 42nd St., 3rd Floor
New York, NY 10036
212-869-7440
The ACM is the major international society for computer technology. **Because of its many publica**tions and special interest groups, ACM is of interest to many Atari users. ACM has special interest groups for many topics. For more information, **write to ACM or find the** *Journal of the ACM* at your library.

Acoustic Coupler   A mechanical instrument for connecting the telephone handset to a computer, through a modem. The data is converted to tones—usually audible—for transmission over the phone lines.

ACTION!   (The following information is adapted from an article in *Antic*—the Atari resource magazine.) ACTION! is a structured language used for software development. The bank-select 16K cartridge contains a monitor, compiler, library routines, and a very sophisticated editor. The bankselect feature built into the cartridge ensures that ACTION! will use only 8K of your precious RAM. Most Atari BASIC commands are included in

ACTION!'s procedure libraries. ACTION! also supports TRACE and break points, immediate mode commands, user-generated proc libraries, and 6502 Machine language instructions. Numeric variable support includes BYTE (0-255), CARD (0-65535), and INTEGER (-32768 to 32767). Floating-point is not directly supported.

ACTION! is an alternative to BASIC, which can be slow, and Assembly language, which is difficult to learn. ACTION! programs can be from 50 to 200 times faster than comparable BASIC programs, and are almost as compact as Assembly language programs. However, it is almost as easy to program as Atari BASIC. The following programs show the respective run times of Atari BASIC and ACTION! as they count to 10,000. BASIC completed the task in 1164 jiffies (60ths of a second), while ACTION! took just over 11 jiffies. While some benchmark tests showed slightly less than this 100 to 1 ratio, others have shown ACTION! to generate code over 200 times faster than BASIC.

Atari BASIC:
```
10 POKE 19,0:POKE 20,0 20 FOR COUNT=1 TO
10000:NEXT COUNT 30 ? PEEK(19)*256+
PEEK(20)
```
ACTION:
```
PROC C10000 ()
BYTE CLOCK=20
CARD count=$AO
CLOCK = 0
FOR count = 1 TO 10000 DO OD
PrintB (CLOCK)
RETURN
```

The ACTION! monitor controls the system. You use the monitor to direct ACTION! to edit, compile, or run a program. The monitor is also used for changing options and debugging programs.

The library is a collection of subroutines that can be used in a program, without being defined within that program. These subroutines are not actually part of the ACTION! language but are provided for your convenience. They include I/O (input and output, both numeric and text), graphics (changing graphics modes, plotting points, drawing lines, changing colors, etc.), and various miscellaneous (sound, paddle, joystick, random numbers, PEEK, POKE, etc.) subroutines.

When you turn on your computer with the ACTION! cartridge installed, the editor starts up. The editor treats your text as though it were on a long sheet of paper with the display as a window through which you can see only part of the sheet (one screen). The editor has commands that allow

you to move this window anywhere on the "paper." Inside the window you can make changes to the text with the cursor. If you try to move the cursor out of the window, the window will move so that the cursor will still be within it. The Editor allows you to insert new characters and to replace or delete the character currently under the cursor. It is also possible to insert a new line above the cursor, or delete the line on which the cursor resides. Other commands allow you to merge, split, move lines, search, and place invisible markers. You can have two windows on the screen at one time. This feature makes it possible to move pieces of text from one section of text to another. You can also enter and save your text using any supported I/O device.

The ACTION! language can be broken up into two parts, declarations and executable statements. The two main types of declarations are for variables and subroutines. Variables are used in ACTION! to hold values, just as mail boxes hold letters. The name of the variable indicates where the value is to be stored, just as the address of a mail box indicates which letters are to be placed in it. To receive mail at a post office box, you have to request a box big enough to hold the amount of mail you expect to receive. In the same manner, you must tell ACTION! the name of the variable and how big it is before you can use it.

In ACTION!, there are three sizes of variables (BYTE, INT, and CARD). BYTE variables can represent numbers from 0 to 255; INT (for integer) variables can represent numbers from -32768 to 32767; CARD (for cardinal) variables can represent numbers from 0 to 65535.

It is also possible in ACTION! to declare variables that represent groups of values. These are called array variables. You can think of array variables as the row name in a stadium, and an array element as the seat number in that row. Let's say you had a ticket for seat A-3. If this is the location of an array element that you want to access in ACTION!, you would reference it as A(3). You must declare an array before it can be used. Just as there are three sizes of normal variables, there are three sizes of array elements. All elements of the array must be of the same size, and you have to tell the compiler how many elements there are in the array.

Here are a few variable declaration examples:

```
BYTE y
CARD x1, x2
INT i, j, k, box
INT mynameisverylarge
```

```
BYTE ARRAY seats(20)
INT ARRAY A(50) c(1000)
```

There are four kinds of statements in ACTION!: assignments, conditionals, looping, and branching. Assignment statements are used to give new values to variables. For example:

```
A = 1
B = B + 1
C = A -B
X(I) = 27
```

As you can see, the form of an assignment is a variable (or array with subscript), followed by =, followed by an expression. When the assignment statement is executed, the expression is evaluated and the resulting value is saved in the variable.

Conditional statements are used to execute other statements based on the value of some variable(s) or expression. For example, when you check the oil in your car, you say to yourself, "If the oil level is more than one quart low then I'll add a quart of oil."

This is a conditional statement. The ACTION! equivalent would be:

```
IF oil.level < -1 THEN
   oil = oil + 1
FI
```

FI indicates the end of the statements to be executed if the conditional expression (in this case oillevel < -1) is true. It is similar to the period at the end of the sentence in our English version of the example.

Just as it is possible in English to say, "If something, then do this, this, and that," it is possible to have multiple statements following the THEN in an ACTION! program. Also, just as it is possible in English to say "IF something then do this, otherwise do that," it is possible in ACTION!:

```
IF "something" THEN
   "this"
ELSE
   "that"
FI
```

ELSE ends the list of statements that will be executed if "something" is true (just as "otherwise" did in the English version), and the FI ends the list of statements that will be executed if "something" is false (as the period did in the English version).

There are four kinds of looping statements in ACTION! The simplest one is the infinite loop:

```
DO "list of statements" OD
```

All of the statements between the DO and the OD will be repeated endlessly (see branching statements below to learn how to stop this infinite loop). In most cases, you will want to put some kind of constraint on how many times the loop is executed (the statements between the DO and OD). This is the purpose of the other three kinds of looping statements (FOR, WHILE and UNTIL).

A FOR statement is used to execute a list of statements a fixed number of times, and is the most common looping statement. For example:

```
FOR it = 1 TO 10 STEP 1 DO
  "list of statements"
OD
```

This statement initially sets "it" to 1. Then, for each execution of the loop, it checks to see if "it" is greater than ten. If it is, the list of statements in the loop is not executed, and the next statement following the OD is executed. After the last statement in the loop is executed, "it" is incremented by one and the whole sequence (except setting "it" to one) is repeated again. In the example above, the 1 following the = was the initial value for "it," 10 was the greatest value for which the statements of the loop would be executed, and the 1 following STEP indicates how much "it" (the loop variable) is to be incremented each time the loop is executed. These values do not have to be constants, they can be any numeric expression or variable. In addition, the key word STEP and the value following it can be left out, in which case it is assumed to be STEP 1.

A WHILE statement is similar to an IF statement, except that the body (statement enclosed by DO OD) is repeatedly executed as long the conditional expression is true. For example:

```
it = 1
WHILE it ≤ 10 DO
  "list of statements"
  it = it + 1
OD
```

An UNTIL loop is similar to a WHILE loop, except that the test to continue looping is at the bottom of the loop and has the opposite sense. For example:

```
it = 1
DO
  "list of statements"
  it = it + 1
UNTIL it > 10 OD
```

Note that an UNTIL loop is always executed at least once whereas a FOR or WHILE loop might not execute at all.

There are three types of branching statements in ACTION!. The first is EXIT and it is directly involved with looping statements. EXIT is only allowed inside of a loop (specifically a DO OD pair), and causes the statement following the very next OD to be executed next. An EXIT is the only way to get out of a simple DO loop.

The other two types of branching statements involve functions and procedures (subroutines). A subroutine is a collection of statements which can be executed from more than one place within a program. The RETURN statement is used within a subroutine to indicate that execution is to resume from where the subroutine was called. Subroutine use in ACTION! is similar to subroutine use in BASIC (GOSUB). In addition, you can pass parameters, and functions can have return values.

The following table compares simple instructions and short routines written in Atari BASIC and ACTION!:

Atari BASIC	ACTION!
10 A=B+C*D	A=B+C*D
10 IF A<>0 THEN B=1	IF A#0 THEN B=1 FI
10 IF A=0 THEN 50 20 A=A-1 30 B=A*2 40 C=B+22 50 REM	IF A#0 THEN A=A-1 B=A*2 C=B+22 FI
10 IF A=0 THEN B=1:GOTO 30 20 B=2 30 REM	IF A=0 THEN B=1 ELSE B=2 FI
10 FOR I=1 TO 10 100 NEXT I	FOR I=1 TO 10 DO OD
10 IF X<>0 THEN 100 90 GOTO 10 100 REM	WHILE X=0 DO OD
10 REM 100 GOTO 10	DO OD
10 REM 100 IF A<>0 THEN 10	DO UNTIL A=0 OD
10 ABC = 20:GOTO 40 20 X=A 30 RETURN 40 REM	PROC ABC(INT A) X=A RETURN
10 A=25:GOSUB ABC	ABC(25)
10 PRINT "hello"	PrintE("hello")
10 PRINT "hello";	Print("hello")
10 PRINT #5;"hello"	PrintDE(5, "hello")
10 PRINT #5;"hello";	PrintD(5, "hello")

Atari BASIC	ACTION!
10 PRINT I	PrintIE(I)
10 PRINT "I=";I	Print("I="):PrintIE(I)
10 PRINT "X=";X;", Y=";Y	PrintF("X=%I,Y=%I%E",X,Y)
10 PRINT #5,I;	PrintID(5, I)
10 INPUT I	Put('?):I=InputI()
10 INPUT #1;I	I=InputID(1)
10 INPUT S$	Put('?):InputS(S)
10 PUT #0,ASC("A")	Put('A)
10 PUT #1,65	PutD(1, 65)
10 GET #1,X	X=GetD(1)
10 OPEN #1,4,0,"D:TEMP"	Open(1,"D:TEMP",4,0)
10 CLOSE #1	Close(1)
10 NOTE #1,X,Y	Note(1,@X,@Y)
10 POINT #1,X,Y	Point(1,X,Y)
10 XIO 18,#6,A1,A2,"S:"	XIO(6,0,18,A1,A2,"S:")
10 X=PEEK(A)	X=Peek(A)
10 POKE A,X	Poke(A,X)
10 GRAPHICS 8	Graphics(8)
10 COLOR 3	color = 3
10 DRAWTO X,Y	DrawTo(X,Y)

Atari BASIC	ACTION!
10 LOCATE X,Y,V	V=Locate(X,Y)
10 PLOT X,Y	Plot(X,Y)
10 POSITION X,Y	Position(X,Y)
10 SETCOLOR 0,1,4	SetColor(0,1,4)
10 GRAPHICS 24 20 COLOR 1 30 PLOT 200,150 40 DRAWTO 120,20 50 POSITION 40,150 60 POKE 765,1 70 XIO 18,#6,0,0,"S:"	Graphics(24) color = 1 Plot(200,150) DrawTo(120,20) Fill(40,150)
10 SOUND 0,121,10,6	Sound(0,121,10,6)
10 X=PADDLE(0)	X=Paddle(0)
10 X=PTRIG(0)	X=PTrig(0)
10 X=STICK(0)	X=Stick(0)
10 X=STRIG(0)	X=STrig(0)
10 A=ASC(S$)	A=S(1)
10 X=LEN(S$)	X=S(0)
10 S$ =STR$(123)	StrI(123,S)
10 A=VAL(S$)	A=ValI(S)

ACTION! was written by Clinton Parker. 16K Cartridge. Optimized Systems Software, Inc.

Action Quest* Six rooms on five levels contain puzzles that you must solve. You are a ghost armed with a gun, and you must destroy menacing creatures and blast through barriers that keep you from solving the puzzles, reaching the treasure, and escaping before time runs out. It may take hours to get all the treasures, but you'll have fun. 16K; disk or cassette. JV Software.

A/D Pronounced "A to D." Analog to Digital. Conversion from a sensor's analog voltages and currents to a digital representation. Analog is converted to digital, so that the data can be handled by the computer. Example: An electrical voltage that represents temperature is converted to a number which the computer can use.

AD ASTRA A newsletter published by the Atari Microcomputer Net Amateur Radio Operators' Group. It contains many tips for the hardware enthusiast, including communicating through the RS-232 port on amateur radios and how to make your own cables. Hams especially like Atari compu-ters because they are well shielded against radio interference. AD ASTRA.

ADC Analog-to-Digital Converter.

ADCCP Advanced Data Communication Control Procedures.

Add Characters in Between Existing Characters BASIC. Pressing CTRL INSERT will insert a space for the next character entered in the line, at the place where the cursor is currently positioned. See Edit, Control Keys.

Adder A processor unit that performs binary arithmetic.

Add-On System or circuitry attached to a computer to increase memory or performance. For the Atari, these include expansion cartridges and other devices attached internally, or to various attachment points such as the game ports, serial I/O port, or 850 interface.

Address Position of a word in memory, expressed by a number. In the Atari, addresses range from 0 to 65535.

Adhesive Tab A diskette is write-protected if it does not have an accessible write-protect notch, about one inch down on the right side. There may not be a notch as on the original DOS diskette, or it may be covered over with an adhesive tab. This blocks a small, spring-loaded switch, or a light beam inside the diskette drive, and is sensed by DOS diskette driver programs. You will get error message #144 any time you attempt to change, delete, or copy a file onto the write-protected diskette, or format the diskette.

You may use and load files, or copy from the write-protected diskette. The purpose of these limitations is to prevent accidental loss of the only copy of programs or data. In most cases, the procedure is to copy the write-protected diskette onto a notched diskette, put away the write-protected diskette as a permanent copy, then modify the notched diskette. You may remove the adhesive tab from the write-protect notch (after thinking it over carefully) and change the diskette.

It is a good practice to put an adhesive tab (supplied with boxes of diskettes) over the write-protect notch of any important diskette before you back it up. Then, if you accidentally ask for the backup in the wrong direction (from the old diskette to your important diskette), you will get a second chance to make the backup, rather than lose your data.

ADR Atari BASIC Function. Returns the memory address (decimal) of a string variable.

Format:

ADR<svar>

Example:

ADR(X$)

This information may be necessary when using Machine language subroutines in a BASIC program by means of the USR (q.v.) function.

Advance One Line on the Printer Space Up One Line. To advance one line on the printer without a carriage return, enter BASIC statement:

LPRINT CHR$(10)

or use the "line feed" (LF) button of the printer. Just LPRINT gives a line feed—both space up one line (line feed) and return to left margin (carriage return.) See also Atari 825 Printer.

Advance to Top of Page To make Epson-compatible printers form feed, you must enter BASIC statement:

LPRINT CHR$(12)

Or use the "top of form" or "form feed" manual control button (FF) on the printer. You may need to adjust the paper in the printer so it actually is at the top of a page, as defined by the perforations.

In a program, you may want to provide instructions to the operator, and a pause to allow for adjustment of the paper. See also Atari 825 Printer.

Advanced BASIC Programming Tools* Tricky Tutorial 14. This programmers helper is for people with some experience in BASIC programming. It contains seven programs/utilities to enhance the output or running of custom programs. Some of the features included are time delay, page flipping, player missle creation, and many other special character manipulations. 16K tape or 32K disk. Educational Software, Inc.

Advanced Musicsystem* Play music on your computer by entering notes on the keyboard. Uses all four voices and generates high quality sound. Includes a copy feature, direct entry of musical notations, playback mode, five sample classical pieces, and complete documentation. 32K; disk. Atari Program Exchange.

Advanced Programming Techniques For Your Atari* Written by Linda A. Scheiber, this book provides advanced techniques in graphics, color, scrolling, display lists, cassette handling, and voice technology. TAB Book Inc.

Adventure* A classic adventure text game in which you search for treasure and return it to the building to earn points. The computer gives a detailed description of your environment, and you must decide which way to go and how to use objects you find along the way. Of course, you encounter monsters and pitfalls, but they are secondary to the quest for treasure. Recommended for more advanced players or patient beginners. 32K; disk or cassette. Creative Computing Software.

Adventure on a Boat* A typical "fishing trip" game, where your boat sails on a gridded lake. The object is to catch the fish that swim in each square within a time limit. 32K; disk. Sublogic Communications Group.

Adventureland Saga #1* An all-text adventure with good documentation. You can save your game, and take advantage of novel options, such as verbal feedback from the game, or a printout of the text made as you go. These options, of course, are dependent on the peripherals you have with your computer (Votrax, printer, etc.). The object of the game is to find the treasures by solving the puzzles—sometimes easier said than done! 24K; disk. Adventure International.

Adventures of Proto, The* Three programs for four-to eight-year-olds. In Coloring Book, you use

the computer joystick to draw on the screen. In Mars-Mellow, you help Proto catch the falling marshmallows with a bag. Playtune is a music creation game that can save songs to disk. 24K; disk. Joystick required. Educational Software, Inc.

A.E.* A shoot-'em-up game where the objective is to chase pollution robots out of the city. You must attack with precise timing. The graphics are wonderful; tiny specks in the distance are transformed into large rays up close, creating a three-dimensional effect. To move to the next level, you must kill three sets of rays. Similar to many arcade games, but a little more difficult. It requires thought, as well as reflex action. 48K. Broderbund.

Aerobics Joystick, The* A joystick that attaches easily to your stationary exercise bike. Now you can play your favorite video game while keeping in shape. Very easy to install. Suncom Incorporated.

AESD II* A bit-plot screen dump utility for the MX-80/100 printers with Graphtrax graphics chips. It can be used with BASIC, DOS, and the Assembler-Editor Cartridge. 32K; disk. 850 Interface, Epson Printer required. Computer Age.

Air Traffic Controller* Simulates twenty-six airplanes, using alphabet characters on a dot grid background. You direct them all, as they land in one of the two airports you control, or pass through your area. 32K; disk. Creative Computer Software.

Airline* Build your own airline empire from the ground up, and then maybe lose it all. Emulate Braniff; be the first kid on your block to go bankrupt. For four players. Joystick, Atari BASIC required. Adventure International.

Air-Raid* You defend two airfields in a fighter plane, while enemy bombers fly in formation to destroy them. While shooting down the bombers, you must be aware of fuel consumption and enemy escort fighter planes. 24K disk or 16K cassette. Atari Program Exchange.

Airstrike* Armed with lasers and bombs you journey through asteroids and space walls, and past missile bases. Five levels of difficulty. 16K; cassette. English Software Co.

Alexander the Great* A competitive game that helps develop word and arithmetic skills. Different levels of difficulty and complete graphics. Available in a board version. 48K. Krell Software Corp.

Algebra Arcade* Learn algebraic equations while combatting the Graph Gobbler, Committee, Whirlwind, and other Algebroids. 48K; disk. Wadsworth Electronic Publishing Co.

Algicalc* Helps students with a fundamental knowledge solve difficult calculus and algebra problems. Includes manual. 24K cassette or 32K disk. Atari Program Exchange.

Algorithm A generalized procedure for solving a problem, with step-by-step specifications, ending in a finite time. In the programming process, a problem is stated, an algorithm developed for its solution, the solution steps flowcharted, and the program developed from the flowchart.

Ali Baba and the Forty Thieves* A hi-resolution action game set in the dungeons and deserts of the middle east. You must overcome all sorts of beasts and villains who can alter their appearance through reincarnation. Hidden clues will help you in your search for treasure and the Sultan's daughter. 32K; disk. Quality Software.

Alien Ambush* Another shoot-'em-up game in which you must defend your ship against aliens who split in two when hit. The pieces bounce off the screen's edge until you kill them, or are destroyed. 32K. Micro D.

Alien Egg* An all-text space adventure game where you prepare to leave your spaceship on an exploratory mission, then go in search of the Alien Egg, which must be delivered to the laboratory for analysis. All age groups can play this captivating game. 24K; disk. Atari Program Exchange.

Alien Garden* A strange, intellectual game that appeals more to adventure gamers than arcade game fans. It requires good memory and pattern recognition. The player must move a "Cosmic Critter" through rows of crystal flowers which grow, explode, or mutate, depending on the part of the critter's body that comes into contact with them. The challenge lies with learning how next to move the Critter, and what you can safely do with each generation of flower. Takes over a minute to restart, which can be annoying to an anxious player. 16K. EPYX.

Alien Hell* A fast-moving animated adventure, where one of the challenges is to figure out how to play the game. Map your way out of the alien slave mine by using the magic crystals you find along the way. But be sure to avoid the guards and monsters. 16K cassette or 24K disk. Joystick required. Syncro.

Alien Swarm* A mysterious thin figure creates the alien bugs who are after your energy packs. If one makes it through your firing line and steals a pack, you can try to retrieve it by shooting the bug before it reaches the top of the screen. 16K; disk or cassette. In-Home Software.

Alog Pagewriter, The* Lets you use your computer and 80 column printer as an electric typewriter. Ideal for simple word processing tasks, and very easy to learn. Features standard editing keys, a HELP screen, automatic return option, and line 'split' and 'splice' commands. 32K RAM; disk. Interface box, printer required. Alog Computing.

Alpha and Beta Test Site A test site helps the originators of a hardware or software product test it in a real-world situation.

Alpha test usually involves only a very few companies or individuals who realize that the product is incomplete or may have flaws. Alpha testers often work for the originating company or are otherwise closely related.

Beta test sites are generally larger in number. They expect that the product is essentially complete and correct, and agree to test in a real-world production situation. If errors are discovered, the originators ordinarily attempt to fix them rapidly so the Beta sites can stay "on the air" with the new product. If numerous or serious bugs are found, the product may have to go back to alpha testing until an improved version can be presented for another round of Beta testing.

Alphanumeric A set composed of all alphabetic and numeric characters.

Alterable Memory Storage media, such as a diskette, cassette, or RAM, which can be written onto or changed.

Alternating Current Any signal which is not constant is called alternating current; however, this term usually means that the current polarity changes on a regular basis.

ALU See Arithmetic Logic Unit.

AMIS Bulletin Board System (BBS) originated by the Michigan Atari Computer Enthusiasts. Donated to the public domain and distributed by Atari Users' Group Support. Many clubs use AMIS as their BBS, although many modifications are being developed. Once you log on to AMIS, the following letters will let you interact with it.

A   ASCII to ATASCII toggle
B   Bulletin which you got when you logged on
C   Calls file to find out who has called
D   Download files from the BBS
E   Enter a message for others to read
F   Files which you can download
G   Goodbye
H   Help, for detailed instructions

I   Index, a short summary of files on download disk
K   Kill a message if you have the password
L   Line feed toggle
M   Members only drive area and menu
Q   Quick scan of messages
R   Read the messages on file
S   Scan the subject headings
T   Time and date
U   Upload files
W   Welcome prints message from log on time
X   Expert user mode gives you short prompts instead of A,B,C, etc.
Y   Yell for the Sysop (operator) to chat
?   List of current functions

Control X Aborts Transmission
Control S Holds Transmission
Control Q Continues Transmission

AMODEM A modem program with two states, COMMS and CONTROL. In COMMS, which the program enters after it is RUN, all entries from the keyboard are sent to the modem. Also in COMMS, all received characters are sent to the screen. In CONTROL, which you enter by pressing the SELECT key, all characters entered from the keyboard are used to change parameters of the modem program. When you enter or leave the COMMS state, the following characters will appear on the screen:

OPTION = TOGGLE MEMORY SAVE
SELECT = (C,D,M,P,R,S,T,U,#)?
START = START TRANSMISSION
FILE =

If any options are selected in the CONTROL state, then a file name will appear after the " FILE = " entry.

OPTION turns on the memory capture. If you want to capture a transmission on disk, then use the C option. A "C" will appear to the left of FILE, and a file name, which you assigned, will appear to the right of FILE. When capture is activated, the screen will be black and all transmitted characters will appear on the screen. The characters will also go to memory.

D in CONTROL is used to Dump the memory to the named disk file
T in CONTROL toggles between ASCII and ATASCII
P in CONTROL toggles between FULL and HALF DUPLEX
M in CONTROL displays a menu of the disks
2 in CONTROL displays a menu of drive 2
R & S in CONTROL are used to set up parameters for XMODEM or Christensen protocols.

AMODEM will ask for a file name and return to COMMS state.

START in COMMS begins the automatic file transfer. Transfer is sector-by-sector and AMODEM will save data automatically as it arrives. Written by J. Steinbrecker.

Ampere Measurement of electrical current; the actual number of electrons moving past a stated point per second.

Amphibian* You are a frog who likes to climb trees and drop fruit on dinosaurs—the more you hit, the more fruit you find. You must return to the water to cool off, but, when you do, birds eat the fruit, and a water-monster attacks you. Once you've returned to your tree, another monster tries to follow you. Graphics and sound are good. 16K; disk or cassette. Business Data Center.

Amplifier A device or circuit that increases the power or strength of a signal.

Analog Has a continuous range of voltage or current values. Contrast with digital.

Analog Compendium, The* A collection of articles and programs from the first twelve issues of *A.N.A.L.O.G.* Magazine, plus some previously unpublished material. Analog.

A.N.A.L.O.G. Computing A magazine dedicated to Atari computer subjects. Originally called *Atari Newsletter And Lots Of Games.* Issues are released approximately every two months, and all programs listed are available in disk form for $60/year. Subscriptions are $14 for six issues. The magazine contains tutorials, games in BASIC with Machine language routines, and reviews on hardware and software. *A.N.A.L.O.G.* also publishes software. P.O. Box 23, Worcester, MA 01653. See Magazines.

Analogies* For high school students preparing for the SAT. Includes six lessons, a test, a manual, and a discussion on analogy strategies. 8K; disk or cassette. Program Design, Inc.

Analyser/Analyzer Any device that checks or regulates a component, board, or system and presents the data for review.

AND Atari BASIC logical operator, binary. A statement is true only if the expressons on both sides of the AND are true.
Example:
100 IF R=18 AND S>18 THEN PRINT "CORRECT"
In this example, only if R is equal to eighteen, and S is greater than eighteen, will "CORRECT" be printed. If R is anything other than eighteen, or S is

equal to or less than eighteen, then "CORRECT" will not be printed.

Andromeda* You are a deadly organism that has invaded a person's body. Defend yourself against threatening antibodies by destroying fat and blood cells. You maneuver with the joystick and kill off cells with the button. 32K; disk. Gebelli Software.

ANSI American National Standards Institute.

Anteater* You are the ant who must dig an underground nest to hide your eggs from the hungry anteaters. You can dig anywhere, and as many tunnels as you want to confuse the anteater. Multiple levels of difficulty; joystick-controlled. 16K; cartridge. Romox.

Anti-Sub Patrol* You are the commander of a squadron of destroyers who must rid the sea of two submarines. There is a lot of tactical planning during the course of the game. Blast the subs before they blast you. Roklan Software.

Antic A magazine for Atari users featuring reviews and comparisons of applications software, hardware, and BASIC programs for Atari computers. Special emphasis is given to helping new users overcome hardware or software problems. Product reviews usually cover the latest products, making *Antic* a good source of information before making a large purchase. 600 18th Street, San Francisco, CA94107. See Magazines.

Antic Atari 800 Computer's video microprocessor chip. Antic has its own data and instruction set—a program called the display list. The display list tells Antic where screen data is located, which display modes to use in interpreting this data, and special options such as Display List Interrupts (DLI), Load Memory Scan (LMS), and scroll enable options. Antic feeds data to the CTIA or GTIA display chips. For additional information on these subjects, *De Re Atari* (APX-90008) is recommended.

APL A Programming Language (APL) invented by Kenneth Iverson. It is used for algorithmic interactive programming.

Append To add to the end of a character string, list, or file.

Apple Panic* The setting is a maze of ladders; you must dig little holes to catch evil apples. You push them into the hole and hit them over the head before they crawl out and get you. At higher levels, you may encounter a green butterfly or a mask of death—watch out! 16K cassette, 48K; disk. Broderbund.

Applications Software A software package is a group of computer programs, possibly including data files and documentation, that perform a function or group of related functions on the computer. These are called applications software when they aid the user in specific practical tasks, such as a word processing package or an accounting package. Systems software packages, on the other hand, facilitate the use of the machinery. These include Disk Operating Systems and Program Development Packages.

Architecture The special selection, design, and inter-connection of the principal components of a system. In a microprocessing unit, this could be the number and function of registers, the instruction addressing modes, and the bus structure and timing.

Archon* A fantasy chess game with fighting pieces. All the action takes place on the strategy board screen where the representatives of the Light and the Dark sides do battle whenever they are moved into the same square. Characters include goblins, trolls, dragons, and sorceresses. Very good graphics makes this a fascinating game for all ages. 32K; disk. Electronic Arts.

Arctangent BASIC. See ATN.

Arena 3000* Joystick in hand, you must enter the arena and destroy the dangerous robot creatures. As you succeed, the play gets faster and more difficult. One or two players can play. High scores can be saved on the disk version. 16K; disk or cassette. Screenplay.

Arex* You are a pilot wandering through space minding your own business, when someone (or something) decides you are a nuisance. If you can elude this diligent pursuer, you may find a safe haven. Adventure International.

Argument Variables usually found in parentheses or brackets in a example of a function or command. Example:

LOAD"D:FILESPEC.BAS"

is the method of loading a program from a disk. FILESPEC.BAS is the argument in this example.

Argument Data passed from one process or program to another. Similar to a football pass, except that one or more bytes of data replaces the football. Also, the receiver is a program. The sender may be a program or a person typing the data onto a command line to be "passed" to a program. A common example would be a BASIC program passing variables to a subroutine.

Arithmetic Logic Unit (ALU) The element in the central processor which performs basic data manipulations such as add, subtract, complement, negate, rotate, AND, and OR.

Arithmetic Statement An instruction specifying an arithmetic operation.

ARQ Automatic ReQuest for repeat. In telecommunications, a device capable of determining whether it has correctly received information transmitted from another source may automatically request a repeat transmission.

Array A one-dimensional set of elements. This would be a series of numbers stored in memory.

Arrays BASIC. See DIM.

Arrow Down (↓) Pressing CTRL and the down arrow will move the cursor down one line in the same position on the screen it previously occupied. This function is common in text entry and in entering commands. See Control Keys.

Arrow Left (←) Pressing CTRL and the left arrow will move the cursor left one character. This function is common in text entry and in entering commands. See Control Keys.

Arrow Right (→) Pressing CTRL and the right arrow will move the cursor right one character. This function is common in text entry and in entering commands. See Control Keys.

Arrow Up (↑) Pressing CTRL and the up arrow will move the cursor up one line in the same column on the screen it previously occupied. This function is common in text entry and in entering commands. See Control Keys.

ASC Atari BASIC String Function. ASC returns the ATASCII code number for the first character of a string expression. This function is operative in either direct or deferred mode. Consider the following short program:

```
500 DIM Z$(10)
510 Z$ ="EXAMPLE"
520 X=ASC(Z$)
530 PRINT X
```

When this program is run, 69 will be printed on the screen. 69 is the ATASCII code number for the letter E.

ASCII American Standard Code for Information Interchange. The 256 ASCII characters are widely used in microcomputers. The Atari, however has its own codes, ATASCII, which are similar to ASCII. See ATASCII.

ASCII Character   BASIC. See CHR$.

ASCII Control Characters   BASIC. To change the Epson MX-80 compatible printer's print size, strike method, or number of lines per inch you must turn on the non-standard type format by sending control codes to the printer. The Atari 825 printer works differently. See Atari 825 Printer.

To return to the normal (default) 10-character-per-inch print size and six lines-per-inch down the page, the non-standard type size currently in effect must be reversed. To do this, use the ASCII codes in the following table:

Type Format	Turn On	Turn Off
Compressed	143	146
Double Width	142	148
Emphasized	155,197	155,198
Double Strike	155,199	155,200
72/7 Lines/inch	155,49	155,50
8 Lines/Inch	155,48	155,50
6 Lines/Inch*	155,50	155,50
72/n Lines/	155,193,	155,193,12,
Inch#	n,155,50	155,50

* Standard 12 dots/line (72/12 = 6 lines/inch) set when printer is initialized or powered on. Not effective after use of 155,193,n to redefine result—see below.

This resets the definition of "Standard."

See Type Formats for a full explanation and examples of type formats and line spacings. See also Atari 825 Printer.

ASCII Keyboard   Includes three cases for each alpha character: upper case, lower case, and control. Provides keys for the set of ASCII characters. Also inverse on Atari. See ATASCII.

ASCII Value of Characters   BASIC. See ASC(x$).

ASM   Program in the Atari Assembler/Editor Cartridge to begin assembly of a source program. The assembler takes the source program which is written in Assembly language and converts it into Machine Code. The Machine Code is processed directly by the 6502 processor in the Atari computer. Besides the ASM program, the Assembler/Editor has an editor program (EDIT) and a debugger (BUG) used in the preparation of Assembly language programs.

ASR   Automatic Send Receive. A terminal with not only a keyboard and printer, but also an automatic reading and recording device, such as a cassette tape unit or a paper tape reader and punch.

Assault on the Astral Rift*   You and your small band must stop interdimensional travel, which threatens to destroy the very fabric of the universe. Original music, fantastic graphics, single or multiple player capability, many hi-resolution, full-color screens, action, even mind-reading. The ultimate adventure. First in the ABRAXAS Adventure series. 48K; disk. MMG Micro Software.

Assembler   Synonym for Assembly. See Assembly for a description of this programming language.

Assembler   A program which takes programs written in Assembly language and produces Machine language files. The Machine language code can be executed directly by the microprocessor in the Atari computer. See Program Development Aids.

Assembler Editor*   A good assembler for the beginner, it uses a line editor similar to BASIC in conjunction with Atari's full screen editor. Search and replace and renumber are among its more useful features. The assembler is rather slow and does not support a printer, but does contain most of the usual features. Cartridge. Atari, Inc.

Assembler Move Subroutines Tutorial   The following program will teach you a great deal about programming subroutines. The REM statements will give you a lot of guidance, but the real learning comes from running the program and seeing what happens.

```
100 REM ASMMOVE BY JERRY WHITE
110 REM
120 GRAPHICS 0:REM TEXT DISPLAY MODE
130 POKE 752,1:REM NO CURSOR DISPLAY
140 POKE 710,144:REM BACKGROUND
COLOR
150 POKE 709,12:REM BRIGHT TEXT
160 POKE 82,2:REM LEFT MARGIN
170 POKE 83,39:REM RIGHT MARGIN
180 POKE 201,5:REM TAB WIDTH
190 ? :? ,"ASSEMBLER MOVE SUBROUTINES"
200 POKE 201,10:? :? ,"BY JERRY WHITE"
210 GOSUB 670:REM CREATE STRINGS
220 POKE 712,144:REM BORDER COLOR
230 POSITION 2,5:? "CLEAR PAGE SIX USING
MOVECHR ROUTINE"
240 ? :? "JW=USR(ADR(MOVECHR$),1536,-
256,0)":GOSUB 530
250 JW=USR(ADR(MOVECHR$),1536,256,0)
260 ? CHR$(125):? :? CHR$(127);"PAGE 6
NOW CONTAINS ALL ZEROS":?
270 FOR LOCATION=1536 TO 1791 STEP 4:?
CHR$(127);
280 ? LOCATION;"=";PEEK(LOCATION);-
CHR$(127);
```

```
290 ? LOCATION+1;"=";PEEK(LOCATION+1);-
CHR$(127);
300 ? LOCATION+2;"=";PEEK(LOCATION+2);-
CHR$(127);
310 ? LOCATION+3;"=";PEEK(LOCATION+3)
320 NEXT LOCATION:? :? :? :?
330 GOSUB 530:? CHR$(125):? "TO DEMON-
STRATE THE MOVERAM ROUTINE"
340 ? :? "WE WILL MOVE THE MOVECHR
ROUTINE TO":? :? "PAGE SIX."
350 ? :? "JW=USR(ADR(MOVERAM$),ADR-
(MOVECHR$),1536,36)":GOSUB 530
360 JW=USR(ADR(MOVERAM$),ADR=MOVE-
CHR$),1536,36)
370 ? CHR$(125):? :? "PAGE SIX NOW CON-
TAINS THE MOVECHR"
380 ? :? "ROUTINE. TO PROVE THIS WE FILL
THE"
390 ? :? "THE TOP HALF OF THE SCREEN
USING"
400 ? :? "DISPLAY CHARACTER 128 BY CAL-
LING THE"
410 ? :? "MOVECHR ROUTINE AT ADDRESS
1536."
420 ? :? "SCREENRAM=PEEK(88)+256*PEEK-
(89)"
430 ? :? "JW=USR(1536,SCREENRAM,479,160)"
440 SCREENRAM=PEEK(88)+256*PEEK(89)
450 ?:?"SCREENRAM STARTS AT LOCATION"
;SCREENRAM
460 GOSUB 530:? :? CHR$(125);:POSITION
2,18
470 ? :? "BASIC":? "IS";
480 JW=USR(1536,SCREENRAM,479,128)
490 POKE 752,0:END
500 REM
510 REM WAIT FOR START KEY PRESS
520 REM AND RELEASE SUBROUTINE
530 REM
540 POSITION 9,21:? "PRESS START TO CON-
TINUE"
550 REM
560 REM BUZZ CONSOLE SPEAKER
570 REM
580 FOR BUZZ=0 TO 8:POKE 53279,BUZZ-
:NEXT BUZZ
590 IF PEEK(53279)≠6 THEN 590
600 IF PEEK(53279)≠7 THEN 600
610 RETURN
620 REM
630 REM MOVERAM$ AND MOVECHR$
640 REM ARE RELOCATABLE MACHINE
650 REM LANGUAGE SUBROUTINES
660 REM STORED AS STRINGS.
670 DIM MOVERAM$(54)
680 POSITION 11,5:? "CREATING MOVE-
RAM$"
690 REM TO CALL MOVERAM FROM BASIC
700 REM JW=USR(ADR(MOVERAM$,ADR-
(FROM),ADR(TO),NUMBERBYTES)
710 REM
720 RESTORE 780
730 REM CREATE MOVERAM$ FROM DATA
740 REM CHANGE BORDER COLOR TO
750 REM SHOW SOMETHING IS HAPPENING
760 FOR JW=1 TO 54:READ IT:MOVERAM$-
(JW,JW)=CHR$(IT):POKE 712,IT:NEXT JW
770 REM
780 DATA 104,104,133,204
790 DATA 104,133,203,104
800 DATA 133,206,104,133
810 DATA 205,104,141,255
820 DATA 6,24,101,206
830 DATA 133,206,24,173
840 DATA 255,6,101,204
850 DATA 133,204,238,255
860 DATA 6,104,168,177
870 DATA 203,145,205,136
880 DATA 192,255,208,247
890 DATA 198,204,198,206
900 DATA 206,255,6,208,238,96
910 REM
920 DIM MOVECHR$(34):POSITION 11,5:?
"CREATING MOVECHR$"
930 REM TO CALL MOVECHR FROM BASIC
940 REM JW=USR(ADR(MOVECHR$),ADR-
(TO),NUMBERBYTES,NUMBERCHR)
950 REM
960 RESTORE 1000
970 REM CREATE MOVECHR$ FROM DATA
980 FOR JW=1 TO 34:READ IT:MOVECHR$-
(JW,JW)=CHR$(IT):POKE 712,IT:NEXT
JW:RETURN
990 REM
1000 DATA 104,104,133,204
1010 DATA 104,133,203,104
1020 DATA 133,205,230,205
1030 DATA 104,170,232,104
1040 DATA 104,160,0,145
1050 DATA 203,200,208,2
1060 DATA 230,204,202,208
1070 DATA 246,198,205,208,242,96
```

Assembler Op Codes for 6502 The operation code (OP code) is the part of the Assembly language instruction which specifies the action the computer is to execute. The following is a list of OP codes for the 6502 microprocessor with a brief description of their functions.

OPCODE	DESCRIPTION	MODE	HEX	DEC	BYTES
ADC	Add to Accumulator with Carry	Absolute	6D	105	2
ADC	Add to Accumulator with Carry	0-PAGE	65	101	2
ADC	Add to Accumulator with Carry	Immed.	69	105	2
ADC	Add to Accumulator with Carry	ABS.X	7D	125	3
ADC	Add to Accumulator with Carry	ABS.Y	79	121	3
ADC	Add to Accumulator with Carry	IND.X	61	97	2
ADC	Add to Accumulator with Carry	IND.Y	71	113	2
ADC	Add to Accumulator with Carry	0-PAGE.X	75	117	2
AND	AND Memory with Accumulator	Absolute	2D	45	3
AND	AND Memory with Accumulator	0-PAGE	25	37	2
AND	AND Memory with Accumulator	Immed.	29	41	2
AND	AND Memory with Accumulator	ABS.X	3D	61	3
AND	AND Memory with Accumulator	ABS.Y	39	57	3
AND	AND Memory with Accumulator	IND.X	21	33	2
AND	AND Memory with Accumulator	IND.Y	31	49	2
AND	AND Memory with Accumulator	0-PAGE.X	35	53	2
ASL	Accumulator Shift Left	ACCUM	0A	10	1
ASL	Accumulator Shift Left	Absolute	0E	14	3
ASL	Accumulator Shift Left	0-PAGE	06	06	2
ASL	Accumulator Shift Left	ABS.X	1E	30	3
ASL	Accumulator Shift Left	0-PAGE.X	16	22	2
BCC	Branch on Carry Clear	Relative	90	144	2
BCS	Branch on Carry Set	Relative	B0	176	2
BEQ	Branch on Result Equal Zero	Relative	F0	240	2
BIT	Test Bits in Memory with ACC.	Absolute	2C	44	3
BIT	Test Bits in Memory with ACC.	0-page	24	36	2
BMI	Branch on Result Minus	Relative	30	48	2
BNE	Branch on Result Not Zero	Relative	D0	208	2
BPL	Branch on Result Plus	Relative	10	16	2
BRK	Force Break	Implied	00	00	1
BVC	Branch on Overflow Clear	Relative	50	80	2
BVS	Branch on Overflow Set	Relative	70	112	2
CLC	Clear Carry Flag	Implied	18	24	1
CLD	Clear Decimal Mode	Implied	D8	216	1
CLI	Clear Interrupt Disable Bit	Implied	58	88	1
CLV	Clear Overflow Flag	Implied	B8	184	1
CMP	Compare Memory and Accumulator	Absolute	CD	205	3
CMP	Compare Memory and Accumulator	0-page	C5	197	2
CMP	Compare Memory and Accumulator	Immed.	C9	201	2
CMP	Compare Memory and Accumulator	ABS.X	DD	221	3
CMP	Compare Memory and Accumulator	ABS.Y	D9	217	3
CMP	Compare Memory and Accumulator	IND.X	C1	193	2
CMP	Compare Memory and Accumulator	IND.Y	D1	209	2
CMP	Compare Memory and Accumulator	0-page.X	D5	213	2
CPX	Compare to Register X	Absolute	EC	236	3
CPX	Compare to Register X	0-page	E4	228	2
CPX	Compare to Register X	Immed.	E0	224	2
CPY	Compare to Register Y	Absolute	CC	204	3
CPY	Compare to Register Y	0-page	C4	196	2
CPY	Compare to Register Y	Immed.	C0	192	2

OPCODE	DESCRIPTION	MODE	HEX	DEC	BYTES
DEC	Decrement Memory by one	Absolute	CE	206	3
DEC	Decrement Memory by one	0-page	C6	198	2
DEC	Decrement Memory by one	ABS.X	DE	222	3
DEC	Decrement Memory by one	0-page.X	D6	214	2
DEX	Decrement X-register by one	Implied	CA	202	1
DEY	Decrement Y-register by one	Implied	88	136	1
EOR	Exclusive-OR Memory with Accum	Absolute	4D	77	3
EOR	Exclusive-OR Memory with Accum	0-page	45	69	2
EOR	Exclusive-OR Memory with Accum	Immed.	49	73	2
EOR	Exclusive-OR Memory with Accum	ABS.X	5D	93	3
EOR	Exclusive-OR Memory with Accum	ABS.Y	59	89	3
EOR	Exclusive-OR Memory with Accum	IND.X	41	65	2
EOR	Exclusive-OR Memory with Accum	IND.Y	51	81	2
EOR	Exclusive-OR Memory with Accum	0-page.X	55	85	2
INC	Increment Memory by one	Absolute	EE	238	3
INC	Increment Memory by one	0-page	E6	230	2
INC	Increment Memory by one	ABS.X	FE	254	3
INC	Increment Memory by one	0-page.X	F6	246	2
INX	Increment X-register by one	Implied	E8	232	1
INY	Increment Y-register by one	Implied	C8	200	1
JMP	Jump	Absolute	4C	76	3
JMP	Jump	Indirect	6C	108	3
JSR	Jump to Subroutine	Absolute	20	32	3
LDA	Load Accumulator with Memory	Absolute	AD	173	3
LDA	Load Accumulator with Memory	0-page	A5	165	2
LDA	Load Accumulator with Memory	Immed.	A9	169	2
LDA	Load Accumulator with Memory	ABS.X	BD	189	3
LDA	Load Accumulator with Memory	ABS.Y	B9	185	3
LDA	Load Accumulator with Memory	IND.X	A1	161	2
LDA	Load Accumulator with Memory	IND.Y	B1	177	2
LDA	Load Accumulator with Memory	0-page.X	B5	181	2
LDX	Load X-register with Memory	Absolute	AE	174	3
LDX	Load X-register with Memory	0-page	A6	166	2
LDX	Load X-register with Memory	Immed.	A2	162	2
LDX	Load X-register with Memory	ABS.Y	BE	190	3
LDX	Load X-register with Memory	0-page.X	B6	182	2
LDY	Load Y-register with Memory	Absolute	AC	172	3
LDY	Load Y-register with Memory	0-page	A4	164	2
LDY	Load Y-register with Memory	Immed.	A0	160	2
LDY	Load Y-register with Memory	ABS.X	BC	188	3
LDY	Load Y-register with Memory	0-page.X	B4	180	4
LSR	Local Shift Right	Accum.	4A	74	1
LSR	Local Shift Right	Absolute	4E	78	3
LSR	Local Shift Right	0-page	46	70	2
LSR	Local Shift Right	ABS.X	5E	94	3
LSR	Local Shift Right	0-page.X	56	86	2
NOP	No Operation		EA	234	1
ORA	OR Memory with Accumulator	Absolute	0D	13	3
ORA	OR Memory with Accumulator	0-page	05	05	2
ORA	OR Memory with Accumulator	Immed.	09	09	2

OPCODE	DESCRIPTION	MODE	HEX	DEC	BYTES
ORA	OR Memory with Accumulator	ABS.X	1D	29	3
ORA	OR Memory with Accumulator	ABS.Y	19	25	3
ORA	OR Memory with Accumulator	IND,X	01	01	2
ORA	OR Memory with Accumulator	IND.Y	11	17	2
ORA	OR Memory with Accumulator	0-page.X	15	21	2
PHA	Push Accumulator on Stack	Implied	48	72	1
PHP	Push Processor Status on Stack	Implied	08	08	1
PLA	Pull Accumulator From Stack	Implied	68	104	1
PLP	Pull Proc. Status From Stack	Implied	28	40	1
ROL	Rotate Left	Accum.	2A	42	1
ROL	Rotate Left	Absolute	2E	46	3
ROL	Rotate Left	0-page	26	38	2
ROL	Rotate Left	ABS.X	3E	62	3
ROL	Rotate Left	0-page.X	36	54	2
ROR	Rotate Right	Accum.	6A	106	1
ROR	Rotate Right	Absolute	6E	110	3
ROR	Rotate Right	0-page	66	102	2
ROR	Rotate Right	ABS.X	7E	126	3
ROR	Rotate Right	0-page.X	76	118	2
RTI	Return from Interrupt	Implied	40	64	1
RTS	Return from Subroutine	Implied	60	96	1
SBC	Subtract from Accum with Carry	Absolute	ED	237	3
SBC	Subtract from Accum with Carry	0-page	E5	229	2
SBC	Subtract from Accum with Carry	Immed.	E9	233	2
SBC	Subtract from Accum with Carry	ABS.X	FD	253	3
SBC	Subtract from Accum with Carry	ABS.Y	F9	249	3
SBC	Subtract from Accum with Carry	IND.X	E1	225	2
SBC	Subtract from Accum with Carry	IND.Y	F1	241	2
SBC	Subtract from Accum with Carry	0-page.X	F5	245	2
SEC	Set Carry Flag	Implied	38	56	1
SEC	Set Decimal Mode	Implied	F8	248	1
SEI	Set Interrupt Disable Status	Implied	78	120	1
STA	Store Accumulator in Memory	Absolute	8D	141	3
STA	Store Accumulator in Memory	0-page	85	133	2
STA	Store Accumulator in Memory	ABS.X	9D	157	3
STA	Store Accumulator in Memory	ABS.Y	99	153	3
STA	Store Accumulator in Memory	IND.X	81	129	2
STA	Store Accumulator in Memory	IND.Y	91	145	2
STA	Store Accumulator in Memory	0-page.X	95	149	2
STX	Store Index X in Memory	Absolute	8E	142	3
STX	Store Index X in Memory	0-page	86	134	2
STX	Store Index X in Memory	0-page.X	96	150	2
STY	Store Index Y in Memory	Absolute	8C	140	3
STY	Store Index Y in Memory	0-page	84	132	2
STY	Store Index Y in Memory	0-page.X	94	148	4
TAX	Transfer Accum. to Index X	Implied	AA	170	1
TAY	Transfer Accum. to Index Y	Implied	A8	186	1
TSX	Transfer Stack Ptr. to Index X	Implied	BA	186	1
TXA	Transfer Index X to Accum.	Implied	8A	138	1
TXS	Transfer Index X to Stack Ptr.	Implied	9A	154	1
TYA	Transfer Index Y to Accum.	Implied	98	152	1

STATEMENT FORMATS:

- *Immediate Addressing:*
  OPCODE #Constant
  LDA #00

Instructions using this mode are:
ADC,AND,CMP,CPX,CPY,EOR,LDA,LDX,LDY,
ORA,SBC.

- *Absolute Addressing:*
  OPCODE Address
  STA $D02A

Instructions using this mode are:
ADC,AND,ASL,BIT,CMP,CPX,CPY,DEC,EOR,INC,
JMP,JSR,LDA,LDX,LDY,LSR,
ORA,ROL,ROR,SBC,STA,STX,STY.

- *Zero Page (0-page) Addressing:*
  OPCODE 0-page Address
  LDA $002A

Instructions using this mode are:
ADC,AND,ASL,BIT,CMP,CPX,CPY,DEC,EOR,INC,
LDA,LDX,LDY,LSR,ORA,ROL,
ROR,SBC,STA,STX,STY.

- *Implied Addressing:*
  OPCODE
  DEY

Instructions using this mode are:
CLC,CLD,CLI,CLV,DEX,DEY,INX,INY,NOP,SEC,SEC,
SEI,TAX,TAY,TSX,TXA,TXS,TYA.

- *Indirect Absolute Addressing:*
  OPCODE (Address)
  JMP ($04BC)

Instructions using this mode are: ADC,CMP,
EOR,LDA,ORA,SBC,STA.

- *Absolute Indexed,X Addressing:*
  OPCODE Address,X
  LDA $B012,X

Instructions using this mode are:
ADC,AND,ASL,CMP,DEC,EOR,INC,LDA,LDY,LSR,
ORA,ROL,ROR,SBC,STA.

- *Absolute Indexed,Y Addressing:*
  OPCODE Address,Y
  LDA $01CE,Y

Instuctions using this mode are: ADC,AND,CMP,
EOR,LDA,LDX,ORA,SBC,STA.
Zero-Page Indexed,X Addressing:

- OPCODE 0-page Address,X
  LDA $002C,X

Instructions using this mode are:
ADC,AND,ASL,CMP,DEC,EOR,INC,LDA,LDY,LSR,
ORA,ROL,ROR,SBC,STA,STY.

- *Zero-page Indexed,Y Addressing:*
  OPCODE 0-page Address, Y
  LDA $00FA,Y

Instructions using this mode are: LDX,STX.

- *Indexed Indirect Addressing:*
  OPCODE (Address,X)
  LDA ($0BC2,X)

Instructions using this mode are: ADC,AND,CMP,
EOR,LDA,ORA,SBC,STA.

- *Indirect Indexed Addressing:*
  OPCODE (Address),Y
  LDA ($0BC2),Y

Instructions using this mode are: ADC,CMP,EOR,
LDA,ORA,SBC,STA.

- *Relative Addressing:*
  OPCODE Address
  BCC THERE
  HERE LDA #$0A03

Branches used in Relative Addressing: BCC,BCS,
BEQ,BMI,BNE,BPL,BVC,BVS.

- *Accumulator Addressing:*
  OPCODE A
  ROR A

Instructions using this mode are: ASL,LSR,ROL,
ROR.

Assembly Language A programming language
closely related to the Machine language of the
computer. The Atari uses a 6502 processor chip, so
the Atari assembler uses instructions based on 6502
Machine language. A brief introduction to As-
sembler here follows.

The 6502 handles information one byte at a time.
Larger units of data such as "character string,"
"floating point numbers," and "records" are ficti-
tious entities. In order to process data organized in
these formats, the 6502 must execute many one-
byte instructions. For example, to move a 25-byte
character string from one place to another, 25 one-
byte moves must be performed, usually by a loop.
Clearly the Assembler program is long and difficult
to understand and code.

The tedious and time-consuming nature of Assem-
bler programming led to the invention of "high-
level" languages, such as BASIC, FORTH, COBOL,
and Pascal. These languages require fewer instruc-
tions written into the program, but they cannot be
run on the computer. A complex translation pro-
cess is required to turn the high-level program into
a Machine language program that the 6502 can use.
The Machine language program that is produced
runs many times slower and takes up a lot more
memory than a program written in Assembler.

Higher-level languages simplify the programmer's job by using very general program procedures which can handle all possible circumstances in which the statements might be used. Since, for a particular program, only a small fraction of the possible codes are used, much of the Assembler code produced by the compiler is not needed. The information required to specify whether or not all of the possible circumstances need to be provided for in the code, is exactly what was left out to simplify the higher-level language. If BASIC did require you to give enough information so that it could avoid generating very general code, it would be as detailed and tedious to use as Assembler.

Interpreted languages (such as BASIC) are translated into executable Machine Code every time the program is executed, rather than only once.

Assembly language programs run faster, use less memory, and access more special machine level functions (such as direct I/O devices) than high-level languages. Assembler is popular with software houses for writing programs that must run very fast, (action games or programs to run fast devices such as disk drives, etc.). But because Assembler is harder to code, few individual users write programs in Assembler. Those who do usually write only selected time-critical or highly specialized routines to do one particular time-critical or memory-size-critical task within a BASIC program. The Assembler code will be called as a subroutine by the BASIC program.

Assembly language is a highly technical language, more adapted to the needs of the 6502 processor than to the needs of the Atari user. It is invaluable when speed or memory size is critical, for highly specialized applications, and for commercial software development. However, for most Atari users, it is not practical to use Assembler as a regular programming language. If you need an Assembly language program or subroutine for a program, consider paying an experienced Assembly language programmer to do it for you. But if you enjoy getting to the nuts and bolts of the computer, Assembly language is the quickest route to the inside workings of the 6502. To learn more about Assembler, see *The Atari Assembler* by Don and Kurt Inman, published by Reston Publishing Company, and *6502 Assembly Language Programming* by Lance Leventhal, published by Osborne/McGraw Hill Inc.

See also Assembler OPCodes.

Assignment   Giving a variable a value. In BASIC, a simple assignment is:

LET X=5

This assigns the value 5 to the variable X.

Association for Computing Machinery   See ACM.

Asteroid Miners*   This BASIC game comes complete with a 50-page book describing the program in depth, including Machine language subroutines which you can use in your own programs! Learn how to construct a new game by taking apart an old one in great detail. 32K; tape or disk. MMG Micro Software.

Asteroid Miners Tutorial*   Presents a rather uninteresting game and attempts to teach methods of game programming. It's useful, but the same information is available in computer magazines that present game coding. 32K; disk. MMG Micro Software.

Asteroids*   Rack up points as your spacecraft blows asteroids to bits. Protection tactics include jumping to hyperspace and using a defense shield. One to four players can get involved, either as teams or individually. 16K; cassette. Atari, Inc.

Astro Chase*   Destroy the Mega bombs that are approaching Earth before they blow it to pieces. Use your laser to shoot enemy fighter spaceships that are trying to distract you long enough for one of their bombs to make contact with our planet. Various levels of difficulty. 32K; disk. First Star Software.

Astrology*   Computes the mathematics of astrology to yield special insights into birth date and location. Can plot natal charts, generate hi-resolution graphics using the standard symbols and conventions, and includes a redefined character set, zodiac symbols, and a save program feature. 40K; disk. Atari Program Exchange.

Astron IV*   Explore a four-level maze, trying to escape before your power runs out. Every move you make requires energy, and you can only recharge at certain spots along the way. Synchro.

Astro-Quotes*   Become familiar with famous quotations as you increase your vocabulary with this three-program package. Intended for high school and up. 16K; disk or cassette. Program Design, Inc.

Astrowarriors*   Four different universe fields are available to battle with the enemy: open space, sun, black hole, or centered asteroid. Once you leave the screen, you must establish a new orbit. For two to four players. 32K disk or 16K cassette. Apogee Software.

Asynchronous An event or device which does not have the same timing as the central processing unit.

Asynchronous Transmission The only type of transmission possible on the Atari computer. Time intervals between characters may be of unequal length, and characters are separated by start and stop elements or bits at the beginning and end of each character.

AT & T American Telephone and Telegraph. AKA, Ma Bell.

Atari: A Beginner's Guide* Written by Lance Zimmerman, this tutorial for the beginner helps you understand the capabilities of the Atari. Prentice Hall.

Atari Assembler, The* The subjects covered in this book include: Machine Language From BASIC, Memory Use, Special Purpose Registers And Addressing Modes, Branching Out, Designing A Program, Addition And Subtraction, Shift And Rotate, Multiplication, Division, And Subroutines, 6502 Instructions, Frequency Values For Three-Octave Scale, Assembler Error Codes, Operating System Errors, ATASCII Character Set. Reston Publishing Company.

Atari BASIC* A hands-on introduction to Atari BASIC written by Richard E. Haskell. Topics covered are low-and high-resolution graphics, loops and arrays, sound effects, bar graphs, and animated graphics. Prentice Hall.

Atari BASIC Faster and Better* This book contains programming tricks and techniques to make BASIC run faster and better. Companion software diskettes are available (sold separately). *ABFAB* Assembly Disk contains ten Assembly language source programs and ten object programs. *ABFAB* Library Disk contains eighty-one subroutines that can be included in your BASIC programs. *ABFAB* Demo/Applications Disk contains eleven application programs and fourteen demonstration programs. IJG, Inc.

Atari BASIC: Learning By Using* A supplementary resource for learning Atari BASIC. The reader should have an elementary knowledge of BASIC to benefit from this book. Subjects covered are use and programming of special keys, sound effects and music, designing graphic characters for games, programming for the joysticks and the paddles, using PEEKs and POKEs for cursor control, changing background colors, cassette recorder control, and generating sounds from the internal loud-

speaker. Appendices contain a memory map and the calculation for screen position. IJG, Inc.

Atari BASIC, Quick Reference Guide* Areas discussed in the book are BASIC operators, file naming conventions, system commands, BASIC language commands, sound parameters, Input/Output control, and graphics and video control. Written by Gilbert Held. Wiley.

Atari BASIC Rev A* The original Atari BASIC cartridge. This version was replaced by Atari BASIC Rev B* in the latter part of 1983. Atari, Inc.

Atari BASIC REV B* This version of Atari BASIC replaced Rev A in the latter part of 1983 and is built into the 600XL, 800XL, 1400XL, and 1450XL. Rev B is better at fixing bugs and requires 16 bytes more RAM than Rev A. Atari, Inc.

Atari BASIC—A Self-Teaching Guide* Written by Bob Albrecht, Leroy Finkel, and Jerald Brown. This beginner's book shows how to read, write, and understand Atari BASIC. Wiley.

Atari BASIC Routines A book that explains how to put together Atari BASIC commands to form routines and programs. It is written by Jerry White and contains the following sections: common subroutines, using the paddles, using the joysticks, using a timer, interpreting the keyboard, setting tab stops, right-justified amounts, dice game G.R.O graphics, mixed graphics modes, text in graphics mode 8, monthly bar graph, sorting a string, musical end routine, deep bass sounds, sound effects, binary to decimal conversions, player missile strings, disk-based inventory, delete BASIC lines, disk utilities, conserving memory, program speed, using memory locations to PEEK and POKE. Adventure International.

Atari CP/M Module* This external Z-80 microprocessor upgrade allows CP/M software to be used on Atari's XL computer line. The package features 4.0 MHz processing speed, 64K RAM, CP/M Operating System, 40/80 column switchable video output, monitor output, and Serial I/O port. Atari, Inc.

Atari Games & Recreations* A book introducing beginners to programming through games. Graphics, sound, and color features are developed as the games go from simple to complex. Written by Herb Kohl, Ted Kahn, Len Lindsay, and Pat Cleland. Reston Publishing.

Atari Graphics and Arcade Game Design* For advanced BASIC and Assembly language programmers. Develops graphics techniques for arcade games. Presents Atari's advanced graphics. Clear

text, flow charts, and working examples. Chapters on custom display lists, GTIA color, player-missile graphics, scrolling, character sets, vertical blanks, display list interrupts, bit mapping, and game theory. One-third BASIC with Machine language subroutines, two-thirds Assembly language. Features four commercial quality arcade games. Written by Jeffrey Stanton, whose earlier book, *Apple Graphics and Arcade Game Design* (published by The Book Company), is an established reference for the game industry. The Book Book Company.

Atari Key Special key on the Atari computer keyboard which sets the highest of eight bits when the keyboard is used to generate characters. The effect is to add 128 to the normal ATASCII value, so the character set is displayed in inverse video (dark character on light background). This key is also used to kill the type-ahead buffer in Letter Perfect V.3.x. See also Control Keys.

Atari Kid's Library* A collection of educational fun and games designed to appeal to children under twelve. Includes characters from Peanuts (tm), Walt Disney (tm), and The Muppets (tm). Atari Game Club.

Atari Light Pen* This pen-like device allows communication with the computer by touching the TV or monitor screen with the lighted point. Atari, Inc.

Atari Logo Activities Cards* Includes a set of 175 individual cards to use while exploring the world of Logo on the Atari computer. The cards provide interrelated experiences in all realms of Logo, and encourage the user to become inventive while using this problem-solving tool. Reston Publishing Company.

Atari Microsoft BASIC* A powerful BASIC developed by the same people who wrote BASIC for the Pet, Apple, and Radio Shack microcomputers. It supports Atari's graphics and sound, has automatic line numbering, renumbering, a range-of-lines delete function, and many other features that make up a complete and convenient language to use on your Atari. 40K disk. Atari, Inc.

Atari MicroSoft BASIC II* A new programming language to make your Atari programming faster and more convenient. Similar to the earlier version, BASIC II can delete blocks of lines in one operation, and insert space to add new subroutines to your program. This release comes on a 16K cartridge and includes a diskette to be used with the cartridge, to provide all the features of a disk-based system. You can use true strings, as opposed to

"pseudo-strings" found in earlier versions, and you need not dimension all strings—just multidimensional arrays or arrays with more than ten elements. The user's manual is improved; overall, this package will add substantially to your home computing power. 16K; disk. Atari, Inc.

Atari Numerical Keypad* This numeric input device includes ten number keys, "+", "-", ".", and four redefinable function keys. The package also includes handler software and technical notes. Atari, Inc.

Atari PILOT Activities and Games* The appeal of the Atari PILOT language is that it is easy to master and therefore very useful for teachers and new programmers. This valuable teaching aid not only gives you the benefits of the PILOT language, but also contains "turtle" graphics, simplifying mastery of the powerful aspects of Atari computer graphics, including drawing and animation. Reston Publishing Company.

Atari PILOT for Beginners* Allows the beginner to learn PILOT through playing with and experimenting on Atari computers. No previous computer experience is needed, since this was written as a "get started" book. Features include Turtle graphics, a simple yet powerful method for doing graphics and animation. Reston Publishing Company.

Atari Programming with 55 Programs* No prior computer knowledge is assumed by this hands-on guide to programming, written by Linda M. Schreiber. This easy-to-follow book contains programs on the following subjects: Atari keyboard, organizing your program, commands and statements, storing the program, understand the screen, getting the answers, storing related information, repeating part of the program, making decisions, reusing part of a program, arithmetic functions, working with strings, finding and trapping errors, playing computer, sights and sounds, special functions, advanced programming skills, using disks, and putting it all together. TAB Books.

Atari Sound & Graphics—A Self-Teaching Guide* Written by Herb Moore, Judy Lower, and Bob Albrecht, this self-teaching guide uses BASIC to demonstrate Atari's sound and graphics capabilities. Wiley.

Atari Touch Tablet* This 4½" by 6" drawing area enables the user to paint pictures, draw diagrams, write, or make menu selections with the touch of a finger or stylus. The package includes a stylus and software to help you make use of 228 by 228 plotting points. Atari, Inc.

*Atari User's Guide: BASIC And Graphics for the Atari 400/800/1200** A comprehensive, detailed guide of Atari BASIC and graphics. Applications include graphics, word processing, and business. Written by Mark Ellis, Robert Ellis, and Joel Goldstein. Brady.

Atari World* Architects will find this 3-D graphics system of particular interest. A maximum of 64,000 units are available on each side of the graphic cube. Includes a text editor, coloring mode, and manual. 40K; disk. United Software of America.

Atari Writer* Similar to the Text Wizard* word processor with several attractive changes. Atari Writer is in cartridge form, which is easy to use, except you must still load the FMS from a DOS disk. All file input and output commands are presented on an initial menu. From the menu, you can create, delete, edit files, format, index disks, load, print, and save files. Printer control characters can be embedded in the text using a Control-O and the decimal number for the ATASCII character you want to send. For example, to turn on the compressed print on the Epson printer, use Control-O 27, Control-O 15. (Escape: control O.) A DELETE buffer is available to recover from any mistakes you may have made. This means the last thirty lines of text you deleted are not really gone—just hidden until the next deletion. START and INSERT activate this feature. The standard overstrike mode is not available. To change text, you must delete old text and insert new text. File formatting is represented by mnemonics at the top of the screen. A line such as B12 D4 G1 I5 J0 L10 R70 S2 T12 Y132 informs you that your bottom margin is twelve half-lines, right margin is seventy spaces, and so on. Line lengths are represented in characters, not dots as in Text Wizard. A good value. Atari, Inc.

*Atari 400/800 Diskglide** Written by John Taylor, this guide contains all the important commands and functions: DOS, Atari BASIC, numeric functions, machine functions, etc. Osborne/McGraw-Hill.

Atari 600XL* This computer is a repackaged version of the 1200XL, available at a list price of less than $200.00. The 600XL offers a very competitive price/performance ratio and will probably be among the top-selling, lower priced personal computers for the next several years. Over 1000 existing Atari software packages are compatible with the 600XL. Significant features and improvements of 600XL over the Atari 800 include an expanded BASIC which occupies 10K of RAM as opposed to 8K of RAM in the 800, and an increased operating system which occupies 14K instead of 10K. The BASIC language is built in.

The 600XL has an expansion bus for additional peripherals such as a CP/M operating system or an 80-column card. Eleven graphics modes and five text modes are available on the 600XL, compared to nine graphic modes and three text modes on the 800. The 600XL uses a 6502C microprocessor and three custom interface chips, the GTIA graphics television interface, the Pokey, and the Antic. This means that the full graphic and sound capabilities, for which the Atari 400 and 800 computers are famous, are available. You can expect some good software now that the Atari computer capability is available in a machine with a full travel keyboard, at less than $200.00. Atari, Inc.

Atari 800XL* A 64K RAM version of the 600XL, with a monitor port for a high-resolution color or monochrome monitor. With the 64K RAM, the 800XL has nearly 40K of user memory available. This means that approximately 2000 Atari-compatible programs will be available for use on the 800XL. The 800XL is positioned to compete against the Commodore 64 and the Radio Shack Color Computer. Atari, Inc.

Atari 825 Printer This is a fifty characters/second, eighty column printer which uses pin-feed and friction feed to advance the paper. The print type is dot matrix, and the print line can be up to eight inches long. It supports ninety-six characters and offers three print sizes: 10 characters/inch (monospaced), 16.7 cpi (condensed), and 14 cpi (proportionally spaced). Atari, Inc.

Atari 825 Printer Control Codes The Atari 825 uses the following control codes:

DECIMAL CODE	CONTROL FUNCTION
10	Line feed
27 & 10	Reverse line feed
27 & 28	Half-line feed
27 & 30	Reverse half-line feed
13	Carriage return
14	End underline
15	Begin underline
27 & 01	1 dot space
27 & 02	2 dot spaces
27 & 03	3 dot spaces
27 & 04	4 dot spaces

Decimal Code	Control Function
27 & 05	5 dot spaces
27 & 06	6 dot spaces
08	Backspace. Code must be followed with a character
27 & 14	Begin extended character printing
27 & 15	End extended character printing
27 & 19	Standard character spacing. 10 characters/square inch.
27 & 20	Condensed character spacing. 16.7 characters/square inch.
27 & 17	Proportionally spaced character set.

Suppose you want to print condensed characters. The control codes used are 27 and 20. Use an LPRINT with CHR$ to send these to the printer:

  100 LPRINT CHR$(27);CHR$(20)

To turn off condensed print and return to standard (10 characters per inch) spacing, use 27 and 19:

  100 LPRINT CHR$(27);CHR$($9)

Atari 1010 Program Recorder* This cassette tape player and recorder transfers data at a rate of 600 bits per second on two channels (digital and audio). It is used to store and retrieve programs and other data, and also for playing sound tracks, as in many of P.D.I.'s educational programs, such as Robin's Halloween and Teddy's Balloon. Atari, Inc.

Atari 1020 Color Printer* This color printer/plotter prints ten-characters-per-second at ten-characters-per-inch, and includes sixty-four standard character sizes. It uses standard 40-column roll paper and its four-color print head prints and plots vertically and horizontally. The package includes software that allows the user to plot directly onto the printer using a joystick, plus six sample graphic programs. Atari, Inc.

Atari 1025 80 Column Printer* This 40-character-per-second printer can use computer fanfold, roll, or single-sheet paper. It uses a 5 by 7 dot matrix and prints 5, 10, or 16.7 characters per inch for 40, 80, or 132 column lines. Atari, Inc.

Atari 1027 Letter Quality Printer* This 20-character-per-second printer prints fully formed characters at 12 per inch (80 columns). It uses single-sheet or roll paper, and features bi-directional printing and underlining capability. Atari, Inc.

Atari 1030 Direct Connect Modem* This device is used to connect an Atari computer to other com-puters. It plugs directly into a standard modular telephone jack and is fully compatible with Bell 103/113 series modems. It features full and half duplex operation at 300 bits per second. Built-in MODEMLINK telecommunications software allows direct dialing from your keyboard. Atari, Inc.

Atari 1050 Disk Drive* This 5¼" floppy disk drive is used for storage and retrieval of programs and other data. It was designed for use with Atari DOS 3.0, and stores up to 127K bytes on a diskette using a built-in 6507 microprocessor. Atari, Inc.

Atari 1400XL* The Atari 1400XL includes all of the features of the Atari 800XL, and is designed to compete with the Apple IIe and IBM PC. Additional features include a built-in modem (direct connect 300 baud) and a built-in speech synthesizer. The BASIC language and the operating system are contained in 24K of ROM, which leaves approximately 40K of user memory available. Improvements in the architecture of the 1400XL result in improved disk access speed, which makes this computer suitable for small business and personal financial use. The differences result from directly accessing the processor bus as opposed to using the serial input/output bus as in the 400 and 800 Atari computers. This was a primary cause of slow disk input/output, which made the 400 and 800 awkward for serious business use. Atari, Inc.

Atari 1450XLD* Includes all the features of the 1400XL with the addition of a built-in, double-density disk drive. This computer does not offer the disk storage capabilities of the IBM PC or a CP/M system in extended density. However, the new double-sided disk drive allows an additional storage capacity of up to 127K bytes over the 88K on the single-sided, single-density disk of the 810 disk drive. The 1450XLD is priced at less than $1000.00 and is software compatible with the 600XL, 800XL, and 1400XL as well as the 400 and 800 machines. Atari, Inc.

Atari's Hardware Manual* This book includes a detailed description of Atari hardware and discusses its capabilities. Includes sections on missile graphics with BASIC and mixing graphics modes. Atari, Inc.

Atari's Operating System User's Manual* The subject covered in this book include: operating system functional organization, program environments, system memory utilization, the I/O subsystem, interrupt processing, system initialization, floating point-arithmetic package, adding new device handlers peripherals, program environment

and initialization, and advanced techniques and application. Atari, Inc.

ATASCII Atari Standard Code for Information Exchange. A version of ASCII which has identical codes for alphanumeric characters, but different codes for the first 32 characters (the control characters) and characters 123 through 127. A translation is required when transferring ATASCII code through modems, or the transmission may be stopped by misread characters.

ATE Automatic Test Equipment. These devices and/or programs (usually ROM-resident) automatically perform routine checks on equipment. The tests may occur in response to an event, such as powering on or resetting the system, or may be based on a time schedule.

Atext* This command-driven word processor performs many of the functions you would expect from a word processor including text centering, text block manipulations, right justification, global find and replace, and automatic page numbering. Line length can be as long as 256 characters, with horizontal scrolling. There is a special buffer for material to be inserted more than once. This word processor uses less memory than most, leaving more for file space. The main drawback is poor program support and documentation. 16K; disk or cassette. Elcomp Publishing.

Atlantis* Save the lost city of Atlantis from invaders from the skies. Fire from your three defense posts as they try to descend and destroy. Great graphics and lots of action. Cassette. Joystick required. Imagic.

Atlas of Canada* Learn the geography and topography of Canada. Position cities, rivers, and other features in their correct location. 16K cassette or 32K disk. APX.

ATN Atari BASIC Function. ATN returns the arctangent of an arithmetic expression.
Format:

ATN(<aexp>)

Example:

10 A=ATN(55)

In this example, the variable "A" takes on the value of the angle whose tangent is 55.

ATR8000* A peripheral box which contains a Z-80 processor and connects directly to the computer. Very expandable in both RAM and processor. You can add up to a total of 64K RAM for the print buffer. It is possible to add an 8088 processor and run the 16-bit CP/M-86 or MSDOS and upgrade to 256K of RAM. This makes a very powerful Atari,

equivalent to a loaded IBM PC. Software Publishing.

Attack At EP-CYG-4* Destroy everything in sight on the fourth planet of Epsilon Cygnus, as you fly over cities and country scenes. Flight is allowed only to the left. 16K cassette or 24K disk. Bram, Inc.

Attank! Each of the two players is given two tanks, which need to be moved strategically through an object-filled battleground. Tunnels add more excitement and suprise to the war. 24K cassette or 32K disk. APX.

Attenuation The reduction in strength of an electrical impulse.

Attract Mode A feature of Atari's Operating System which ensures that an image will not be accidentally burn-in to your television screen. If no key has been pressed for about nine minutes, colors of relatively low intensity begin changing on the screen until a key is pressed. You can insure against attract mode from within a program by storing a zero in location seventy-seven on a regular basis. You can also force attract mode by storing a number between 128 and 255 in the same location.

AU Arithmetic Unit. See Arithmetic Logic Unit (ALU).

Austin 80-Column Board* This plug-in circuit adds many features to the display capability of the Atari 800. Features claimed by Austin are DEC VT100 terminal emulation, which comprises most of the following features: a 256-character set, true descenders, smooth scrolling, underlining, and sixteen-color RGB output. Hardware. Austin Franklin Assoc.

Auto Link Files to be printed in Letter Perfect can be loaded, sent to the printer, then followed by more files loaded from the disk drive. The effect is to chain files together when the sum of the two is too much to fit into memory at one time. In order to link a file, the command CNTRL V "NEXTFILE" is placed at the end of the previous file being printed.

Auto-Answer A modem capable of establishing a telephone connection between a computer and a remote device automatically, by receiving communications over a telephone network.

Autodialing Dialing a telephone through *software* control or through the keyboard. Accoustically coupled modems cannot be autodialed. The Hayes SmartModem and Anchor SignalMan Mark 7 can autodial.

AUTORUN.SYS Same as AUTO.SYS, except for DOS 2.0S version disks. See Disk Utilities—Tricky Tutorial #7* for a software package that creates AUTORUN.SYS files.

AUTO.SYS Name reserved for use on DOS 1 disks for files which are automatically loaded immediately after the File Management System is booted. Any binary load file can be named AUTO.SYS, and it will be run without intervention upon starting the computer, provided the run and init addresses are in place.

AV Available.

Avalanche* Requires coordination and quick reflexes. As rocks tumble, you must stop them from reaching the bottom of the screen with your shields. Difficulty levels can be set. 16K; cassette or disk. APX.

AXIOM AT-100 PRINTER* A low-cost, low-performance printer, ranging in price from $300 to $350. This printer includes a built-in parallel interface, which means that an 850 interface is not required. This saves $175 to $200 in extra costs; the AT-100 plugs into the serial port on the side of the 400 or 800 with the provided cable. This saves another $40. At 20 characters per second, it is slow and it makes quite a bit of noise. The print quality is only fair, but it can produce bit-mapped screen dumps of graphics if you get the program from Axiom. This printer is a great value if you use it to print program listings for debugging or general record keeping. It is not suitable for long documents or for important correspondence. Axiom.

Aztec Challenge* A humorous and economical game with good graphics that feature horizontal scrolling. One or two players try to escape being sacrificed by running an obstacle course called the "Aztec Challenge." There are seven skill levels that present ninety-nine obstacles for you to overcome. The real challenge starts on level four where exact timing is required and a miss means falling into a fire. Stick figures and weird collisions make this game appealing. 16K cassette, 32K disk. COSMI.
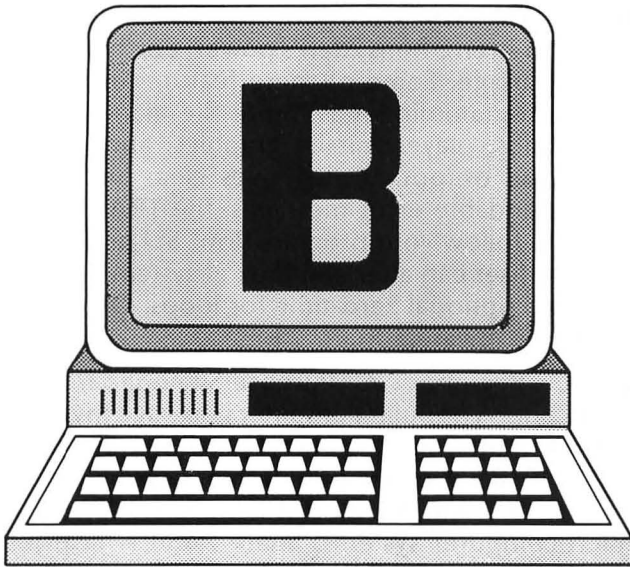
B Codes. ATASCII = 66, HEX = 42. b ATASCII = 98, HEX = 62.

B See DOS Options.

B B is used as an abbreviation for Bytes when referring to memory; or for Baud rate when referring to communications. KB = 1000 bytes or baud (technically 1K = 1024 bytes).

B Bus line. Also the hexadecimal symbol for the decimal number 11.

Baccarat* The famous casino card game for your Atari. The rules of the game are similar to Blackjack. The dealer and players get two cards each. The person whose cards add up closest to nine, without going over, wins. For any cards above ten, only the first digit is added into the points. 24K; disk or cassette. Dynacomp.

Backgammon 2.0* A challenging version for beginners. Keyboard input controls your moves. You have the choice of rolling the dice yourself or having the computer do it. You must be sure of your moves, since they cannot be changed. 24K; cassette or disk. Dynacomp.

Background Can refer to the area of your television screen on which characters or graphics are displayed. The background color is programmable using the BASIC SETCOLOR or POKE commands. You may experiment with various background colors in GRAPHICS mode 0 by POKEing any integer from 0 to 255 into location 710.

Backplane Also called a motherboard. The physical area in a system where the boards are plugged in. It usually contains the buses of the system in either printed circuit or wire-wrap form.

Backspace The cursor square appears on the screen to let you know where an action (such as typing in a character, deleting, inserting, etc.) takes place. The cursor moves to the right as you type, and backs up to the left when you press DELETE BACK S or cursor left (←). DELETE BACK S erases the characters from the screen as the cursor moves left, while cursor left (←) usually does not. See Control Keys for related information.

Backup Copy A duplicate copy of a program or data, stored on a seperate diskette or cassette, in case of loss or damage to the original.

Backup Diskettes Because diskettes can be rendered unreadable by physical damage, magnetic contamination, or dirt, it is wise to keep at least two copies of any important information.

Bad Sector A sector on the diskette which will not read/write data correctly. Usually due to a minor physical flaw in the diskette. One or two bad sectors will not seriously effect the diskette's use—DOS will mark them as bad and avoid using them. More than a few bad sectors, however, indicates the diskette should be used as a frisbee rather than to hold your valuable data.

Baja Buggies* You've drawn eighteenth place in a buggy race across the desert. It won't be easy to catch up and pass the pack. If you crash or run off the road too often, your buggy will break down. Good graphics and fast action make this two-level game an interesting challenge. 16K; disk or cassette. Gamestar.

Bandits* Shoot the Phalanxes as they try to steal your equipment and supplies. You must avoid their heat-seeking missiles, the deadly missile of the Menaces, and the multiplying capablilities of the Carries. Twenty-eight levels of difficulty. 48K; disk. Sirius Software.

Bank Usually 64K of memory, however, there are also 4K and 16K banks.

Bank Select Or bank switching. A method of extending a computer's RAM memory. Each bank responds to the same addresses, but only one is active at a time. Used in the language ACTION! (q.v.) from Optimized Systems Software (O.S.S.).

Bank Street Writer* An easy-to-learn, but somewhat limited word processing program. Two basic modes of operation are featured: WRITE mode which allows normal data input; and CORRECT mode, which allows the user to erase text by using the cursor movement keys. A third mode of operation contains most of the true word processing

functions, such as block erase and block move, as well as insert text at the current cursor position. The forth operational mode is for input and ouput of files, to and from disk and to the printer. Printed material can be formatted to a predefined line width, page break, and spacing, but neither right justification, or indented paragraphs are supported. 48K; disk. Broderbund.

Bank Switching   Bank switching describes the process by which a computer utilizes additional blocks or "banks" of RAM. Bank switching is used to bypass a certain segment of the computer's memory and to substitute an amount of memory external to the system to store and retrieve data or programs.

Banner Generator*   With this utility, you can reproduce anything you can type on the keyboard as a banner. Character size can be varied from six to ten inches when printed. Despite some limitations, which are noted in the documentation, it does its job with minimal fuss. 16K; cassette or disk. Atari Program Exchange.

Bar Code   The consumer product information code (bars of various thicknesses) which is read by an optical wand or bar-code reader.

BAS—File Extension   The extension (1 to 3 letters after a period) of a file name usually tells you what kind of file it is. BAS (.BAS) is the file extension for a BASIC source program. Keep in mind that BASIC programs (.BAS extension) are not executed as programs by DOS. They are interpreted as source code data by the BASIC interpreter, which is itself a program. See Extensions.

BASE   Alternate business name of Bay Area Systems Engineering—originators of the *Atari User's Encyclopedia* and other information resources for the personal computer user.

Base Register   The register which contains the longer part of a two-part Assembly language address. The smaller part, called the displacement or offset, is contained in the Assembly language instruction. The data that the instruction is to operate on is located at the "effective address"—the byte of memory whose address is the sum of the number in the specified base register and the offset number given in the instruction. This method of specifying addresses allows data to be located with fewer bits than with a full, explicit address.

BASF   Badische Anillin und Soda Fabrik, a manufacturer of magnetic storage media including diskettes.

BASIC A+*   An extension of Atari BASIC*, this program strengthens Atari's power, flexibility, and ease of usage. Some of these features are structured programming aids, more file manipulation commands, player/missile graphics, and greater input and output. It also gives clear and easily understandable error messages, the TRACE command to follow your program flow, SET and SYS so that the user can alter and look at system parameters, and optional zero-time for loops. Optimized Systems Software.

BASIC   Beginner's All Purpose Symbolic Instruction Code. A popular computer language invented at Dartmouth for educational purposes. Similar to the FORTRAN programming language, BASIC is easy to use and learn, and is now on almost all microcomputer systems. Some BASICs have just the bare essentials of regular BASIC, which is a form of Dartmouth original BASIC. Super BASICs may have features from other languages. Compatibility problems between various BASICs do exist. Some of the BASIC available for the Atari are Atari BASIC 8 Revs A and B*, Atari Microsoft BASIC I and II*, BASIC A+*, and BASIC XL*.

BASIC—Deleting Program Lines   To delete a program line, type the line number and press RETURN. Each line must be deleted separately.

BASIC Commander*   Atari BASIC was designed to fit into a single 8K cartridge, which forced the omission of a number of useful features. BASIC Commander adds 17 functions to Atari BASIC, including Autonumber, Block Delete, Renumber, DOS functions, and even three programmable keys. Speeds program entry twenty-five to seventy-five percent, and can renumber a 500-line BASIC program, including all line numbers and references, in three seconds. This is the most powerful utility programs available for Atari computers. 16K; disk. MMG Micro Software.

BASIC Compiler   All programs that run directly on the Atari are Machine language programs written in the numeric instruction code of the 6502 microcomputer chip. Most are orginally written by a programmer as text files, known as source programs. The source program contains readable statements in a language such as FORTRAN, COBOL, or BASIC. These are then translated by a compiler program, producing an object program.

The object program contains the Machine language instructions for the Atari 6502, which correspond to the instructions of the original source program. BASIC programs work in this way with a BASIC compiler.

Regular BASIC works in a slightly different way. Regular BASIC is a program (in Machine language) which uses your BASIC program as a guide to what it should do. It is therefore an interpreter, processing each line of your source program and interpreting what should be done. Since it must reinterpret your source program each time you run it, interpreted BASIC can be as much as 100 times slower than compiled BASIC.

When you write a BASIC program, you have produced a source program in text form. The BASIC interpreter, itself a Machine language program, uses your source program as data—a source of instructions or commands to control its execution.

To speed up a BASIC source program by compiling it into a faster Machine language program, you need a BASIC compiler. Various software houses offer compilers for the Atari. Give your BASIC compiler your source program (.BAS) as input. The BASIC compiler will translate your .BAS source program into an .OBJ executable Machine language program. The resulting .EXE program is no longer a BASIC program—it is a Machine language program which is based on (or is a translation of) your BASIC source program. See ABC.

BASIC Compiler* An Atari BASIC compiler that will increase the run-time of your BASIC programs. It will convert the statements into Machine language, then execute them. This is helpful for programs with many statements, variables, and logical branches. For game programs, the increased speed will improve the action. 40K; disk. Datasoft.

BASIC Crossreference Utility* Very useful for debugging, speeding up, and condensing programs. 40K; disk. Printer useful. Atari Program Exchange.

BASIC Exercises for the Atari This book teaches BASIC through a series of exercises and programs. The areas covered include flowcharting, number systems, financial computations, games, and statistics. Sybex.

BASIC From or To DOS To get to BASIC from DOS, use the Option B selection on the DOS menu. In DOS 3.0, use Option T to get to the cartridge. See DOS Options.

BASIC Interpreter All programs that run directly on the Atari are Machine language programs, in the numeric instruction code of the Atari's 6502 micro computer chip. Most were originally written by a programmer as text files, known as source programs, containing relatively readable statements in a language such as FORTRAN, COBOL, or BASIC. They were translated by a compiler program to produce the Machine language or object program.

The object program contains the Machine language instructions for the 6502 which correspond to the instructions of the original source program. BASIC programs work in this way with a BASIC compiler.

The Atari BASIC interpreter is a program in Machine language which uses your BASIC program as a guide to what it should do. It processes each line of your source program and interprets what should be done. Since it must reinterpret your source program each time you run it, interpreted BASIC can be as much as 100 times slower than compiled BASIC. See BASIC Compiler.

BASIC Program Compressor* Helps make your programs use less memory and run faster. It merges short statements, removes REM statements, and substitutes variables for frequently used constants. Can be effectively used in conjunction with BASIC Crossreference Utility* and/or Variable Changer*. 24K; disk. Atari Program Exchange.

BASIC Programming Tools* Tricky Tutorial 13. For those just starting out writing their own programs, this aid can help solve some of the early problems that may arise. Some of the programs included are Trace, a debugger; Expand, reduces wordiness; Quick Reference, identifies variables; Lister, prints listings including special characters. Documentation is included. 16K tape or 32K disk. Educational Software, Inc.

BASIC Prompts A question mark (?) indicates that a BASIC program is running and needs you to enter data in answer to a question. This is a prompt. When you use this prompt, it is a good idea to include a description such as "Enter check amount 9999.99" in the program, so you will know exactly what should be entered in response to the ? prompt. An example of how to do this:

```
100 PRINT "ENTER CHECK AMOUNT 9999.99";
          :INPUT CHECKAMOUNT
```

This will give the operator using the program this prompt upon the screen:

```
      ENTER CHECK AMOUNT 9999.99 ?
```

BASIC Renumber Utility* Helps you renumber your BASIC programs, giving them a neater appearance and opening up space for inserting additional lines. 24K; disk. Printer useful. Atari Program Exchange.

BASIC Reserved Words Reserved words have particular meanings in BASIC and are used for

commands, statements, functions, and operator names.

The reserved words, when used, are to be delimited (separated with space or spaces around them) so that they are easily recognized by BASIC. If you accidentally use one of the reserved words, you may see an error message or have strange results when you execute the program.

Following are the reserved words in BASIC:

ABS	ADR	AND
ASC	ATN	BYE
CHR$	CLOAD	CLOG
CLR	CLOSE	COLOR
COM	CONT	COS
CSAVE	DATA	DEG
DIM	DOS	DRAWTO
END	ENTER	EXP
FRE	FOR	GOTO
GET	GOSUB	GRAPHICS
IF	INPUT	
INT	LET	
LEN	LIST	LOCATE
LOAD	LOG	LPRINT
NEXT	NEW	NOT
NOTE	ON	OPEN
OR	PADDLE	PEEK
PLOT	POSITION	POINT
POKE	POP	PRINT
PTRIG	PUT	
RAD	READ	REM
RESTORE	RETURN	RND
RUN	SAVE	SETCOLOR
SGN	SIN	SOUND
SQR	STATUS	STEP
STICK	STOP	STR$
STRIG	THEN	TO
TRAP	USR	VAL
XIO		

BASIC Special Characters

The following characters have special meanings in Atari BASIC. These characters can not be used to have meanings other than what is stated below:

	blank space
+	plus sign
/	slash or division symbol
^	caret or exponential symbol
$	dollar sign or string
!	abbreviation for REM
,	apostrophe
;	semicolon, print the following
)	right parenthesis
(	left parenthesis
=	equal sign or assignment symbol
-	minus sign
*	asterisk or multiplication
#	device IOCB device number to follow
''	double quotation mark or literal delimiter
,	TAB 10 spaces or the value of PEEK (201) spaces
.	period or decimal point
:	statement separator or drive name delimiter
>	greater than
<	less than
?	question-mark or PRINT abbreviation

BASIC Statements

The following is a table of BASIC statements and their uses.

Statement	Type	Description
ABS(<x>)	F	Returns absolute value of <x>
ADR(X$)	F	Returns memory address of X$
AND	O	Binary comparison of expressions before and after AND
ASC(X$)	F	Gives ATASCII code of first character of X$
ATN(<x>)	F	Returns the arctangent of <x>
BYE	C	Leave BASIC and go into memo pad mode
CLOAD	C-I	Load a program from cassette to memory
CHR$(<n>)	F	Returns a character with ATASCII code <n>
CLOG(<n>)	F	Returns the logarithm (base 10) of <n>
CLOSE #(<n>)	C-I/O	Closes an I/O control block <n>
CLR	C	Clears memory of all previously defined strings, arrays, and matrices

Statement	Type	Description
COLOR<expression>	C	Defines data to be used by following commands such as PLOT, DRAWTO, etc.
COM	C	The same as DIM
CONT	C	Continues program execution after BREAK, STOP, or END
COS(<x>)	F	Computes cosine of angle <x> (<x> is in degrees or radians)
CSAVE	C-O	Save programs from memory to cassette
DATA <list of expressions>	C-I	Data table is created to be read by READ statement
DEG	S	Specifies trigonometric calculations argument and/or results expressed in degrees
DIM <name> (<list of subscript variables>)	S	Sets up maximum subscript values for arrays and makes space available for them
DOS	C	Accesses disk operating system menu
DRAWTO <x>,<y>	C	Draws a line from last plotted point to point <x>,<y>
END	C	Terminates the program, closes all files, and returns you to the command level
ENTERDEV: "<filespec>"	C-I	Loads files from cassette or diskette into memory
EXP(<x>)	F	Returns the number e raised to <x> power
FOR <variable> <x> TO <y> [STEP <z>]	S	Used with NEXT statement to repeat program lines a specified number of times
FRE(<x>)	F	Gives the number of unused bytes in memory
GET # <expresn>, <variable>	C-I	Reads the byte at the cursor position
GOSUB<line>	C	Used with the RETURN statement to execute and return from a subroutine
GOTO<line>	S	Delivers control to a specified line
GRAPHICS <n>	C	Selects one of the 9 graphics modes
IF <expression> THEN <clause>	S	If <expression> is true, the statements in <clause> are performed
INPUT <variable>	C-I	Reads data input from the keyboard
INT(<x>)	F	Gives greatest integer that is less than or equal to <x>
LEN(X$)	F	Returns the number of characters in X$
[LET] <variable> <expression>	S	Assigns the value in <expression> to <variable>
LIST["<dev>: [<filespec>"] [<line1>] [-<line2>]]	C	List specified program lines to the screen or specified device
LOAD"<dev>: <filespec>	C	Loads a program from a disk drive into memory
LOCATE <row>, <col>,<variable>	C	Positions an invisible cursor at a location and places the data in <variable> at that location
LOG(<x>)	F	Returns the logarithm to the base of <x> (natural log)
LPRINT <list of expressions>	C-O	Prints data on the printer
NEW	C	Clears memory of a program and all variables
NEXT <variable>	S	Ends a FOR...NEXT loop
NOT	F	Reverses the true/false flag for an expression

BASIC Statements

Statement	Type	Description
NOTE #<n>, <sector #>, <variable>	C-I/O	Locates a byte in a file on disk and stores it for future use
ON <n> GOSUB <line>[,<line>]	S	Exits to subroutine <line> specified by <n>—Used with RETURN statement
ON <n> GOTO <line>	S	Exits to <line> specified by <n>
OPEN #<n>,<x> ,<y>,DEV: <filespec>	C-I/O	Opens file or other device before it can be used for I/O
OR	O	Between two expressions, OR checks the truth of each expression
PADDLE (<n>)	F	Gives the status of the game paddle (<n> ranges from 0 to 7)
PEEK(<n>)	F	Reads the byte from the memory position <n>
PLOT <x>,<y>	C	Displays a specified point on the screen
POINT #<n>, <variable>, <byte #>	F	Reads a specific byte from a file into memory
POKE <n>,<m>	S-I/O	Places a byte <m> in a memory location <n>
POP	S	Clears data from the top of the stack
POSITION <x>,<y>	C	Locates the cursor at a specific position on the screen
PRINT [#<file>] <variables>	C-O	Prints data to a file or the screen
PTRIG (<n>)	F	Returns the status of the paddle trigger (<n> is the paddle port #)
PUT #<n>, <variables>	C-O	Outputs a single byte from the file specified by <n> to the screen
RAD	S	Specifies trigonometric calculations have arguments and/or results expressed in radians
READ <variable> [,<variable>]	C-I	Reads data from a DATA statement and assigns the data to variables
REM <remark>	C	Inserts remarks into a program
RESTORE <line>	S	Allows DATA statements to be reread from a specified <line>
RETURN	S	Returns from a subroutine
RND(<x>)	F	Returns a random number between 0 and 1
RUN "<dev>: <filespec>"	C	Executes a program
SAVE "<dev>: <filespec>"	C	Saves a BASIC program file on diskette
SETCOLOR <reg>, <hue>,<lum>	S	Chooses particular hue and luminance
SGN(<x>)	F	Returns the sign (-1, 0, +1) of <x>
SIN(<x>)	F	Returns the trigonometric sine function of <x>
SOUND <voice>, <freq>,<distor>, <volume>	C	Produces sound through the speaker
SQR(<x>)	F	Gives the square root of <x>
STATUS #<dev>, <variable>	C	Calls the STATUS routine for <dev> and stores the status in <variable>
STEP <z>	S	Specifies the increment for a FOR...NEXT loop

Statement	Type	Description
STICK (<n>)	F	Gives the code for the position of the joystick in port <n>
STOP	S	Stops program execution and returns to command level
STR$(<x>)	F	Converts the value of <x> to a string value
STRIG (<n>)	F	Gives the condition of the trigger of the joystick in port <n>
THEN	S	Closing portion of an IF/THEN statement
TRAP (<n>)	C	Branches the program execution to line <n> when an error occurs
USR (<addr>)	F	Calls a Machine language routine at the specified <addr>
VAL(X$)	F	Returns the numerical value of the string X$
XIO 18,#<color>, <dummy1>, <dummy2>,<flspec>	S	Fills an area with color

Abbreviations used: <x>= a numeric variable X$= a string variable

Type: C= Command S= Statement F= Function I/O= Input or Output

BASIC Statements—Multiple On One Line

You can put a colon (:) at the end of one statement and continue entering another statement on the same line, without giving a new line number. The line number at the left refers to all statements on the line. Examples:

```
40 LET X=1:REM Comment
50 LET X=1:LET Y=2
```

BASIC Statements Cross-Referenced by Function

The following is a list of BASIC statements and their functions:

Arctangent—ATN (<x>)
Arrays—DIM <variable>(<subscripts>)
ATASCII codes for characters—ASC(X$)
ATASCII code to characters—CHR$(<n>)
Branch—GOTO <line>
Call BASIC subroutine—GOSUB and RETURN
Clear the screen—CTRL/CLEAR or PRINT"(ESC)(CTRL/CLEAR)"
Change memory byte with BASIC—POKE <n>,<m>
Convert number to a string—STR$(<n>)
e, powers of—EXP(<x>)
Erase current BASIC program and variables—NEW
Erase current BASIC variables (not program)—CLR
Execute BASIC program—RUN
Exponential—EXP(<x>)
Fill and area with color—XIO 18,#<color>,<dummy1>, <dummy2>,<filespec>
Graphics—GRAPHICS <n>
Integer—INT (<x>)
Joystick—STICK/(<n>) and STRIG (<n>)
Keyboard, read data from—INPUT <variable>
Length of string—LEN(X$)
Load BASIC programs—CLOAD"<filespec>" and LOAD"<filespec>"
Loop—FOR and NEXT statements
Machine language program (subroutine)—USR (<x>)
Memory, amount of free—FRE (<x>)
Memory, change—POKE <x>,<y>
Memory, read byte from—PEEK (<n>)
Music—SOUND <voice>,<freq>,<distortion>, <volume>
Natural logarithms—LOG (<x>)
Numeric value of string—VAL(X$)
Print BASIC program listing to screen—LIST [<line1> [-<line2>]]
Print on printer—LPRINT <list of expressions>
Program, BASIC (run or execute)—RUN or LOAD/- CLOAD and then RUN
Random number—RND (<x>)
Read data from keyboard—INPUT <variable>
Repeat program lines—FOR <variable> = <x> TO <y> [STEP <z>]...NEXT
Save programs—SAVE "<filespec>"
Screen graphics—GRAPHICS (<n>)
Sign—SGN (<x>)
Square root—SQR (<x>)
Stop BASIC program—END
String, length of—LEN(X$)
String, numeric value of—VAL(x$)
Subroutine—GOSUB <line>

BASIC Utility Disk*

A combination of four utilities: Ultimate Renumber Utility*, Variable Changer*, BASIC Crossreference Utility*, and BASIC Program Compressor*. This disk is great if you program a lot. 40K; disk. Atari Program Exchange.

BASIC Variable Names

Variables in BASIC:

a) must start with a letter
b) can have up to 120 characters

c) cannot be a reserved word such as IF, ON, THEN, GOTO, etc. See BASIC Reserved Words for a complete list.

d) can contain only capital letters and numbers.

BASIC X/A (Extended BASIC)* A versatile utility package that helps you program in BASIC. The key features are variable name listing, cross-referencing, manipulation, error checking, line renumbering, and block line deleting. Well-documented. 16K cassette or 24K disk. Atari Program Exchange.

BASIC XL* An improved, 16K Bank Select Super cartridge version of BASIC A+*. It occupies only 8K of RAM, is fully compatible with Atari BASIC, provides all the commands of BASIC A+, and is two to three times faster than Atari BASIC. In addition, the new FAST command resolves line numbers to their absolute addresses to provide even faster execution. Additional features include AUTO (automatic line numbering), automatic DIMensioning of short strings, and string arrays like those found in Microsoft BASIC. Serious BASIC programmers should not be without this cartridge. See BASIC A+* and INTEGER BASIC XL. Optimized System Software.

Basics of Animation* If you have a working knowledge of Atari BASIC, this program can teach you how shapes move on screen and how to program them. Using the BASIC PRINT and PLOT commands, the program demonstrates how images move when animated. The user is encouraged to modify the program to produce his own animations and thereby learn more about the processes. See Tricky Tutorials* for other programs in this series. 16K cassette or 32K disk. Educational Software, Inc.

Basketball* For up to four players. With three players, the computer will act as a teammate to one of them. The graphics are very good and almost three-dimensional. Controlled by a joystick for realistic action on the court. 16K; cartridge. Atari, Inc.

BASM* An Atari BASIC compiler that will speed up the run-time of your BASIC programs. It will convert the statements into Machine language, then execute them. This is helpful for programs with many statements, variables, and logical branches. For game programs, the speed will improve the action. 32K; disk drive. Computer Alliance.

Batch Processing Running a program or series of programs with little or no interaction with the user.

Battery A device which produces electrical energy by chemical means.

Battery Backup Batteries that supply auxiliary power to the processor, so you don't lose information during a power failure.

Baud See Baud Rate.

Baud Rate The rate of data transfer between devices measured in bits per second. The baud rate of the Atari 410 Cassette Program Recorder is 600.

Baud Rate Generator An oscillator, usually adjustable, which provides clock signals for connection of a peripheral. Typical rates are 110, 300, and up to 9600 baud.

Baudot An older communications code, named for the man who invented it, and used for five-level (hole) teletypewriter and telex machines. Other codes used are ASCII and EBCDIC, which are eight-level codes.

Bay Area Systems Engineering BASE. Developers of the Atari User Encyclopedia and other information resources for the personal computer user.

BCD Binary-Coded Decimal. A 4-bit binary representation of the ten decimal digits 0 through 9. Six out of the sixteen possible codes are unused, requiring a "Decimal Adjust" instruction for correct binary addition. 1 is encoded as 0001, 9 as 1001. Two BCD digits are usually packed in a byte. The Atari is capable of processing BCD data.

BCP Byte Control Protocol. A protocol for communications between two computers or devices which use a special character to identify the start of a message. The message includes both a count of the number of data bytes, and the actual data bytes. Also called byte count oriented protocol.

Bean Machine, The* Moving, slanting beams convey beans from the top to the bottom of the screen. An elevator carries them back up, but not always to the top, so you have to keep an eye on how multiple beans will affect the balance of the tilting beams. It's for ages six and up, and is more complicated than it sounds! 24K; disk or cassette. Joystick required. Atari Program Exchange.

Bell Laboratories Research laboratories in New Jersey which have made many prime discoveries in the electronic and computer field.

Benchmark Program A specific program which calibrates the speed of a computer in a well-defined situation, or type of computation, e.g., scientific "number crunching," sorting, or compilation.

Best of ANTIC and More, The* Articles, tutorials, and programs previously published in ANTIC, plus new material. ANTIC.

Beta Fighters* Protect Martians from aliens travelling from left to right across the screen. This dull game only allows one shot on the screen at a time. 16K cassette or 32K disk. Artworx.

Beta Test Site vs. Alpha Test Site See Alpha Test Site vs. Beta Test Site.

Bi-Directional Data may flow in either direction on a wire. At each end of the wire, there are transceivers (units which both receive and transmit). Common bi-directional busses are the tristate bus and the open collector transistor-transistor logic bus.

Bi-Directional Printing Alternately printing in either direction. A line printed left to right is followed by a line printed right to left, avoiding a carriage return delay and greatly increasing output.

Binary Counter An electronic device which outputs a sequence of ascending or descending binary numbers.

Binary File Another term for a Machine language object code file or program.

Binary Number A representation of an integer as a sum of powers of 2, using a sequence of 0s and 1s.

Binary Search An efficient search technique for sorted tables. Works by determining which half of the table an entry is in, then which half of that half, etc.

Biorhythm* Charts your intellectual, physical, and emotional cycles in graphic format. Explains the results based on the theory of biorhythm. 16K; cassette. Atari, Inc.

Bipolar A technology of integrated circuit fabrication using transistor switching elements based on majority carriers for switching and amplification. See MOS.

Bishop's Square/Maxwell's Demon* Bishop's Square is a puzzle game that cuts a high-resolution picture into a user-specified number of pieces, and challenges the player to reassemble it by shifting columns or rows. In Maxwell's Demon, you control the gate between two rooms. Your task is to selectively admit fast moving "molecules" and not admit the slower ones. 48K; disk. Datasoft.

Bistable A device that is always in one of two possible stable states.

Bistable Multivibrator Active elements able to assume either one or another stable state characterize a flip-flop circuit.

BISYNC Pronounced "by-sink." BInary SYNchronous Communications protocol.

Bit A contraction of BInary digiT. A bit is a 0 or a 1. Bits are used in computer systems to code information, instructions, and data. Larger units of bits are nibbles (4 bits), bytes (8 bits), or words (16, 24, 32, 96, or more bits).

Bit-Parallel Data transmission method where each digit of a binary number is sent over a separate wire simultaneously.

Bit-Slice A vertical slice of a computer. This component constitutes an n-bit slice of a traditional CPU, minus control. Usually n = 4. A bit-slice implements a complete data path across the CPU, including multiplexers, ALU, shifters, registers, and accumulators. A typical case is two 4-bit, bit-slice processors, linked together to make one eight-bit processor.

BJ DOSPatch* Allows you to create a custom DOS for your system. Also includes a program that configures your double-density disk drive properly, and a copy program that allows you to copy from single- to double-density drives, and vice versa. Disk. Double-density drive required. BJ Smartware.

Black Forest, The* Destroy the monsters as you wend your way through the Black Forest in search of the magical waters of Amrita. This game is joystick-controlled, and the graphics are less than sophisticated. Suitable for children. 48K; disk. Sublogic Communications Corp.

Blackjack* A somewhat limited version of the card game in which play is between one person and the computer. The betting limit is 4,000, and only one deck is played. Splitting or insurance bets are prohibited. 8K; cassette or disk. Atari, Inc.

Blackjack Tutor* Not only plays a fast and exciting game of blackjack, but also teaches the fundamentals of card counting, multiple deck playing, and betting strategy. Allows doubling down and splitting, insurance bets, and a surrender option. 16K; cassette or disk. APX.

Blade of Blackpoole, The* In this imaginative, fun game, you are looking for the Sword of Myraglym to restore it to its proper location. Before you can do that, you must deal with a drunk monster, a lizard, and a couple of riddles that could spell doom. In a second challenge, you must build a

maximum of five hundred points by solving puzzles. It is relatively easy to get four hundred and ninety-nine, but that last point is a doozie. 48K. Sirius Software.

Blank Line on Printer See LPRINT.

Blanking Leaving a blank space on the monitor screen.

Blinking—Video Tutorial The following program will teach you a great deal about Atari Graphics. The REM statements will give you a lot of guidance, but the real learning comes from keying and running the program and seeing what happens.

```
100 REM BLINK BY JERRY WHITE
110 REM A SIMPLE DEMONSTRATION USING
20 REM VERTICAL BLANK INTERRUPTS
130 REM
140 REM STORE ROUTINE ON PAGE 6 (1536)
150 REM 160 GRAPHICS 0:FOR JW=1536 TO
    1568:READ IT:POKE JW,IT:NEXT JW
170 REM
180 REM JUMP TO ASM SUBROUTINE
190 REM
200 JW=USR(1536)
210 REM
220 REM INVERSE VIDEO WILL NOW BLINK
230 REM UNTIL SYSTEM RESET IS PRESSED.
240 REM
250 LIST 220,230:? :? "BASIC":? "IS";:END
260 REM
270 REM DATA FOR VBLANK ASM SUB-
    ROUTINE
280 REM
290 DATA 104,169,17,141,40,2,169,6,141,41,2,
    169,30,141,26,2,96
300 DATA 173,243,2,41,2,73,2,141,243,2,169,12,
    141,26,2,96
310 REM
320 REM POKE 1564 WITH THE NUMBER OF
330 REM JIFFIES (1/60 OF A SECOND)
340 REM YOU WANT BETWEEN EACH BLINK.
350 REM EXAMPLE POKE 1564,60 FOR A
360 REM FULL SECOND BETWEEN BLINKS.
```

Blis* Gives you a listing of your BASIC programs. This utility will print out the listing in a structured format (indenting some statements). Each statement of a multiple-statement is on a separate line, and boldface remarks are standard. A couple of drawbacks are that the program must be in LIST format prior to loading, and the process is a little time-consuming. 16K; disk. Printer required. Atari Program Exchange.

Block Within a logical record, information is stored in units, or blocks. Block is also used to mean a collection of logical records, as in blocked records or blocking factor. Block size is usually expressed in bytes. In DOS 3 format, a block is 1024 bytes of disk data.

Block Buster* A program designed to work in conjunction with or replace your Rubik's Cube (tm). It displays all sides of the cube, using a mirrored reflection of the far side. The computer can solve a cube you have scrambled. The computer checks for the legality of the configuration and proceeds to solve the puzzle, while generating documentation that can be printed out as a permanent record. 32K; cassette or disk. Quality Software.

Block 'Em* Two players try to build a wall around their opponent, either boxing him in or making him crash into his own wall. You move constantly and gain points by making your opponent crash. Two brick sizes, six speeds, and the competitive nature of the game make it interesting. 16K cassette or 24K disk. Atari Program Exchange.

Block of Memory A series of consecutively numbered bytes in a memory device. Usually refers to internal memory.

BNPF Representation An older data encoding format for PROM programmers using the characters B = beginning, F = finish, N = negative(1), P = positive(0). For example: the byte 10010110 is represented as BNPPNPNNPF.

Board, Breadboard The fiberglass or pressed paper sheet on which integrated circuits are mounted. Interconnections may be wire-wrapped, soldered, or printed on the board. The term breadboard refers to a prototype circuit, and dates from the time when radios were made on mother's breadboard. Also called a card, when referring to smaller boards that plug into the motherboard (q.v.).

Board-Tester A computer controlled device that performs electronic tests on printed circuit boards.

Boing* You are a bubble with five lives, bouncing around a playfield of thirty-six cubes. You must jump on each cube to turn it on. You must also avoid landing on the same cube with the pin or the bubble eater, otherwise it's pop. Boing is a one-player game by Alex Leavens and Shirley A. Russell. First Star Software.

Boldface Type See Double-Strike Type Format.

Bond Analysis* A two-section financial investment tool. It includes a bond-yield section that will calculate the total yield of a bond at maturity, as well as give you the current yield. The second section calculates the price and interest the bond accrued, based on the time to maturity, coupon payment, mature redemption price, and rate of return expected, which you provide. Easy to use, with good documentation. 24K; disk. Atari, Inc.

Book of Atari Software, The* Edited by Jeffrey Stanton, Robert P. Wells, Sandra Rochowansky, and Michael Mellin. This resource manual has reviews of ATARI software presently on the market. Areas covered are business, education, communications, database management, and entertainment. The Book Company.

Bookkeeper, The* An accounting and bookkeeping aid that is mainly a general ledger package, but includes functions to handle accounts receivable and accounts payable. Allows 350 accounts, for which you designate names and numbers. The program will generate profit and loss statements and a consolidated report for the profit centers. Special reports that can be generated include a summary of checks written, monies received, and invoices written. 32K; disk. Atari, Inc.

Books, General* *Analog Compendium, The; Atari: A Beginners Guide; Atari Games and Recreations; Atari Hardware Manual; Atari Operating System User's Manual; Atari PILOT Activities and Games; Atari User's Guide: Basic and Graphics for the Atari; Atari 400/800 Diskguide; Best of ANTIC and More; Book of Atari Software, The; COMPUTE'S First Book of Atari; COMPUTE'S First Book of Atari Graphics; COMPUTE'S Second Book of Atari Graphics; Creative Atari, The; De Re Atari; Designs from Your Mind. Atari Graphics; Games for the Atari; Genesis II; Kids and the Atari; Mapping the Atari; Master Memory Map; PLAN POWER for Visicalc or Supercalc; Rainy Day Book of Activities for the Atari; Secrets of Atari I/O; Some Common BASIC Programs: Atari Edition; Understanding Atari Graphics; Your Atari Computer; ZAtari.*

Books, Programming Languages *A+ Programming: Learning BASIC on your Atari; Advanced Programming Techniques for Your Atari; Atari Assem-bler, The; Atari BASIC; Atari BASIC Faster and Better; Atari BASIC: Learning by Using; Atari BASIC, Quick Reference Guide; Atari Pilot for Beginners; Atari Programming with 55 Programs; BASIC Exercises for the Atari; COM-PUTE'S Machine Language for Beginners; COMPUTE'S The Atari BASIC Source Book; FORTH on the Atari; How To Program Your Atari in 6502 Machine Language; I Speak BASIC to My Atari; Inside Atari BASIC: A Fast, Fun, Friendly Approach; Inside Atari DOS; Picture This—Programming Your Atari Computer; Stimulating Simulations.*

Boolean Logic Named after George Boole, who defined an algebra of logical operations such as And, Or, and Not, on the two values true and false. See AND entries, OR.

Boot To use a bootstrap. Generally used to describe starting up a computer. To boot the Atari Computer, turn the main power switch on the right side of the computer to the ON position.

Bootleg* Watch out for Prohibition agents, while you deliver your contraband to the anxious speakeasies all over town. Don't get lost or run out of gas in this multi-maze game. And, of course, if you crash, the game's over. 16K cassette or 24K disk. Joysticks required. Atari Program Exchange.

Bootstrap A program used for starting the computer, which usually clears memory, sets up I/O devices, and loads the operating system from ROM, diskette, or cassette.

BOP Bit-Oriented Protocol. A protocal for communication between two computers or devices which causes a special bit pattern to separate groups of data bits. See also Byte Control Protocol.

Border Refers to the area of your televison screen that surrounds the background. The border color is programmable using the BASIC SETCOLOR or POKE commands. You may experiment with various border colors in GRAPHICS mode 0 by POKEing any integer from 0 to 255 into location 712.

Botticelli* A game system that offers a choice of subject areas including geography, history, sports, theatre, and the movies. The computer indirectly teaches effective methods of questioning, so that you can get at the facts. Krell Software Corp.

Bouncing Short intermittent conduction from vibration of switch contacts after closure. Usually present in keyboard input and eliminated by special hardware or software (debouncing).

Bound Processor-bound or I/O-bound indicate which component of a system is the bottleneck preventing faster performance.

BPI Bits Per Inch. Specifies the density of data recorded on tape or disk.

Branch A programming instruction which causes transfer of control to another program sequence. In BASIC, for example, the GOTO statement.

Branch BASIC. See GOTO.

Break To end or break the current function in any program at any time, press the BREAK Key. See Control Keys.

Breakpoint A point at which the processor will stop a program sequence and display the current machine status. It is implemented through hardware, software, or a combination of both. See Debugger.

Bridge 2.0* Allows bidding, using a limited version of Goren's point counting system. One of the first games to have the computer's opponent team play offensively. Don't expect fair play from the computer, as it tends to peek at your hand. 24K; disk or cassette. Artworx.

Bridgemaster* Pits you and your computer partner against a pair of computer opponents. Hands are displayed in text format and there are 1,000 possible opening hands. Each of the computer's players tends to play in a different way, sometimes forgoing their best options to do so. 32K; disk. Dynacomp, Inc.

Bristles* In this innovative four player game, players choose to be one of eight available characters (four boys and four girls). A painter has been commissioned by a finicky landlord to paint eight dwellings. As he runs around, frantically riding elevators and painting rooms in the most outrageous colors, he encounters a lot of obstacles such as Smart Buckets, Dumb Buckets, and Flying Half-Pints. He must duck or jump them, as he paints and rides the elevators. To make matters even more hectic, our hero must contend with the building superintendant's daughter, who occasionally puts her hand print on the wet paint. There are seventy-two levels of play. Each character in Bristles has his or her own theme from Tchaikovsky's Nutcracker Suite. Disk, cassette, or cartridge. By Fernando Herrera. First Star Software.

Bruce Lee* Join this legendary hero in his battle against evil, using martial arts. Fight street gangs, wicked masterminds, and other hooligans. Disk or cassette. Datasoft.

BTAM Basic Telecommunications Access Method (IBM term used on mainframes).

Bubble Memory Memory using microscopic magnetic domains in an aluminum garnet substrate.

Present memories have 92K bits per device. Future devices should boast better than one million bit storage density per chip.

Buffer In software, any memory structure used for temporary data storage. In hardware, a device which restores logic drive signal levels to drive a bus or a large number of inputs.

Buffering The delaying, and temporary storage, of data in a data communications path.

Bug—Error in a Program A programmer must ensure that a program will correctly process all of the types of data for which it is intended. Samples of the data are prepared (test data), and the program is executed using it (a test run). The program's outputs (reports, screen displays, files, etc.) are then verified to be as specified. An error in the processing logic of a program is called a "bug," hence the term "debug" and "bug-free."

Bug Attack* Destructive insects will invade your garden if they're not stopped. More dangerous bugs creep in as the level of difficulty increases. 16K; disk or cassette. Cavalier.

Bug Off* A shoot-'em-up game that is reflex- rather than strategy-oriented. You must control bugs that swarm from a Florida sinkhole by maneuvering around the sides to shoot the bugs, until they are all dead. Your opponent controls spiders and wasps. If they manage to eat all of your DDT supplies, the game ends. Sound and graphics are average. 32K. Adventure International.

Bug/65* A strong debugger that offers regular debugging techniques such as display memory, change memory, disassembly, instant assembly, and so forth. Features include breakpoint capacity that permits "conditional breakpoints," and a single step and trace mode that displays the status register. Can be loaded anywhere in memory so that your program will not be disturbed. Atari, Inc.

Bulk Storage Large capacity data storage, generally long term and external.

Bulldog Pinball* A bulldog's face is the playing area of this unexceptional pinball-simulation game. 16K; cassette. Hayden Software.

Bumper Pool* A two-player game that demands a lot of strategy and offers a high level of competition. You control your shots with a joystick, and shoot with the fire button. Both offensive and defensive moves make the game realistic. 16K cassette or 24K disk. Atari Program Exchange.

Buried Bucks* An arcade-style treasure hunt game where you are racing against your nemesis, Dr. Muta, to retrieve buried treasure. The area is remote, so you get to use a helicopter to search for the site, and use explosives to dig for the treasure. Although the sound and graphics are average, the game is enjoyable and holds your attention. 16K. Analog Software.

Burn-In A phase of component testing where basic flaws or early failures are screened out by running the circuit for a specified length of time at high temperatures in an oven. Also, when referring to PROMs, Burn-in means to load with data.

Bus Path for signals having a common function. Every standard MPU creates three busses: the data bus, the address bus, and the control bus.

Bus Controller The unit in charge of generating bus commands and control signals.

Bus Extender A device which allows additional cards to be plugged into a computer's bus. Also known as an expansion chassis.

Bus Termination An electrical means of preventing reflections at the end of a bus. It is only necessary in high-speed systems and some specially designed low-speed systems.

Business Applications Software See Accounts Receivable; Bond Analysis, The; Bookkeeper; Car Costs; CCA Data Management System; Data Management System; Data Perfect; DataBase/Report System; Decision Maker; Disk Manager; Diskette Inventory System; Diskette Librarian; Enhancements to Graph It; File Manager 800+; File-it 2+; Fill-N-Bill; Financial Asset Management System; Graph It; Graph Master; Home Accountant, The; Loan Analyzer; Mail List; Mail List Version 3.0; Mailing List; Miles Payroll System; Mini Database/Dialer; MMG Accounts Payable; MMG Accounts Receivable; MMG Data Manager; MMG Form Letter Writer; MMG General Ledger; MMG Inventory; MMG Payroll; Money Manager; Mortgage & Loan Analysis; Multiplan; Newspaper Route Management; Property Management Program 2000; Stock Analysis; Stock Charting; Stock Management; Strategic Financial Ratio Analysis; VisiCalc; VisiDex; VisiFile; VisiTrend/Plot; and Weekly Planner.

BYE Atari BASIC Command. Entering BYE will cause the computer to leave BASIC and go into memo pad mode. The screen can then be used for experimentation, messages, etc., without disturbing the BASIC program in memory. Pressing SYSTEM RESET will return the control to BASIC.

Byte A group of eight bits. A byte is universally used to represent a character. Microcomputer instructions generally require one, two, or three bytes. One byte has two nibbles.

Byte Count Oriented Protocol See BCP.

BYTE Magazine A popular magazine for microcomputer users. See Magazines.
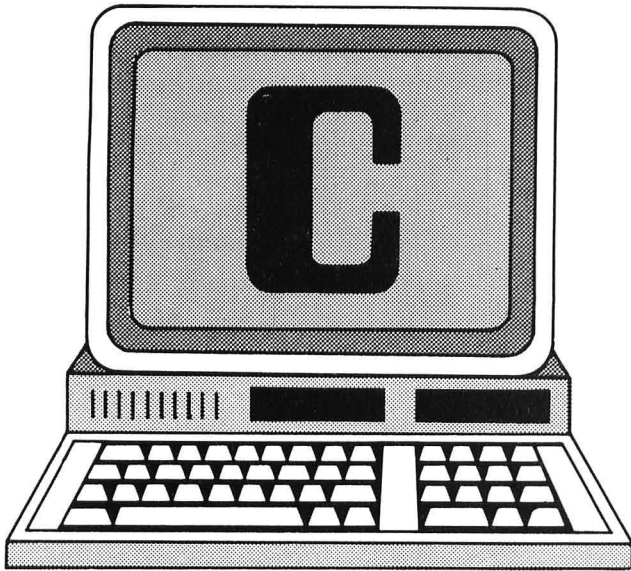
C Codes. ATASCII = 67, HEX = 43. c—ATASCII = 99, HEX = 63.

C See DOS Options.

C DOS 3.0 command to Copy/Append.

C Symbol for the Carry bit, the Clock, and the hexadecimal notation for the decimal number 12.

C—Programming Language C is a high-level programming language developed at Bell Laboratories, associated with the UNIX operating system.

C/65* A C language compiler for the Atari. It is one of the first compilers to offer Assembly language output. Gives code that is easier for the computer to understand than the usual p-Code. Optimized Systems Software, Inc.

Cache Used between the central processor and main memory, a cache is a high speed buffer. Filled at medium speed from main memory, instructions and programs can operate at high speed if found in the cache. A new instruction sequence is loaded from main memory if not found in the cache.

CAD Computer-Aided Design.

CAI Computer-Assisted Instruction.

Calculator* Your computer becomes a programmable calculator with 145 functions. You can save and load data from disk or cassette, and obtain hard copy of all operations. This program is rather complex for the average user. 24K; disk. APX.

Cancel the Current Operation Pressing BREAK, cancels the current operation.

Can't Quit* You gotta know when to hold 'em, know when to fold 'em—are you reckless, do you play by hunches, or is strategy your style? You definitely should bet on the odds in this game of dice and chance. Requires joystick. 16K cassette or 32K disk. Atari Program Exchange.

Canyon Climber* Use exact timing and skill to reach the peak of this three level game. You want to escape from the danger-filled bottom of the Grand Canyon. On the first level, you must leap over horned mountain goats while attempting to lay dynamite charges under support pillars of towering bridges. On the second level, you scale a ramp that is guarded by Indians wielding bows and arrows. On level three, you leap from one mesa to another across open gorges, amidst bricks falling from the sky. 16K; disk or cassette. Datasoft.

Captain Cosmo* Young children help Captain Cosmo capture the deadly Munchies and put them safely away in the zoo. Devious Dan and Spacey Stacey join the Munchies side, though, and free them whenever possible. Visual graphics are well done. 32K; disk. Nexa Corporation.

Car Costs* Keeps track of your car expenses with five expense categories, an expense history, fuel consumption calculations, and trip expenses. 32K; cassette or disk. Creative Software.

Card Cage A rack to support the printed circuit boards in a computer.

Career Counselor* Explore career possibilities in an interesting and fun way. This unique career search system leads you through a database with over 300 potential occupations, and selects a small number consistent with your likes, dislikes, and goals. 32K; Disk. MMG Micro Software.

Carnival* Earn points by hitting the moving targets at the shooting gallery. But watch out for the ducks or they'll eat your bullets! 16K; disk or cassette. Analog Software.

Carriage Return A standard typewriter key which, when pressed, causes the printing element to move back to the beginning of the line. To move the paper up, a separate line feed must be added. Frequently the microprocessor interprets a carriage return to mean end of line or end of command.

Carriage Return (CHR$(155)) Press RETURN to end the current line, give the line to the requesting program, and put the cursor at the start of the next line. This is valid under DOS and BASIC. See also Control Keys.

Carrier A frequency used to "carry" information. Modulated to denote 0 or 1.

Carry In the status register of the central processor, a carry is a flag bit which indicates an operation overflow by the arithmetic logic unit. The carry is also used during shifts.

CAS Column Address Strobe. Used for addressing in dynamic memory control.

CASDIS* This is a utility system that lets you transfer cassette programs to disk. Programs copied with CASDIS do not require software modification to make them run. IJG, Inc.

CASDUP* CASDUP will copy both programs and data from cassette. Can handle nine files at a time. IJG, Inc.

Cassette A small plastic cartridge containing two spools of ⅛" magnetic tape. Frequently used in audio recorders. Applied to the mass storage requirements of microcomputers and minicomputers, a "digital" cassette meets standards for digital recording.

Cassette—CLOAD Instructions for a BASIC program. See CLOAD.

Cassette—SAVE Instructions BASIC. See CSAVE.

Castle* You've been kidnapped by the evil wizard and must find the dungeon's exit. A good beginning game for the novice adventurer. 24K; disk. Atari Program Exchange.

Castle Wolfenstein* A translation of one of the most popular Apple adventure games. You are being held prisoner by the Germans in the castle of Wolfenstein. Armed with a gun and ten bullets, you must find the war plans for Operation Rhinegold, and escape with them from the castle. In your wanderings, you will run into guards, SS storm troopers, bulletproof vests, schnapps, ammunition, and treasure chests. You control the prisoner by joystick or keyboard. This game is enjoyable but can become tedious after awhile. 32K. Muse.

CATV CAble TeleVision.

Caverns of Mars* Guide your spaceship through a long, narrow cave to find the Martian base. After you destroy it, race the timer back to safety. Five levels of difficulty. 16K; disk. Atari, Inc.

CCA Data Mangement System* This versatile package is useful in a variety of applications, including home inventories, small business and payroll record-keeping, and stock portfolio management. It serves as a database, record keeper, and a highly selective report generator. The menu-driven file manipulation functions include file definition, merging, searching, sorting, and updating. Each file consists

of twenty-four user-defined fields of 110 characters each. The maximum length for records within a field is 249 characters. New fields can be defined as mathematical derivations of existing fields and will be automatically generated as specified. Report formats can be generated and saved for later use. Report and mailing label formats are available. All records are indexed by record number rather than by field, which can make for very slow searches in a large file. 40K; disk. CE Software.

CCD Charge-Coupled Device. A storage technology using Metal Oxide Semiconductor (MOS) capacitors. It transfers charge from one cell to another in a recirculating pattern.

CDC Control Data Corporation. A manufacturer of large computer systems and peripherals, as well as diskettes.

CDILP Ceramic Dual In-Line Package. See DIP.

Cell A repeated unit in a RAM chip which stores one unit of information and returns it in response to a particular address signal.

Centipede* There's never a dull moment as you blast spiders, scorpions, fleas, and centipedes. Each proves difficult to kill as it slithers in to destroy your bug blaster. 16K; cartridge. Atari, Inc.

Central Processing Unit The device in charge of fetching, decoding and executing instructions, containing a control unit, an ALU, and other related facilities with registers, clocks, or drivers. The Atari uses the 6502 CPU chip.

Chameleon CRT Emulator* Allows you to use your Atari to emulate Lear Siegler ADM-3A, DEC VT-52, or "Glass TTY" terminals for communication with other computers. All the usual features of the emulated terminals are supported, plus selection of baud rates, duplex settings, and parity setting. The program works with any modem connected to the 850 interface. A comprehensive manual is included. 16K cassette or 24K disk. Atari Program Exchange.

Change Memory Byte BASIC. See POKE.

Change Name or Extension of a File Using Option E. See DOS Options.

Character Codes and Their Significance

Decimal Code	ATASCII Character	Keystrokes Character
28	↑	ESC/CTRL—
29	↓	ESC/CTRL-=
30	←	ESC/CTRL-+

Decimal Code	ATASCII Character	Keystrokes Character		Decimal Code	ATASCII Character	Keystrokes Character
31	→	ESC/CTRL-*		84	T	T
32		SPACE BAR		85	U	U
33	!	SHIFT-1		86	V	V
34	''	SHIFT-2		87	W	W
35	#	SHIFT-3		88	X	X
36	$	SHIFT-4		89	Y	Y
37	%	SHIFT-5		90	Z	Z
38	&	SHIFT-6		91	[	SHIFT-;
39	:	SHIFT-7		92	□	SHIFT-,
40	(	SHIFT-9		93	]	SHIFT-+
41	)	SHIFT-0		94	—	SHIFT-*
42	*	*		95	-	SHIFT—
43	+	+		96	**	CTRL-.
44	,	,		97	a	(LOWR) A
45	-	-		98	b	(LOWR) B
46	.	.		99	c	(LOWR) C
47	/	/		100	d	(LOWR) D
48	0	0		101	e	(LOWR) E
49	1	1		102	f	(LOWR) F
50	22			103	g	(LOWR) G
51	3	3		104	h	(LOWR) H
52	4	4		105	i	(LOWR) I
53	5	5		106	j	(LOWR) J
54	6	6		107	k	(LOWR) K
55	7	7		108	l	(LOWR) L
56	8	8		109	m	(LOWR) M
58	:	SHIFT-;		110	n	(LOWR) N
59	;	;		111	o	(LOWR) O
60	<	<		112	p	(LOWR) P
61	=	=		113	q	(LOWR) Q
62	>	>		114	r	(LOWR) R
63	?	SHIFT-/		115	s	(LOWR) S
64	@	SHIFT-8		116	t	(LOWR) T
65	A	A		117	u	(LOWR) U
66	B	B		118	v	(LOWR) V
67	C	C		119	w	(LOWR) W
68	D	D		120	x	(LOWR) X
69	E	E		121	y	(LOWR) Y
70	F	F		122	z	(LOWR) Z
71	G	G				
72	H	H				
73	I	I				
74	J	J				
75	K	K				
76	L	L				
77	M	M				
78	N	N				
79	O	O				
80	P	P				
81	Q	Q				
82	R	R				
83	S	S				

** denotes special graphics character.

Character File   Same as text files. A file containing character data, letters, numbers, or special characters. These files may have any file extension. By contrast, an object file, such as the .OBJ files, may contain data which is not displayable as characters. Most data and programs that you *write will be in* character files.

Character Generator   A circuit which forms the letters or numbers on a screen or printer.

Character Graphics A term that describes the use of control characters and/or redefined characters to create a graphics display. Many of the high-resolution graphics displays in game programs employ character graphics. Using character graphics instead of mapped graphics mode saves a lot of memory.

Character Graphics Tutorial* Demonstrates the versatility and power of character graphics for illustration or animation. Demonstration is the major feature, but with concentrated study you may learn some programming. A good character editor is included, which allows you to test animation before using it in a program. See Tricky Tutorials for other programs in this series. 16K cassette or 32K disk. Educational Software.

Character Insert BASIC. Pressing CTRL/INSERT will insert the next character in the line at the current cursor position. See also Control Keys.

Character Mode The term given to the six Antic character display modes (2-7). Mode 2 (GRAPHICS 0) is the standard 40 by 24 character mode. Mode 4 is often used to create colorful high-resolution character mode graphics displays. This mode was used in the popular arcade-style game Astro Chase* from First Star Software, and for the colorful playing cards seen in Poker Tourney* from Artworx.

Character Set The collection of characters available for display or processing on a particular computer or peripheral.

Character String A one-dimensional array or sequence of characters, encoded as bytes. Character strings have a length field or are terminated by the zero byte.

Characters Per Inch To return to normal, 10 character-per-inch print size, you must turn off all non-standard print options. See Type Formats and Atari 825 Printer.

Chatterbee* Teaches correct spelling using color graphics, music, and voice simulation. Review 2500 words on 25 levels of difficulty. 40K RAM. Don't Ask Computer Software.

Checker King* A one- or two-player game with six levels of difficulty. You move using joystick and buttons. Illegal moves or jumps are not permitted. On the higher levels, the computer's "move time" can be frustrating—sometimes more than five min-*utes.* 16K; disk or cassette. Joystick required. Atari Program Exchange.

Checkers* A sixteen-level game with good graphics. Play is controlled from the keyboard, with joystick, or paddles. An excellent game. 48K; disk. Odesta.

Checksum A program which adds up bytes in memory and prints out the "checksum." The checksum is used to verify the success or failure of a program or data read into memory or saved to tape or disk. If the checksum is not what it should be, you'll know you have an error in the loaded or saved copy, before you erase the original or try to run the bad copy.

Chess 7.0* A fast-responding game with levels from beginner to advanced—one of the best games for the Atari. The computer can play demonstration games, acting as both players, or forty famous chess games by the masters. You can save your games on disk. 48K; disk. Odesta.

Chicken* You must catch falling eggs in your cart at the bottom of the screen. A fox at the top of the screen is stealing the eggs and dropping them. If you miss an egg, it hatches into a chick which you must avoid. Good graphics; an exciting challenge for children. 16K; disk or cassette. Synapse.

Chinese Puzzle* A short, all-text adventure. Acquire three objects as you make your way through ten mappable locations. A good beginner's game, but not to be played repeatedly. 24K; disk. Atari Program Exchange.

Chip A rectangular silicon die, cut from a wafer. See entries by number for each commonly used chips.

Chip Select Most large scale integration chips normally have one (or more) chip selects. Those activate the chip to examine the rest of its pins, for example, the address bus. This information will in turn specify a location/register within the chip. Multiple chip selects can replace decoders external to the chip, but do require extra pins.

Choplifter* Your job is to fly into a desert and rescue sixty-four hostages. Your helicopter responds to the up, down and sideways movement of the joystick. You must land as close to the prisoners as possible and get away quickly, but watch out for the tanks! The graphics are fascinating: prisoners run toward your chopper, and wave goodbye to you as you leave. The blades on the chopper rotate. When you have rescued sixteen hostages, the second part of the game begins, which involves dodging enemy aircraft. On the third level, you must avoid enemy air mines. 48K; disk. Broderbund.

Chopper Rescue* Rescue your captured comrades. The tricky part is flying the helicopter through labyrinthine tunnels guarded by missile launchers. 32K; disk or tape. Microprose Software.

CHR$ Atari BASIC Function. This function returns the character represented by an arithmetic expression (0-255) in the ATASCII code.

Format:

CHR$(<aexp>)

Example:

PRINT CHR$(69)

In this example, the letter E will be printed on the screen. E is the character that is represented by 69 in the ATASCII code.

CIO The acronym given to Atari's Central Input Output system routine, which is the common entry for many I/O functions. The vector to CIO is labeled CIOV and is located at the hex address $E456. For additional information, see De Re Atari*, Atari's Operating System User's Manual*, Atari's Hardware Manual*.

CIOV Central Input Output Vector. CIOV is the label for Atari's standard Central Input Output routines. This vector is located at the hex address $E456. See Memory Map.

Circuit Lab* Use your TV screen to create and test direct current electrical circuits. Good for use in electronics or physics classrooms, this program can also be used at home to learn to draw, modify, and test electrical circuits. 32K; disk. Atari BASIC cartridge, joystick required. Atari Program Exchange.

Claim Jumper* A two-person competitive action game where the objective is to collect gold nuggets and run as quickly as you can to deposit them in the bank. Your opponent, who is armed with a pistol, tries to steal your loot. You are chased by tumbleweeds and snakes, whose touch paralyzes long enough for the other guy to steal the loot. But you have a pistol, too. This game features more rules than most games of this sort, making it more fun to play. The graphics are basic, but pleasant. 16K; disk or cassette. Synapse.

Claim to Fame & Sports Derby* A fun-filled package of trivia questions about celebrities and athletes. Includes a module for youngsters with a word/definition matching game. This is an expansion module to Word Race*. 32K; disk. Don't Ask Software.

Clear Signal to place a device or a circuit in an initial, usually zero, state.

Clear the Screen BASIC. PRINT CHR$(125) or SHIFT/CLEAR will clear the screen and put the cursor in the home position. This function is common in entering text and commands. See also Control Keys.

Clipper* You are the captain of the ship Flying Cloud, sailing the challenging seas from New York to San Francisco. Choose your course and crew carefully, or you may get lost or face mutineers. 32K disk or 24K cassette. Joystick required. Program Design, Inc.

CLK CLocK. The reference timing source in a system, which provides regular pulses that trigger or synchronize functions. Most micro-processor clocks operate in the range of 1 to 8 MHz, whereas real-time clocks usually operate at 1, 10, or 100KHz. A system usually requires a CPU clock, a timer clock, and other clocks for specific I/O devices.

On Atari computers, the clock frequency is 1.79 MHz. The real-time clock is located at decimal RAM locations 18, 19, and 20, and countdown system timers begin at decimal RAM location 536. See Memory Map.

CLOAD Atari BASIC Command. This command, in either direct or deferred mode, will load a program from cassette tape into the computer's memory. When CLOAD is entered, one bell rings as a reminder to press the PLAY button on the program recorder (Atari 410) and then RETURN.

Clock Frequency The oscillation rate of a clock, usually expressed in megahertz. Also known as Clock Rate. See CLK.

CLOG Atari BASIC Arithmetic Function. This function returns the logarithm to the base 10 of an arithmetic expression.

Format:

CLOG(<aexp>)

Example:

PRINT CLOG(1000)

This example will print "3" on the screen. 3 is the power to which 10 must be raised in order to get 1000.

CLOSE Atari BASIC Command. This command closes an input/output control block (arithmetic expression # 1-7) that was previously opened with an OPEN (q.v.) command.

Format:

CLOSE #(<aexp>)

Example:

CLOSE #7

The arithmetic expression must be the same number (1-7) that was used in the OPEN command. CLOSE can be used in direct or deferred mode.

Close Disassociation of a file from a particular program, including flushing unwritten buffers and updating the directory and Bit Map if required.

Clowns and Balloons* Three rows of balloons must be popped by a clown who is bouncing on a joystick-controlled trampoline. 16K; cassette. Datasoft.

CLR Atari BASIC Command. Typing CLR, followed by RETURN, will clear the computer's memory of all previously dimensioned strings, arrays, and matrices. The values stored in undimensioned numeric variables are also cleared. Any dimensioned variable that will be needed again after a CLR command *will* have to be redimensioned.

Coarse Scrolling Vertical or horizontal scrolling by one full byte. This causes a quick but somewhat jerky movement compared to fine scrolling. De Re Atari* is recommended for additional information.

Coax See Coaxial Cable.

Coaxial Cable Transmission line with an inner conductor and an outer shield conductor.

COBOL COmmon Business Oriented Language. A high level programming language developed for business applications. COBOL has many statements based on English. Popular on mainframes.

Code Synonym for Program Instructions Code, which includes language statements or a symbolic representation for data, in any language, including BASIC and Machine language. See Program.

Codec COder-DECoder. A chip which makes the analog-to-digital conversion.

Codecracker* You try to guess the hidden number code in the smallest number of tries, or before time runs out. For one or two players. 8K; disk or cassette. Atari Program Exchange.

Codename: Cobalt* You must locate and neutralize a spaceship that is heading for Earth with a cargo of deadly cobalt bombs. It may sound easy, but the ship is guarded by armed robots. Features a sound scenario and good graphics with a three-dimensional effect. 24K; disk. Merlin Enterprises.

Coldstart A coldstart occurs when you turn on your computer. It is an initialization sequence of events that can also be performed through software. A coldstart will occur if location 580 contains a non-zero when SYSTEM RESET is pressed.

Collision A collision occurs when a player or missile contacts another image on the screen. Collisions may be detected by checking Operating System Collision Registers beginning at hex address $D000. See Memory Map.

Colon (:) Drive Name Delimiter. In a file name, the : and . are specified to delimit drive name and extension respectively.

Colon (:) Multiple Statements on One Line. You can put a colon (:) at the end of a statement and continue entering another statement on the same line, without giving a new line number. The line number at left refers to all statements on the line.

COLOR Atari BASIC Command. The COLOR command does not change any of the color registers, but is used to define the data to be used by commands such as PLOT and DRAWTO that follow. When used in a graphics window of a screen, COLOR defines the color data that will appear on the screen. When used in a text display mode, COLOR defines the character that can be plotted or drawn on the screen.

Format:

$$COLOR <aexp>$$

The following program will teach you a lot about Atari COLOR. The REM statements will give you guidance, but learning comes from keying in and running the programs and seeing what happens.

```
0 REM COLORDEM BY JERRY WHITE
10 FOR MODE=0 TO 3 STEP 3
20 GRAPHICS MODE
30 POKE 752,1:REM TURN CURSOR OFF
40 FOR C=0 TO 4:REM C=COLOR DATA
50 COLOR C:REM COLOR DATA
60 ? CHR$(125):? "NOW USING COLOR";C;"
IN GRAPHICS MODE ";MODE
70 PLOT 15,5:REM DRAW
80 DRAWTO 25,15:REM A
90 PLOT 15,15:REM LARGE
100 DRAWTO 25,5:REM X
110 FOR TIME=1 TO 1000
120 NEXT TIME:REM TIME DELAY
130 NEXT C:REM DO IT 5 TIMES
140 NEXT MODE
150 GRAPHICS 0:LIST :END100 GRAPHICS
1:DIM C$(1),CC$(1)
110 SETCOLOR 0,7,13
120 SETCOLOR 1,0,15
130 SETCOLOR 2,0,8
140 POKE 82,7:?
150 ? #6;"TEXT WINDOW"
160 ? #6;"COLOR TEST BY"
170 ? #6;"JERRY WHITE"
180 ? #6
200 ? #6;"(A) GREY"
210 ? #6;"(B) GOLD"
220 ? #6;"(C) ORANGE"
```

```
230 ? #6;"(D) RED/ORANGE"
240 ? #6;"(E) PINK"
250 ? #6;"(F) PURPLE"
260 ? #6;"(G) PURPLE/BLUE"
270 ? #6;"(H) BLUE"
280 ? #6;"(I) LIGHT BLUE"
290 ? #6;"(J) TURQUOISE"
300 ? #6;"(K) GREEN/BLUE"
310 ? #6;"(L) GREEN"
320 ? #6;"(M) ORANGE/GREEN"
330 ? #6;"(N) LIGHT ORANGE"
340 CC$ ="A"
400 ? CHR$(125);"CURRENT WINDOW
COLOR=";CC$
410 ? "ENTER COLOR BY LETTER";:INPUT C$
420 C=ASC(C$):IF C<65 OR C>78 THEN 40=
430 CC$ =C$:C=C-65:IF C>7 THEN C=C+1
440 SETCOLOR 2,C,8:GOTO 400
```

Color Clock   The color clock is a measure or unit of horizontal distance. There are 160 color clocks displayed on each scan line of your television screen in a normal width playfield. A wide playfield contains 228 color clocks.

Color Register   There are nine color registers within Atari's operating system, and each has its own shadow register. The value stored in each register provides the color and luminance used in playfield and player missile graphics.

Colortrack and Soundtrack*   Two utilities that will help you understand Atari's sound and color capabilities. They are easy to use and are joystick-controlled. 16K; disk or cassette. Advanced Computing Enterprises.

COM   Atari BASIC command. COM is the same as DIM (q.v.).

Combinational Logic   A circuit with Boolean logic functions and no memory.

Combined BASIC Commander and MMG BASIC Debugger*   The two most powerful Atari utilities combined into a single program co-resident with your BASIC program. 24K; disk. MMB Micro Software.

Comma   (,) When used with the Atari BASIC PRINT command, a comma will cause several spaces to be inserted before the following data is printed. The default value for the number of spaces is 10. To change this value, POKE the desired number into decimal RAM location 201. This space padding also applies when PRINTing to devices such as a disk, as well as the screen editor.

Command   A statement which causes a computer to carry out a specific action. Commands differ from instructions in several ways. A command is usually a complete specification of an action, while instructions must usually be combined in dozens or hundreds to make a useful program. Commands are usually acted upon immediately by the computer, while instructions are saved for later execution in a program. Commands are acted on by the operating system of the computer, while instructions must be processed by a particular program such as the BASIC interpreter or a Pascal compiler. See Command Processor and Disk Operating System.

Command Control Joystick*   The main feature of this joystick is its large size and solid construction. Another nice feature is the choice of fire buttons, either on the top of the stick or at the base. Wico.

Command Control Trackball*   Similar to arcade trackballs, this unit can sit on a table or your knee. The direction control is fast and accurate; the fire button has rapid fire action. Solidly built, it'll last through hard use. Wico.

Command Processor   A program which accepts a command (usually from a keyboard) and causes it to be carried out. Some command processors contain the programming required for all commands they process. Others do not carry out any commands directly. Instead, they examine the command, determine what other program (if any) can carry it out, locate the required program, and start it running. Still another type of command processor carries out some commands directly (internal commands), but locates and runs other programs for some commands (external commands).

Commands, DOS   DOS, the Disk Operating System, is the collection of programs that helps you manage files containing data and programs on diskettes, while it runs the other devices such as keyboard and monitor. See Disk Operating System.

Commbat*   This is a realistic computer war game for two computers. It can run on the Atari and the TRS-80, with full duplex modems. Each computer controls eight remote-control tanks, with a full arsenal of awesome weaponry to destroy the enemy. There are also reconnaissance planes and even an ICBM, in case things really get out of hand. Adventure International.

Comment Field   A field within an instruction containing explanations or remarks that are ignored by the interpreter, the compiler, or the Assembler.

Comments in BASIC Programs   See REM.

Communications Software See Chameleon CRT Emulator, Compuserve, Crosstalk, Datalink, Fantasy Plaza, Source, Swifty Datalink, TeleTari, Telelink I, Tele-Talk I, and 3270 Personality.

Compatible, Upward (Versions of Programs) The term upward compatible indicates that programs developed for one version of a programming language, operating system, application software package, or computer will work without alterations on an expanded, more powerful version of the same language, system, or package. For example the versions of BASIC for Atari are upward compatible, from Cassette to Disk to Advanced. See Program, Version, or Release.

In hardware, upward compatibility refers to the possibility of building-up to more powerful models without reprogramming. The Atari fits this definition to a large extent, because of its capacity to handle large amounts of additional memory, disk drives, and other peripherals.

Compile Time The point in the processing of a program when it is being translated from source code to object code by a translator (compiler or Assembler).

Compiler A translation program which converts high-level instructions into binary instructions for direct processor execution. Any high-level language, such as BASIC or COBOL, requires a compiler or an interpreter.

An interpreter translates each statement of the program each time the statement is executed, whereas a compiler translates the complete program once, producing object code that can be executed repeatedly. Any change in the program requires recompilation. The code produced by compilers may be longer and/or slower than the code generated from Assembly language source code.

Compiler BASIC. See BASIC Compiler.

Compiler Programs All programs that run directly on the Atari are Machine language programs, in the actual numeric instruction code of the Atari 6502 micro-computer chip. Most are originally written by a programmer as text files known as source programs. Source programs contain relatively readable statements in a language such as COBOL or BASIC. These are then translated by a compiler program, producing an object program. The object program contains the Machine language instructions for the 6502 which correspond to the instructions of the original source program. BASIC programs work in this way with a BASIC compiler.

When you write a BASIC program, you have produced a source program in text form. The BASIC interpreter, itself a Machine language program, uses your source program as data—a source of instructions or commands to control its execution. Suppose you decide to speed up a BASIC source program by compiling it into a faster Machine language program. You will need a BASIC compiler, a program not supplied with the Atari, but available from various other software houses. You will run your BASIC compiler, giving it the source program (.BAS) that you wrote as input. The BASIC compiler will translate your .BAS source program into an .OBJ executable Machine language program.

Complementing The action of changing each 1 to a 0, and each 0 to a 1.

Compressed Print For this small type size on an Epson-compatible printer, enter BASIC statement:

LPRINT CHR$(143)

either in a program with a line number at the point you want to start printing in the small type, or in direct mode without a line number. This gives 132 characters on the 8-inch line, or about 16 characters per inch. To return to normal-size print, enter:

LPRINT CHR$(146).

For the Atari 825 printer, use:

LPRINT CHR$(27);CHR$(20)

and to terminate condensed print:

LPRINT CHR$(27);CHR$(19)

See Type Formats, Atari 825 Printer.

Compressed Print 72/7 Lines Per Inch. This is a good setting for spacing with compressed print. Use the BASIC statement:

LPRINT CHR$(155);"1"

or

LPRINT CHR$(155);CHR$(49)

See Type Formats, Atari 825 Printer.

Compu-Math* Elementary children can increase their mathematical skills with help from this program. Features decimal conversion, fraction arithmetic, and percentages. 48K; disk or cassette. Edu-Ware.

Compu-Math Decimals* Master the mathematical function of decimal computations. Examples and tests are given throughout. 32K cassette or 48K disk. Edu-Ware.

Compuserve* A subscription service that gives you access to a wide range of information and communication services with your microcompu-

ter. Services available include electronic mail, catalog shopping, games, entertainment, various databases, and more. 32K, 300-baud. Compuserve Communication.

Compu-World* A four-program package designed to improve reading speed and concentration skills. The student is asked to recall letters or answer questions on sentences which flash on the screen. Documentation is virtually non-existent. 48K; Edu-Ware.

COMPUTE Books Publishers of a number of computer books. (A Division of Small System Services, Inc.) These are their books related to the Atari computer:

COMPUTE'S First Book of Atari includes introduction to BASIC and graphics, programming hints, and peripherals.

COMPUTE'S Second Book of Atari discusses utilities, programming techniques, and applications.

COMPUTE'S Third Book of Atari includes many practical and game programs.

COMPUTE'S First Book of Atari Graphics includes fundamentals of graphics and redefining character sets.

COMPUTE'S Machine Language For Beginners includes introduction, addressing, and borrowing from BASIC.

COMPUTE'S Second Book of Atari Graphics includes copying to printer, color, and animation.

COMPUTE'S The Atari BASIC Source Book provides an in-depth look at Atari BASIC.

Computer A general purpose computing system, usually incorporating a central processing unit, memory, I/O facilities, power supply, and cabinet.

Computer Chess* Offers eight levels of play, with moves easily entered by cursor maneuvers. Illegal moves are not allowed. Should you change your mind, a move can be recalled before you have signalled the computer that it is complete. A challenge on the advanced levels, if you aren't an expert. 16K; cassette. Joystick required. Atari, Inc.

Computer Discovery* This computer literacy course provides an introduction to computers, with history and applications, hardware and software concepts, and simple programming. Includes software with accompanying workbook. Science Research Associates, Inc.

Computer Memory Measured in Bytes, which is a label for the storage required to hold one character (letter, digit, etc) in computer memory, internal or diskette. Abbreviated B or in thousands KB, or

simply K. Actually, 1K = 1024 because this is an even power of 2.

Computer System A complete system including the MPU, keyboard, CRT, and other peripherals such as printers, disks, tapes, etc. Often used to include programs.

Computers For Kids: Atari Edition* An easy-to-understand book which teaches children about computers. There is a special section of hints for parents and teachers. Written by Sally Greenwood Larsen. Creative Computing.

Concatenation Adding one item to the end of the others to produce one longer data or program item.

Connections* Offers intellectual challenge and entertainment with a set of databases about geography, mammals, chemistry, and others. You can also build your own databases, and use others in the Connections User Group Exchange Program. 48K. Krell Software Corp.

Console The unit that has the most control in a system. For a microcomputer, the keyboard or the front panel is the console.

Constant An explicit value in a program instruction or statement, rather than a symbolic value. The value is fixed throughout a program.

CONT Atari BASIC Command. Typing CONT and RETURN will resume program execution after it has been stopped by a BREAK, STOP, or END. CONT is only effective in the direct mode. The halted program will restart at the next line after the line containing the statement at which it stopped. This means that any remaining statements in the line where the stop occurred will not be executed. This may cause a loop to execute incorrectly if the remaining statements are part of that loop.

Continue a Program After a Pause Press CTRL and 1 simultaneously on the keyboard to continue a paused program. Press CTRL and 1 together to pause any program at any time. See also Control Keys.

Control Bus The set of control lines in a computer system which carry the necessary synchronization and control information throughout the system. Examples of signals carried on these lines are orders such as Read or Write, and sync signals such as Interrupt, Hold, or Acknowledge.

Control Characters Characters with specific system-dependent meanings.

Control Characters—Printer BASIC. To set the Epson MX-80 compatible printer's print size, strike method, or number of lines per inch, the desired non-standard type format must be turned on by sending control codes to the printer.

To do this use the ASCII codes in the following table:

Type Format	Turn On	Turn Off
Compressed Print	143	146
Double Width	142	148
Emphasized	155,197	155,198
Double Strike	155,199	155,200
72/7 Lines/Inch	155,49	155,50
8 Lines/Inch	155,48	155,50
6 Lines/Inch*	155,50	155,50
72/n Lines/Inch#	155,193, n,155,50	155,193,12 155,50

* Standard 12 dots per line (72/12 = 6 Lines/Inch) Set when printer is initialized or powered on. Not effective after use of 155,193,n to redefine result.

This resets the definition of "Standard."

See Type Formats for a full explanation and examples of type formats and line spacings. See also Atari 825 Printer.

Control Keys Most of the control keys are defined by the currently executing program, rather than by the Atari's hardware. The same key may produce one function in DOS, another in BASIC, and still another in an application program, such as a word processor.

In Atari BASIC, the keys are defined as follows:

Keys(s)	Function
BREAK	terminate or end current function
SHIFT/INSERT	insert a line
CTRL/INSERT	insert a character
CTRL/↓	cursor down one line
CTRL/→	cursor right one character
CTRL/←	cursor left one character
CTRL/↑	cursor up one line
Atari Key	inverse
SHIFT/CLEAR	clear screen and home cursor
RETURN	end current line and send line to requesting program; put cursor at start of new line
CTRL 1	pause or freeze screen, continue a pause
CTRL/DELETE BACK S	delete character under cursor
SHIFT/DELETE BACK S	delete current line
DELETE BACK S	back space and delete last character entered

SYSTEM RESET	clear memory and restart system
TAB	tab right
SHIFT/SET	set tab
CTRL/CLR	clear tab

OPTION key—When the OPTION key is pressed, a 3 is stored in decimal RAM location 53279. If this key is held down during power-up on Atari computers that contain built-in versions of Atari BASIC, BASIC will be deselected leaving its 8K of RAM available. The following BASIC routine shows how to sense whether the OPTION key is pressed:

```
10 IF PEEK(53279) ≠3 THEN GOTO 10:REM
Keep Checking
20 PRINT"OPTION KEY PRESSED":GOTO 10
```

SELECT key—When the SELECT key is pressed, a 5 is stored in decimal RAM location 53279. This key has no other function unless the program in control tells the computer to do something when the SELECT key is pressed. The following BASIC routine shows how to sense whether the SELECT key is pressed:

```
10 IF PEEK(53279)≠5 THEN GOTO 10:REM
Keep Checking
20 PRINT"SELECT KEY PRESSED":GOTO 10
```

START key—Stores a 6 in decimal RAM location 53279. If the START key is held down during power-up, the computer will assume that a boot-tape is to be binary loaded. The following BASIC routine shows how to sense whether the START key is pressed:

```
10 IF PEEK(53279)≠5 THEN GOTO 10:REM
Keep Checking
20 PRINT"START KEY PRESSED":GOTO 10
```

HELP key (XL computers only)—May be used to initiate self-testing when the color logo appears on your screen. Other HELP key functions will vary depending on the software in control. The following BASIC program show how to sense whether the HELP key is pressed:

```
10 POKE 732,0:PRINT "HELP FLAG CLEARED"
20 IF PEEK(732)=0 THEN GOTO 20:KEEP CHECKING
30 HELPFLAG=PEEK(732)
40 IF HELPFLAG=17 THEN PRINT "HELP KEY
PRESSED"
50 IF HELPFLAG=81 THEN PRINT "SHIFT/HELP
PRESSED"
60 IF HELPFLAG=145 THEN PRINT "CTRL/HELP
PRESSED"
70 GOTO 10
```

F1 function key (XL computers only)—Causes the cursor to move up one line on the screen. If F1 and SHIFT are pressed, the cursor will go to the HOME

position in the upper-left corner of the screen. If F1 and CTRL are pressed while the keyboard is enabled, then the keyboard will be disabled. If F1 and CTRL are pressed while the keyboard is disabled, then the keyboard will be enabled.

F2 function key (XL computers only)—Causes the cursor to move down one position on the screen. If F2 and SHIFT are pressed, the cursor will move to the lower-left corner of the screen. If F2 and CTRL are pressed while screen DMA is on, then screen DMA will turned off. If F2 and CTRL are pressed while screen DMA is off, then screen DMA will be turned on. When screen DMA is off, the computer will process 10 to 40 percent faster.

F3 function key (XL computers only)—Causes the cursor to move left one position on the screen. If F3 and SHIFT are pressed, the cursor will move to the beginning of the physical line below. If F3 and CTRL are pressed while the key-click is enabled, then the key-click will be disabled. If F3 and CTRL are pressed while the key-click is disabled, then the key-click will be enabled.

F4 function key (XL computers only)—Causes the cursor to move right one position on the screen. If F4 and SHIFT are pressed, the cursor will move to the far right of the physical line below. If F4 and CTRL are pressed and the domestic character set is in use, then the international character set will be displayed. If F4 and CTRL are pressed and the international character set is in use, then the domestic character set will be displayed.

Control Unit The module which fetches and decodes instructions. The CU requires an instruction register and a program counter. It generates control signals and manages the control bus.

Controller A circuit board or boards that interface a peripheral to the computer, having complex circuitry to maintain device control.

Controller* You decide how many aircraft to control in this simulation. A status board is displayed for each plane, indicating vital information, such as air speed, flight vector, altitude, and fuel level. 32K; disk. Avalon Hill.

Conversational Spanish/French/German/Italian* Each package contains five learning cassettes and a manual. Reading, speaking, and listening aid in mastering the language of your choice. 16K; cassette. Atari, Inc.

Convert Number to String BASIC. See STR$.

Convoy Raider* The British fleet is your target. Only two commands can be somewhat limiting. 16K; cassette. Avalon Hill.

COPY—DOS Command Copies information from one place to another. The original file is always left undisturbed. See DOS Option C.

COS Atari BASIC Function. COS returns the cosine of an arithmetic expression, all of whose terms have been previously defined and specified in degrees or radians.
Format:

$$COS(<aexp>)$$

Example:

$$PRINT\ COS(A+B+C)$$

In this example, if A, B, and C have the values 10, 20, and 30 degrees respectively, then 2 will be printed on the screen. 2 is the cosine of 60 degrees.

Count With Bunky* Teach your preschool children to count and do simple math. Colorful graphics are used to stimulate the youngster into counting correctly and developing better addition and subtraction skills. Bunky the monkey will do tricks if all the answers are correct. 32K disk or 16K cassette. Joystick required. Swifty Software, Inc.

Counter See Binary Counter.

Counter* Teaches very young children to count. Features colorful graphics, four different languages, six skill levels, and two program parts: "Count With Me" and "It's Your Turn." 24K; disk. Atari Program Exchange.

CPS Characters Per Second or Cycles Per Second.

CPU See Central Processing Unit.

CR Carriage Return, Command Register, or Card Reader.

Crash The system becomes inoperative from a hardware or software malfunction. A head crash refers to the accidental impact of the read/write head upon the diskette surface.

CRC Cyclic Redundancy Check. A binary polynomial used to check information in blocks of data. All single-bit errors are detected. When used with Longitudinal Redundancy Check (LRC), all two-bit errors are detected and all one-bit errors corrected. The two checksums (CRC and LRC) are calculated based on the data and appended to it. When the data is received or reread, the CRC and LRC are recalculated and compared to the earlier CRC and LRC. Any difference indicates *that a bit* has changed. The CRC and LRC act like parity bits, except that they work on a whole block of data rather than one byte.

Create Usually refers to making a new file on diskette, as opposed to modifying an existing file.

Creative Atari, The* This book includes sections on graphics, hardware, and software, and tutorials covering graphics and the disk drive. Creative Computing Press.

Creative Computing* Creative Computing Magazine specializes in information on the Atari and other microcomputers. See Magazines. Creative Computing.

Creepy Corridors* You gather the riches that can help you defeat the creepy creatures. An entertaining, action-packed chase game. Cartridge. Sierra On-Line.

Cribbage* The computer is your opponent in this classic card game. The goal is to score 121 points. There are four levels of play. This program also tutors you about correct hand scoring and good game strategy. Graphics are hi-resolution. If you enjoy Cribbage, you'll enjoy this computer version. 32K cassette or 40K disk. Atari Program Exchange.

C.R.I.S. Cash Register Inventory System* Turn your Atari 400, 800, or 1200 into a total electronic sales terminal. In addition to the normal functions of a cash register, this menu-driven program keeps tabs on your inventory, with information available on backorders, stock on hand, vendors, and so on. The system can support ten salesmen and 1000 inventory items. 32/48K; disk. Adventure International.

Crisis Mountain* Terrorists have planted explosive weapons under an active volcano. It is your job to travel down the caves and disengage the bombs before they explode and cause an eruption. You need quick reflexes to avoid falling boulders and flowing lava. 48K; disk. Synergistics Software.

CROM Control Read Only Memory.

Crossfire* You are the sole protector of the city as aliens attack. You may fire in four directions from your thirty-five-missile gun when you reach the junction of two streets. Strategy and quick reflexes keep the streets safe. 32K; disk. Sierra On-Line.

CROSSTALK* A well-known communications program, this asynchronous communications package has most of the bells and whistles you need. Microstuf.

Crosstalk Two signals interfering with one another.

Crossword Magic 2.0* An interesting program for interactive development of crossword puzzles. The user chooses the theme of the puzzle and supplies the words which the computer weaves together to form the crossword. Once the appropriate clues have been entered, the program will print the blank puzzle and list of clues. You can store your puzzles on a separate disk and solve them on-line with a game playing program. 40; disk. L & S Computerware.

CRT Cathode Ray Tube. A computer terminal using a CRT that displays characters or pictures. Also called a monitor, screen, or terminal.

CRTC CRT Controller.

Crush, Crumble, and Chomp* You are a monster trying to destroy cities with your tentacles, flaming breath, and high-pitched screams. If you eat enough, even the army and their scientists will be no match for you. A large selection of commands gives you a lot of flexibility and control. 32K; disk. Automated Simulations.

Crypt of the Undead* Try to find your way out of a cemetary while collecting scattered gold pieces and scraps of food. You must be patient and persistent to overcome the powers of the undead. Interesting documentation for a simple game. 40K; Automated Simulations.

Crypto 800* Keeps those important programs a secret by converting the code to unreadable characters. Uses DES (Data Encryption Standard). Only you have the key to convert it back to usable form. 32K. Swifty Software, Inc.

Crypts of Plumbous* Selfish aliens are after lead-lined crypts which contain atomic waste. They intend to release the deadly substance into earth's atmosphere. Use your best strategy as you attack the mothership. Five levels of difficulty. 16K cassette or 32K disk. COSMI.

Crypts of Terror* Battle monsters to save your dwindling life points, and raise your score through shrewd barter and lucky finds. Locate the magic rings in the crypts, and tackle yet another level of difficulty. 16K; disk or cassette. In-Home Software.

Crystal Quartz crystal whose piezoelectric vibrational modes issue extremely accurate frequency for clock timing.

CS Chip Select or Code Segment.

CSAVE Atari BASIC Command. This command, usually in direct mode, saves the tokenized version of the program in the computer's memory onto cassette tape. The tape must be properly positioned in the program recorder (Atari 410). Two bells will ring to remind you to press the PLAY *and* RECORD buttons simultaneously on the 410, and then RETURN.

It may be necessary to enter LPRINT (q.v.), get an

ERROR 138 message, then use CSAVE, in order to get it to work properly.

CTIA The CTIA chip is the original television interface chip found in most early Atari Computer models. This chip converts the ANTIC chip's digital commands into a signal, which is then sent to the television or monitor.

CTS Clear To Send. Control signal from the modem to the terminal indicating that data may be sent because the carrier is present. RS-232C is standard.

Current Statement The current BASIC token (command) within a line of the statement table is known as BASIC's current statement.

Curse of Crowley Manor, The* You are an investigator for Scotland Yard in 1913 assigned to the murder case at Crowley Manor. Beware, everything is not as it seems in this adventure game. Bizarre things could happen to you at almost any time. 16K cassette or 32K disk. Adventure International.

Curse of Ra* An expansion module for the Temple of Apshai* which adds more exploration, fighting, and treasure to the game. Includes hi-resolution graphics and stronger monsters. 32K; disk. Automated Simulations.

Cursor The cursor is the square symbol that appears on the screen to let you know where an action (such as typing in a character, deleting, inserting, etc.) will take place.

Cursor Movement The cursor moves to the right as you type, backs up to the left when you press DELETE BACK S or cursor left (←). DELETE BACK S erases the characters from the screen as the cursor moves left, while cursor left (←) does not.

The cursor's location on the screen is also controlled by some programs with the TAB (→| |←) keys, cursor right (→), cursor up (↑), cursor down (↓), and other keys.

In many situations, it is necessary to first position the cursor at the correct location, then enter certain characters at that location, to achieve the desired outcome. Example: To change a line of a BASIC program that is listed on the screen, first move the cursor up to the line, then over to the place where the change is required. Retype, delete, or insert as needed, then press RETURN (to send the changed line into BASIC). Finally, move the cursor back to a blank line to RUN the program or do other things.

BASIC provides a limited full screen editor, not just a line editor. You can move the cursor anywhere on the full screen and do editing, as long as you press

RETURN while the cursor is still on the modified line.

CONTROL/Down Arrow (↓) moves the cursor down one line.

CONTROL/Left Arrow (←) moves the cursor left one space.

CONTROL/Right Arrow (→) moves the cursor right one space.

CONTROL/Up Arrow (↑) moves the cursor up one line.

See BASIC Editor, Control Keys.

Cursor—Current Location To find the cursor's vertical location enter:

?PEEK(84)

To find the horizontal location enter:

?PEEK(85)+256*PEEK(86)

Custom IC Integrated Circuit built to the customer's specifications.

CUTS Cassette User Tape System.

CW Control Word.

Cyberdrive* A high-performance 13.5, or 27MB, hard disk drive subsystem. It comes in one cabinet, with an integrated mini-cartridge tape for secure data backup. The system offers an integrated, business-oriented backup device. Media transfer is assured because of the Cyberdrive's availability for other systems, regardless of the host hardware or operating system. Cybernetics, Inc.

Cyborg* A high-level science fiction adventure game with 122 mappable locations. Your mission becomes clear as you encounter many surprises and twists in the plot and setting. This is for experienced adventure-game players, and includes a little something for everyone. 48K; disk. Sentient Software.

Cycle Stealing This term is applied to the machine cycles that are lost to the 6502 chip when ANTIC performs Direct Memory Access (DMA) functions. This occurs when the memory or the screen is refreshed (updated).

Cycle Time The total time a device needs to complete one internal cycle, before becoming available again.

Cyclod* In this maze game, you are an eyeball and your enemies are snakes. You protect yourself against the snakes by tumbling the red brick portions of the maze walls down upon the snakes, thus crushing them. Destroying all the snakes on one level places you on another, more difficult level.

When you've lost three eyeballs to the snakes, the game is over. 48k; disk. Sirius Software.

Cypher Bowl* In this two-player football game, you punt, pass, kick a field goal, or run the ball as the screen scrolls vertically to cover your progress. The "bird's-eye" view of the field isn't very realistic. Graphics are rather crude. 16K; cassette. ARTSCI.
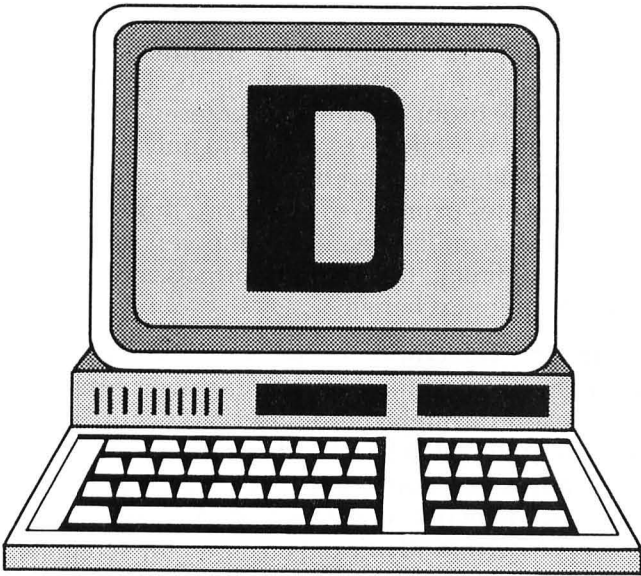
D Codes. ATASCII = 68, HEX = 44. d—ATASCII = 100, HEX = 64.

D See DOS Options.

D DOS 3.0 command to Duplicate a disk.

D Data line, or the hexadecimal symbol for the decimal number 13.

D Flip-Flop A flip-flop circuit with a delayed reaction. The output is determined by previous input.

D/A Pronounced "D to A." Digital to Analog. Conversion from the digital representation used in computers, to the analog signals used to drive speakers, motors, etc.

DAA Data Access Arrangement.

DAC Digital-to-Analog Converter.

DADIO* A digital-to-analog, four-channel, 12-bit converter, with a five-microsecond conversion rate. Double buffering (channels change simultaneously), or random channel selection available. In addition, the converter contains twenty-four parallel lines for digital interfacing. Tecmar, Inc.

Daisy Chain A method of establishing priorities for interrupts. Units capable of interrupting the system can either transmit or block acknowledgement requests generated by a unit further away from the processor. The highest priority is given to the unit electrically closest to the processor.

Daisy Wheel Printer An impact printer which has a wheel with radial spokes bearing type, to produce letter-quality output.

Dandy* A twenty-six level dungeon adventure game, where success depends on the players' abili-

ties to cooperate with each other. Up to four players can battle the monsters and work out strategy. There is an option to create your own mazes when you've mastered all the ones in the program. The challenges are endless! 40K; disk. Joystick required. Atari Program Exchange.

Darker See Double-Strike Type Format.

Darts* A British version, with realistic action and graphics. 16K; cassette. Thorn EMI Video Programming.

DAS Data Acquisition System.

DATA Atari BASIC Command. This command is part of the two-command combination, READ/-DATA. They are always used together. The DATA command is always in deferred mode and can be placed anywhere in the program. It is followed by numbers or strings (separated by commas), to be placed into numeric or string variables respectively. The type of data in the DATA statement must match the type of variable in the corresponding READ statement. There must also be the same number of items of data in the DATA statement as there are variables in the READ statement, or else an "out of data" error is received. Remember to dimension all string variables used in READ statements.

Example 1:
```
100 READ P,Q,R,S
500 DATA 50,12,144,6
```
Example 2:
```
100 READ P$,Q$,R$,S
500 DATA CHUCK, DON, MARY, LINDA
```
In Example 1, the variables P, Q, R, and S will take on the values 50, 12, 144, and 6 respectively. In Example 2, the string variables P$, Q$, R$, and S$ will become CHUCK, DON, MARY, and LINDA, respectively.

Data Acquisition Collecting data from external sensors, usually in analog form.

Data Bus The set of lines carrying data. All system components are normally connected to the data bus.

Data Diskette A diskette is called a data diskette when it is used primarily, or totally, to store data rather than programs. Likewise, program diskette refers to a diskette which is primarily used to store programs used to process data. A system diskette is used mainly to store related utility-type programs. Often a diskette will contain both data *and* the programs needed to process it.

Data File   A named collection of information usually stored on magnetic media. The extensive (a period followed by one to three characters) usually identifies the type of file.

Data Link Escape   An escape character used to introduce control information in a data system.

Data Management System*   A menu-driven database program for small records. The size of the records is limited, so this program is best suited to home or small business use. There isn't a redefine feature for future expansion of information, so you have to define carefully. Also, when entering data, all fields must contain something, which can be annoying. 32K; disk. Atari Program Exchange.

Data or Program Concatenation   Adding one item on at the end of others to produce one longer data or program item.

Data Perfect*   You design the screen and printing formats with this sophisticated database program. The data stored on one disk is sorted. Search features include four fields, with two criteria per field. Full-screen editing is impossible, since the display includes space beyond the size of the screen columns. The customization of the format is good, because it fills different needs for different data. 32K; disk. LJK Enterprises.

Data Security   Insuring that data or programs cannot be altered or viewed improperly. For example, in an accounts receivable system, steps must be taken to insure that clients cannot alter their invoices.

Data Separator   A circuit in disk controllers which separates the data from the carrier in the signals read from the diskette.

Data Set   File or group of related data elements.

Data Tablet   A peripheral for graphic input, which digitizes the position of a stylus on a special sensory surface.

Data Types   A specific interpretation applied to binary data, such as integer, real, character, etc.

Database   A systematic organization of data files for central access, retrieval, and update.

Database (Filer) Software   See CCA Data Management System, Data Management System, Data Perfect, Database/Report System, File-it C, File-it 2+, Mailing List, Mini Database/Dialer.

Database/Report System*   As the name implies, you can store and retrieve data on a single disk storage base with this program. Numeric fields can be defined and summarized while alphabetic fields and records can be stored for eventual retrieval and printing in a variety of formats. Entries are stored in the order that they are entered. There is a search option for field retrieval, but only the specified field will be displayed. The menu-driven program provides prompts to guide you though functions. The strongest feature is the versatility you have in defining the output formats. 40K; disk. Atari Program Exchange.

Datalink*   Telecommunications can be yours with the help of Datalink. This menu-driven program guides you through the desired tasks, but, when you want to switch into different modes, the procedures are confusing. The large buffer will hold a lot of incoming data which can be stored on disk or cassette, and printed on either the screen or paper. It uses a 300 baud modem when plugged into Port 1 of the Atari 850 Interface Module. You must be careful when you change modes or you will lose access to the data in the buffer. 24K; disk. Swifty Software.

Datasm/65*   A co-resident Assembler/editor, featuring a PIE screen editor with global search and replace functions. The utility can also scan for a string, move, copy lines, and delete and insert lines. The Assembler is fast, somewhat expensive, and resides in the middle of memory. DOS is non-standard and does not generate Atari-compatible files without a separate utility. Datasoft.

Data-Transfer Rate   The rate of transfer of data from one place to another, such as from disk to memory, or from memory to memory.

Datestones of Ryn*   This mini-adventure is part of the Dungeonquest series. You explore various locations in search of the missing datestones. Monsters and thieves will try to stop your progress, but, if you are a good fighter, you can overcome them. 32K; disk or cassette. Automated Simulations.

David's Midnight Magic*   This double-decker pinball game is a pinball fan's delight. Both levels, which are connected by ramps, feature flippers that respond as accurately as those in real pinball machines. Look for a lot of action in this game, with targets on both levels. You can save high scores to disk if it is unprotected; if not, those high scores can only be saved for the night. Great graphics. 48K; disk. Broderbund.

DBMS   DataBase Management System. A type of program which provides a general mechanism for systematic storage and retrieval of data from a database.

D-Bus Internal Destination bus in a CPU, from the ALU to the registers.

DC Direct Current.

DC Motor A motor which operates with a direct current power source, often used in variable speed applications.

DCE Data Communications Equipment. Equipment used to interface with a data communications network. Generally, a modem.

DCM Data Communication Multiplexer.

DCO Digitally Controlled Oscillator. An oscillator using a digital circuit to control frequency, rather than an analog circuit as with a normal oscillator.

De Re Atari* The topics covered in this book include ANTIC and the display list, color registers, and character sets, player/missile graphics, sound, Atari BASIC, and human engineering. Atari Program Exchange.

Deadline* A fascinating detective mystery adventure. You are the detective investigating the apparent suicide of a wealthy and famous industrialist. The text is well-written, the characters are enigmatic, the clues are obscure, and there are twenty-five possible outcomes, including your own untimely end. 32K; disk. Infocom, Inc.

Deadlock A situation in which two processes wait indefinitely for each other.

Debouncing Eliminating the rapid signal fluctuations which accompany a change of state in mechanical switches. Mechanical springs bounce repeatedly until the contact is finally closed or opened. Typical debounce time is five to ten milliseconds for stable contact. Debouncing may be performed by hardware (latch) or software (delay).

Debug or Test a Program A programmer must insure that a program will correctly process all of the types of data for which it is intended. Samples of the data are prepared (test data), and the program is executed using it (a test run). The program's outputs (reports, screen displays, files, etc.) are then verified to be as specified. An error in the processing logic of a program is called a "bug," hence the terms "debug" and "bug-free."

Debugger An essential program that helps eliminate bugs in software. At a minimum, it provides breakpoints, dump facilities, register and memory examine/modify, preferably in symbolic form.

Debugging Eliminating the bugs in a program; troubleshooting and correcting mistakes or errors.

DEC Digital Equipment Corporation, manufacturers of the PDP family of computers.

Decade Counter A counter which advances in increments of ten.

Decision Maker* Helps you make a decision, by listing your requirements. You input a number of choices with their ranked attributes. The computer then tells you what the "logical" choice would be. 8K cassette or 16K disk. Atari Program Exchange.

Decision Maker* If you just can't make decisions, this program can give you a hand. You input ten alternatives and ten decision criteria. Each is assigned a numerical point value, and the program gives you its choice based on your data. 32K; cassette or disk. Creative Software.

Decode Cycle The second cycle of the fetch-decode-execute sequence of instruction execution. The instruction, contained in the IR, is decoded into a set, or a sequence, of control signals to all the required elements of the system, such as register gates, ALU functions, or external devices. See Fetch and Execute.

Decoder A logical unit which decodes two, three, four, or more inputs into mutually exclusive outputs. A 3-bit decoder will have eight outputs because a 3-bit number can have eight possible values.

Dedicated Register A register used exclusively to contain a specific item.

Default A value for a parameter or variable which will be supplied by a system, if you do not specify a value. For instance, in the American judicial system, "innocence" is the default value for the accused's status.

Default Diskette Drive Or Current Diskette Drive. DOS and BASIC keep an internal record of which diskette drive is currently considered the "default diskette" or "default drive." When you start a DOS or BASIC session, the default diskette drive is always 1.

Default Parameters The parameter values supplied by a computer system when no explicit values are provided by a program or a programmer.

Defender* The home version of the William's arcade game will keep you challenged for hours. Invading aliens are out to capture humans and turn them into mutants. You battle the aliens and rescue the humans before they are transformed. You are armed with quite an array of bombs and blasters. At the top of the screen is a radar display that shows

the location of alien crafts and surviving humans during the battle. 16K; cartridge. Atari, Inc.

DEG Atari BASIC Statement. Computers can calculate trigonometric functions in degrees or in radians. The default is to radians. If you want degrees, use the statement DEG. To return to radians, use RAD.

Del BASIC. Delete a Character. Press DELETE BACK S to delete one character at a time. See Control Keys.

DEL Pronounced "dell." DELete character in ASCII, 127 (HEX 7F).

Delay Loop To freeze the screen briefly while the operator using your program reads a message, just write a delay loop after you print the message:

```
1000 FOR Y = 1 TO 2000
1010 NEXT Y
```

To freeze the screen until the operator is done with it, put in a dummy input statement and instruct the operator to press RETURN to proceed. The input variable need not be used in your program:

1000 PRINT "Press RETURN to continue"; : INPUT A

DELETE DOS Command. See DOS Options.

DELETE BACK S Pressing DELETE BACK S by itself will move the cursor one position to the left and delete the character underneath it.

Pressing CTRL/DELETE BACK S deletes the character to the right of the cursor (the cursor does not move).

Pressing SHIFT/DELETE BACK S deletes the current line and brings the following lines up one position. See also Control Keys.

Delete Character BASIC. Pressing CTRL/DELETE BACK S will delete the character under the cursor. See Control Keys.

Delete Current Line Press SHIFT/DELETE BACK S to delete the current line. This is valid under DOS and in BASIC. See Control Keys.

Delete Last Character Press DELETE BACK S to delete the last character entered. This is valid under DOS and in BASIC. See Control Keys.

Delete Program Line BASIC. To delete a program line, type the line number and hit RETURN.

Delimiter A character which indicates the end of a sequence of characters. A space is the common delimiter in English to indicate the end of a word.

Delimiters DOS Commands. Parameters on DOS commands can be delimited (separated) by a comma.

In a file name, the : and . are specified to delimit drive name and extension, respectively.

Deluxe Invaders* Similar to Space Invaders*, this improved version has descending creatures which fire continuously at you. They must be destroyed before they land on your base. Levels of difficulty increase. 16K; disk or cartridge. Roklan.

Demon Attack* A shoot-em-up game converted from Atari VCS cartridge. The demons are goblins, gargoyles, and moths. You can fight off their attack with your laser gun, and success depends more on timing than on fast reaction. The graphics, which were so wonderful on the VCS, lose something in the translation to your home computer. 16K. Imagic.

Demultiplexer A logical circuit which routes digital signals from one source to many different destinations.

DESC Defense Electronics Supply Center. Manages procurement policies and monitors quality, of military electronics contracts.

Descenders The parts of printed or displayed characters that extend below the baseline of the type.

Designs From Your Mind: Atari Graphics A book for the aspiring computer artist. Shapes, colors, and screen design explained, as well as advanced graphics techniques and internal architecture of the Atari computer. Reston Publishing Company.

Desk Set* A two-program package designed to keep your desk, and at least part of your life, organized. It consists of a calendar program, and a card file. The later helps you keep track of up to 200 names, addresses, phone numbers, and other information for business and personal contacts. The calendar portion of the program can be used either as a perpetual calendar, or an appointment log, with up to 400 days of 15 appointments each. 40K; disk. The Programmers Workshop.

Developer's Diskette* Useful programs for the serious programmer. Some of the areas covered are custom character generation, signed integer multiply routine, unsigned integer multiply routine, a BASIC program compressor, RS-232C device handler for your Atari 850 interface, fixed-length records to disk-writing capability, self-booting BASIC programs, disk fixer, and many more. 32K; disk. Atari Program Exchange.

Development System A system with the capabilities required for efficient hardware and software application development for a given microprocessor. Such a system typically includes a microcom-

puter, monitor, printer, mass storage (often diskettes or hard disk), PROM programmer, and an in-circuit emulator. Software is often developed on a system totally different from the system it will run on, either because the target system does not have enough memory or other resources to support development, or because the system is not yet available.

Development Tools Hardware and software aids used in developing programs and/or hardware systems. See Utility Programs.

Device Control Block DCB. Input/Output routines in Atari's Operating System that communicate between the Serial Input Output (SIO) routines and the Device Handler routines.

Device Handlers These Operating System routines provide communication between the Input/Output routines and the display editor, screen, keyboard, printer, cassette, and other devices, as defined in the handler tables.

Device Names Names which may be used in place of a file name in many DOS or BASIC commands. Specifies that data is to come from, or go to, a device (keyboard, CRT, printer, etc.) rather than a diskette or cassette file.

Device Names, Reserved These names have special meaning to DOS. They may be used in most places where a file name occurs. They name devices (rather than diskette files) that can originate or receive data. The colon at the end of a device name is optional.

Reserved Name: Description

D:	Disk
C:	Cassette
S:	Screen
E:	Editor
K:	Keyboard
P:	Parallel printer, as used for output
R:	RS-232

Device Spec The code for a device such as D: for Disk and K: for Keyboard are known as device specs.

Devices and Ports A port is an address providing a connection between the computer's internal processor and an external device. Ports are used to attach input and output devices. Some devices require several ports to function.

Devil's Dare* A game of strategy and skill that lets you combine forces to gang up on the evil computer. If you can get five tokens in a row and discover the secret code, you win the game. 16K; disk or cassette. The Jay Gee Programming Company.

DFR Double Frequency Recording.

Diablo A Xerox-owned company which makes computer peripherals and computer systems. A supplier of daisy wheel printers.

Diagnostics A set of routines used to diagnose system malfunctions and/or run standard performance tests.

Dice Poker* Players roll any combination of five dice three times, to get the highest possible score. Two players required. 16K; cassette or disk. APX

Die/Dice Circuit elements made of small, rectangular pieces of silicon on a wafer. Each wafer has several dozen to hundreds of rectangles—dice. Once they are mounted, this is called a chip.

Dig Dug* A popular arcade game which features a hero, Dig Dug, who digs deep inside the earth to look for monsters trapped in their own tunnels. The most dangerous monsters are Fygar, who breathes fire and is very hard to destroy and Pooka. Both Fygar and Pooka can turn into ghosts and move behind Dig Dug to chase him. If you manage to kill the monsters, you get to move on to a higher level of play. 16K. Atari, Inc.

Diggerbonk* The object of this maze game is to clean out creatures that are hoarding Titan ore in a mine. The trick in this game is the constantly scrolling mineshaft. A lot of chance is involved. The maze is randomly generated, and the creatures are randomly placed. This is a good game, but not fantastic. 16K. Santa Cruz Educational Software.

Digital Having discrete states. Digital logic may have from two to sixteen states. Most logic is binary logic, with two states, on or off.

Digital Analyzers Troubleshooting tools which allow the user to locate timing or logic errors.

Digitizer A device which converts analog information to its digital equivalent. Often used with devices obtaining input from a plotting surface and providing coordinates as output, such as a graphics tablet.

DIM Atari BASIC Statement. All string variables, arrays, and matrices, in order to be ensured sufficient memory, must be DIMensioned before they can be used. The DIM command does this for each, as in the following examples:

```
DIM S$(35)(Used with strings.)
DIM A(14)(Used with arrays.)
DIM M(9,4)(Used with matrices.)
```

In these examples, memory is reserved as follows: The string (S$) will be able to have up to thirty-five characters; the array (A) will be able to hold a list of fifteen numbers (0-14); and the matrix (M) will have space for ten rows (0-9) and five columns (0-4) of numbers.

Diode A device which allows current to flow in only one direction.

DIP Pronounced "dip." Dual In-line Package. A standard IC package with two rows of pins 0.1 inch apart.

Dip Switches A collection of small switches on a DIP, used to select options on a circuit board without modifying the hardware.

Direct Memory Access Or DMA. A method used to provide high-speed data transfers between a peripheral and the main memory. Data is exchanged at maximum memory speed. Memory can be accessed several ways. Disconnecting the MPU from the busses is accomplished by a HOLD signal, and requires tristate data and address busses. DMA is performed under the control of a DMAC. The Atari ANTIC chip uses DMA to fetch its instructions and data from memory.

Directory The table of contents of a file system which allows convenient access to specific files. See DOS Options and List Disk Directory.

DISAM* A general purpose disassembler and boot file copier. Some knowledge of 6502 Assembly Language is necessary to fully utilize the program. IJG, Inc.

DISDUP* Copies a disk by individual sectors, or in groups of sectors. Bad sectors may be displayed on the screen or printer. Copies may be made with or without read-verify. IJG, Inc.

Disk A flat, circular magnetic storage medium, which is rotated while in use.

Disk Boot Maker* To alleviate the long loading time of cassette tape programs, this utility transfers those programs to disk. It makes the move very simple, and prompts you to set up everything correctly. 32K; disk. Computer Age.

Disk Commander II* Transfer both the AUTO-RUN.SYS and the DISKCOMM files onto your disk. Then, each time you boot up your computer, your *screen* will display every program on your disk—and the remaining free space available. You can run ANY program on your disk by pressing a single number. The only such program that works with BASIC or Machine language programs! Great for young children. 16K; Disk. MMG Micro Software.

Disk Controller Card A printed circuit board which interfaces disk storage drives to the CPU of a computer.

Disk Directory See Directory, List Disk Directory.

Disk Doctor* This package can read sectors, patch around bad sectors, dump or print files from desired sectors, convert tokenized or list-protected BASIC programs into list and modifiable form, manipulate file locations, and search any part of a disk for a sequence of bytes (up to six). A user friendly utility with good documentation. 32K; disk. BJ Smartware.

Disk File A file residing on a disk. Also used to refer to the complete disk drive.

Disk Fix Kit* This accessory kit will help you keep your 810 Disk Drive functioning properly. Includes a test disk to check out reading, writing and drive speed, as well as oil, cleaner, and swabs. The Programmers Workshop.

Disk Fixer* This utility can list files in your directory, trace the sector chain of a file, modify the directory entry, check the sector allocation map, modify sector links, set the drive number, dump sector contents, modify a sector, and return to DOS. Caution is recommended when using Disk Fixer—if you aren't sure of what you're doing, you may create problems you can't solve. 24K; disk. Atari Program Exchange.

Disk Manager* A utility which can create labels for your disks, give alphabetical lists of cataloged programs, catalog program titles, print lists of disk directories, and list disks by topic or disk number. 32K or 40K; disk. Synapse.

Disk Operating System DOS. The collection of programs that helps you manage files containing data and programs on diskettes, as well as run peripheral devices such as keyboard, monitor, etc. See DOS.

Disk Sentry* An electric accessory device which allows override of the write-protect circuit. It can write to both sides of a single-sided disk without destroying the disk or requiring an exposed write-protection notch. Swifty Software, Inc.

Disk Utilities—Tricky Tutorial #7* A utility package that includes MENU—to select and run BASIC programs; DISKLIST—disk directory printing (suitable for labeling jacket covers); INSPECT—any sector contents can be displayed; FORMAT—single-keystroke disk formatting; Autoboot—AUTORUN.SYS file creation; SPEEDCHECK—disk drive speed

displayed (RPM); and DISKFILE—disk file demonstration and tutorial. It includes some of the best documentation on the market. Fills many of the Atari user needs. Complete listings for all the programs are included in the documentation. 32K; disk. Educational Software.

Disk Wizard* Four utility programs to help you program. Includes Disk Speed, which shows you the speed of your disk drives, and marks bad sectors on disk; Disk Edit, which allows you to edit data on any sector of the disk, or scan disks for strings; Disassembler, which disassembles Machine language from disk by sector number or file name; and Disk Backup, which copies any disk. C.A.P. Software.

Disked* Several useful programs which allow you to retrieve programs that have become "lost" but are still on the disk, and allow you to use the empty space that is on most commercial software disks. This disk is expensive and not as useful as it could be. The documentation for this utility package is not clear. 24K; disk. Amulet Enterprises.

Diskette A mass storage device using a flexible (floppy) mylar disk (diskette) to record information. The diskette is sealed in a square plastic jacket lined with a soft material which cleans the diskette as it rotates. A cut-out slot provides access for the moving head which must actually come in contact with the diskette surface in order to read or write. Other holes in the jacket provide access to sector index holes in the diskette. Diskettes are hard-sectored if the sector start points are marked by holes in the diskette. Soft-sectored diskettes have only one (or a few) holes to mark the start of the track. The sector start marks are placed on the soft-sectored diskette under software control in a process known as formatting the diskette.

Diskette—Free Space The diskette directory includes a display of the amount of free space you have on your diskette. See DOS Options.

Diskette—Storage The Atari diskette software writes eighteen sectors for each of the forty tracks around the disk. By multiplying the number of tracks by the number of sectors (40 x 18) you will have the number of sectors available for storage on the diskette (720). Of these 720 sectors, only 707 are available to you. The remaining thirteen sectors are taken by the system for VTC (Volume Table of Contents), the Directory, and booting the system.

Diskette, Data A diskette used to store data rather than programs. In order to save space, a data diskette will usually not have the DOS commands,

or related utility-type programs. Often, a data diskette will contain both data and the programs needed to process the data.

Diskette, Source The diskette from which information/data is coming. The target *diskette* is the diskette to which information/data is going.

Diskette, System The diskette which contains the disk operating system that makes your disk drive work. It usually contains the DOS.SYS file, the DUP.-SYS file, and other utility programs.

Diskette, Target The diskette to which the information/data is going. The source diskette is the diskette from which information/data is coming.

Diskette Directory DOS. On each diskette, DOS maintains an index or directory of all files. It contains the available space on the diskette, and the size of each file. The disk directory is available through the DOS menu. See DOS Options, List Disk Directory.

Diskette Drive A diskette drive (or "disk drive") is the machine attached to the Atari which reads the diskette, transferring data from the diskette to the Atari and vice versa.

Diskette Inventory System* Records a complete list of all directories onto a single diskette for library expansion. Read, catalog, and alphabetize disks quickly and automatically by putting them in numerical order. 24K; disk. Swifty Software, Inc.

Diskette Librarian* Turn your disk, cassette, and cartridge collection into a well organized library. Organizes your software using volume numbers, program or file names, types of software, descriptions, sources, dates, numbers of sectors per disk, and tape counter numbers. Programs included are Autocatalog, List Directory, Add Non-DOS, Inquiry/List, Update, Sort, Run Program, and End Session. 24K; disk. Printer useful. Atari Program Exchange.

Diskette Maintenance Diskette maintenance and file management are terms describing keeping track of files on diskettes. This includes creating them, finding them by name, insuring that adequate free space is available on diskette, maintaining backups, and deleting files no longer needed. These functions are supported by the DOS functions, but require thoughtful planning by the user to insure proper results.

Diskey* A utility program to search and repair damaged files on your disks. Be careful: you can further damage your disks if you don't know what you're doing, so it is wise to make copies of your

damaged disks before using Diskey. 32K, 48K; disk. Two drives recommended. Adventure International.

Diskmenu* *Like* making selections in a restaurant, you can choose the program you want to run from a menu. Diskmenu can run BASIC or Assembly language programs. 16K; disk. Atari Program Exchange.

DISKPAK* Modifies a BOOT disk so normal DOS files may be stored on it. This utility works on all BOOT file disks, as long as they are not copy-protected. IJG, Inc.

Diskscan* This utility package will allow you to change any byte on any disk. It lets you change character, hex, decimal, and Assembler formats. You can correct problems with single bytes in programs or change them to suit your needs. You can also dump the contents of a disk sector to the screen or printer, search for certain sequences, do hex conversions, and much more. 24K, 32K; disk. David Young.

Diskwiz* A utility which recovers data lost due to damaged or unreadable disks. Tracks down the cause of the problem, checks for bad sectors, and identifies duplicate sectors, as well as empty or deleted sectors. The problem data can be copied to good sectors, another disk, or printed. 32K; disk. Allen Microware.

Display A computer output device which displays alphanumeric and/or graphics, such as a CRT or a seven-segment LED.

Display List A program used by the ANTIC chip that specifies the address of screen data, the display modes, and special display options, such as interrupts. The address of the display list is stored in the variable DL when the following BASIC command is executed:

DL=PEEK(560)+256*PEEK(561)

Display List Interrupt DLI. When the interrupt bit is set within a display list, a short Machine language routine may be executed at this predetermined place each time the screen is refreshed. See the sample DLI program below:

```
100 REM DLI BY JERRY WHITE
110 REM A SIMPLE EXAMPLE OF
120 REM A DISPLAY LIST INTERRUPT
130 REM THAT MAKES A GRAPHICS 0
140 REM SCREEN APPEAR TO HAVE
150 REM A PINK TEXT WINDOW.
160 REM
170 GRAPHICS 0
180 DLIST=PEEK(560)+256*PEEK(561):REM FIND
```

```
DISPLAY LIST
190 POKE DLIST+24,130:REM ADD 128 TO
ENABLE DLI
200 FOR ME=0 TO 19:READ IT:POKE 1536+ME,
IT:NEXT ME
210 DATA 72,138,72,169,80,162,92,141,10,212,
141,23,208,142,24,208,104,
170,104,64
220 POKE 512,0:POKE 513,6:REM POINT TO
DLI ROUTINE
230 FOR ME=0 TO 19:POSITION ME,ME:? "*
POSITION" ;ME;",";ME:NEXT ME
240 POKE 54286,192:REM TURN ON OUR
NEW TEXT WINDOW
250 ? "BASIC":? "IS";:END
```

Display Lists* This Tricky Tutorial shows you how to get multiple graphics modes on the screen by modifying the Display Lists. Simple program modifications will allow you to put all fifteen normal graphics modes, plus five new modes, on the screen at the same time for truly custom graphics effects. See Tricky Tutorials for other programs in this series. 16K cassette or 24K disk. Educational Software, Inc.

Display Mode Provides the method by which the ANTIC chip will interpret screen data. The ANTIC display mode 2, for example, will cause a line to be displayed in BASIC's GRAPHICS 0 mode. ANTIC provides for fifteen display modes.

Display the Contents of a File on the Screen See DOS Options.

DLC Data Link Control.

DLE Data Link Escape.

DMA Direct Memory Access.

DMAC Direct Memory Access Controller. A device available as a single chip, used to automate DMA transfers. A DMAC is a specialized block-transfer processor which takes bus control away from the MPU, and transfers one or more memory words. A typical DMAC can connect to four or eight devices.

DMM Digital Multi-Meter.

DOC File Extension. The extension (the one to three letters after the period) of a file name tends to tell you what kind of file it is. DOC is the file extension for a text format or documentation file. See also Extensions.

DOD Department Of Defense.

Dodge Racer* Based on the arcade game Head On (tm), this is a game in which you accumulate points by running over dots on a multiple-lane,

maze-like racetrack. You can change lanes only where gaps in the dividers appear. You have to do plenty of this kind of maneuvering, because the computer is controlling a "jam car" that is running the maze in the opposite direction, on a head-on course. This is a fast action game that features multiple skill levels and a play option in which the jam car is operated by another player. Synapse.

Dog Daze* A pleasurable, competitive game for kids that is a welcome relief from the shoot-em-ups. You must move your dog to one of the blue fire hydrants that appear on the screen. The first one to reach a hydrant claims it. If you accidentally brush up against your opponent's fire hydrant, you must sniff it for a few seconds, giving your opponent time to claim more hydrants. A major disaster could occur if one of the reckless cars hits you. Its honking horn may warn you, but sometimes it's hard to maneuver! 16K cassette or 24K disk. Atari Program Exchange.

DO-Loop A feature of a high-level language which allows a segment of a program to be executed repeatedly, while or until a certain logical or arithmetic condition is fulfilled.

Donkey Kong* A home version of the arcade game. This version is comparable to the arcade version in all four screens. The varying levels of difficulty, excellently detailed graphics, wonderful sound effects, and the variety of challenges make this game exciting. 16K; cartridge. Atari, Inc.

Dorsett Educational Series* Includes fifty-two complete series which can be run with the Educational System Master Cartridge. Uses minimal graphics, and no Atari sound. There is little computer interaction. The tapes present the material in reasonable depth, and provide drills with multiple-choice questions. Some of the featured programs cover algebra, decimals and percents, geometry, math for electronics, physics, reading comprehension, various levels of reading development, spelling, United States Government, world history, and writing. 16K; cassette. Educational System Master Cartridge required. Dorsett Educational Systems.

DOS Pronounced D-O-S or "doss." Disk Operating System. A program, or collection of programs, functioning as an operating system whose main secondary storage medium is disk. It usually supplies facilities such as symbolic files, automatic space allocation, dynamic memory allocation, program relocation and loading, and utilities.

DOS Atari BASIC Command. Entering DOS and pressing RETURN will bring the menu of the Disk Operating System to the screen if it has been booted. If not, the computer goes into memory pad mode. Pressing SYSTEM RESET in either case returns to direct mode. The DOS command for the Disk Operating System menu is primarily used in direct mode. It may, however, be used in a program.

DOS-MOD* An enhancement of the Atari DOS 2.0S which greatly improves DOS's capabilities. With full screen menu and easier command functions, the system responds faster, and less effort is required of the user. It has the same memory space as DOS 2.0S, so programs used with that system can be run on this one without changes. There is better control of editing commands, and running programs is easier. The documentation enables the user to incorporate the new system easily. Elipse Software.

DOS Options In the 2.OS version of DOS used on the Atari, the following options (commands) bring the listed results.

DOS Option A—Allows you to examine the contents of a disk's directory file. If you simply press RETURN twice, the entire directory of the disk on drive 1 will be displayed. If you enter a disk drive number at the "SEARCH SPEC,LIST FILE?" prompt, the directory of the disk on that drive will be displayed.

Examples:

```
SELECT ITEM OR RETURN FOR MENU
A (RETURN)
DIRECTORY-SEARCH SPEC,LIST FILE?
(RETURN)   DOSSYS 039
DUPSYS 042
PROGRAM BAS 015
ADDRESS DAT 125
486 FREE SECTORS
```

By typing D2:,P: for search spec and list file, the directory of the diskette on drive 2 will be output to the printer. Wild cards may be used with this option.

DOS Option B—Return control to the cartridge inserted in the cartridge slot, usually BASIC.

DOS Option C—Copy a file or files from one disk to another. Use this if you have more than one disk drive. Wild cards may be used with this option. Examples:

```
PROGRAM,D2:PROGRAM copies PROGRAM
from drive 1 to drive 2.
PROGRAM.BAS,PROGRAM.BAK creates a back-
up copy of PROGRAM.BAS called PROG-
RAM.BAK on drive 1.
PROGRAM.LST,S: displays PROGRAM.LST on
screen.
```

PROGRAM.LST,P: prints PROGRAM.LST on your printer.

PROGRAM1,PROGRAM2/A appends PROGRAM2 to the end of PROGRAM1.

DOS Option D—Delete one or more files on a disk. By adding /N to the end of the file name to be deleted, no verifying will be done. You will get an error if you are trying to delete a locked file (Error 167). Wild cards may be used with this option. Example:

```
SELECT ITEM OR RETURN FOR MENU
D (RETURN)
DELETE FILESPEC
D2:PRO*.BAS (RETURN)
TYPE "Y" TO DELETE...
D2:PROGRAM.BAS?
Y (RETURN)
D2:PRO2.BAS?
Y (RETURN)
SELECT ITEM OR RETURN FOR MENU
```

DOS will delete all files on drive 2 that begin with PRO and have an extension of .BAS.

DOS Option E—Change the name of one or more files. Type in the old name, and the new name. Wild cards may be used with this option. Example:

```
SELECT ITEM OR RETURN FOR MENU
E (RETURN)
RENAME, GIVE OLD NAME,NEW
D2:PRO*.BAS,PRO*.LST (RETURN)
```

DOS will change the extension to .LST on all files on drive 2 that begin with PRO and have an extension of .BAS.

DOS Option F—Write-protect a file or files. A locked file cannot be deleted, renamed, or appended. An asterisk will precede the file name in the directory file to indicate a locked file. Wild cards may be used with this option.

DOS Option G—Allows you to unlock a file or files previously locked by Option F. Wild cards may be used with this option. Example:

```
SELECT ITEM OR RETURN FOR MENU G
(RETURN) WHAT FILE TO UNLOCK?
PRO*.* (RETURN)
```

DOS will unlock all files on drive 1 starting with "PRO".

DOS Option H—Write DOS.SYS and DUP.SYS onto your formatted diskette. No wild cards are permitted with this option. Example:

```
SELECT ITEM OR RETURN FOR MENU
H (RETURN)
DRIVE TO WRITE DOS FILES TO?
```

```
1 (RETURN)
TYPE "Y" TO WRITE DOS TO DRIVE 1.
Y (RETURN)
WRITING NEW DOS FILES
```

DOS Option I—Initialize a previously unused disk, or totally erase or delete all files. If there are any bad sectors, the disk will not format and ERROR 173 will be displayed. The drive will try three times before displaying an error. No wild cards are permitted with this option. Example:

```
SELECT ITEM OR RETURN FOR MENU
I (RETURN)
WHICH DRIVE TO FORMAT?
1 (RETURN)
TYPE "Y" TO FORMAT DISK 1
Y (RETURN)
```

DOS Option J—Copy all files on a disk. The files on the duplicate disk will be located in the same sectors as on the original disk. When using a single disk drive, prompts will be displayed to insert source and destination disk. No wild cards are permitted with this option.Examples:

Single drive system:

```
SELECT ITEM OR RETURN FOR MENU
J (RETURN)
DUP DISK-SOURCE, DEST DRIVES?
1,1 (RETURN)
INSERT SOURCE DISK, TYPE RETURN
TYPE "Y" IF OKAY TO USE PROGRAM AREA?
CAUTION: A "Y" INVALIDATES MEM.SAV
Y (RETURN)
INSERT DESTINATION DISK, TYPE RETURN
(RETURN)
```

Multiple drive system:

```
SELECT ITEM OR RETURN FOR MENU
J RETURN
DUP DISK—SOURCE, DEST DRIVES?
INSERT BOTH DISKS, TYPE RETURN
(RETURN)
```

DOS Option K—Save the contents of memory locations in object code file (binary) format. No wild cards permitted with this option. Example:

```
PROGRAM.OBJ,2F00,7600
```

Saves binary file PROGRAM.OBJ, starting at address 2F00 and ending at address 7600, on drive 1.

DOS Option K—Save the contents of memory locations in object code file (binary) format. No wild cards permitted with this option. Example:

```
PROGRAM.OBJ,2F00,7600
```

Saves binary file PROGRAM.OBJ, starting at address 2F00 and ending at address 7600, on drive 1.

DOS Option L—Load a binary file previously saved

by Option K. If the binary file does not run automatically, Option M (Run at Address) may be used to execute the program.

DOS Option M—Used to run an object code program previously loaded by Option L. Use this option when the starting address has not been appended to the object file. No wild cards permitted with this option.

DOS Option N—Creates a file called MEM.SAV, which will store the lower user memory whenever you call DOS. Saves your program area so you may return to it after using DOS. MEM.SAV can only be created on disk drive 1. No wild cards are permitted with this option.

DOS Option O—Duplicate a file or files using only one disk drive. A prompt will be displayed to insert source disk and destination disk. Wild cards may be used with this option. Examples:

```
SELECT ITEM OR RETURN FOR MENU
O (RETURN)
NAME OF FILE TO MOVE?
PROGRAM.BAS (RETURN)
TYPE "Y" IF OK TO USE PROGRAM AREA
CAUTION:A  x"Y" INVALIDATES MEM.SAV
Y (RETURN)
INSERT SOURCE DISK, TYPE RETURN
(RETURN)
INSERT DESTINATION DISK, TYPE RETURN
(RETURN)
SELECT ITEM OR RETURN FOR MENU
O (RETURN)
NAME OF FILE TO MOVE?
PROG*.* (RETURN)
TYPE "Y" IF OK TO USE PROGRAM AREA
CAUTION:A "Y" INVALIDATES MEM.SAV
Y (RETURN)
INSERT SOURCE DISK, TYPE RETURN
(RETURN)
COPYING—D1:PROGRAM.BAS
INSERT DESTINATION DISK, TYPE RETURN
(RETURN)
INSERT SOURCE DISK, TYPE RETURN
(RETURN)
COPYING—D1:PROGRAM1.LST
INSERT DESTINATION DISK, TYPE RETURN
(RETURN)
INSERT SOURCE DISK, TYPE RETURN
(RETURN)
SELECT ITEM OR RETURN FOR MENU
```

For additional information, see *Atari's DOS Reference Manual, De Re Atari, Atari's Manual, Atari's Operating System User's Manual, Inside Atari DOS.*

DOS Reference Manual* This reference manual is included when you purchase an Atari disk drive. It explains in detail how to operate your disk drive (with many illustrations). Advanced topics are also covered for the more experienced user. Atari, Inc.

DOS XL* Supplies a Disk Operating System that loads below the cartridge area and provides 5K of additional user RAM for a low price. Optimized System Software.

DOS 3.0 Atari's Disk Operating System version 3.0 is used on the 1050 disk drive and the built-in disk drive(s) of the 1450XLD. DOS 3.0 is friendlier than previous versions of Atari DOS. It includes a HELP option that tells you how to use the functions and function keys. A brief overview follows.

To get help on any DOS function, press the Atari logo key or the HELP key, instead of entering the data requested by a screen prompt. Once you've requested help, you may return to the DOS menu by pressing the ESC (escape) key.

To keep RAM usage minimal, certain command programs are stored on the DOS 3.0 Master Diskette, and loaded into RAM as needed. Therefore you must keep a DOS 3.0 Master Diskette on disk drive 1 when selecting any of the following options:

A   ACCESS DOS 2
C   COPY/APPEND
D   DUPLICATE DISK
H   HELP
I   INITIALIZE DISK
X   USER-DEFINED PROGRAM

The following key combinations perform differently than they would in BASIC:

SHIFT/CLEAR will cause a function to restart from the first prompt for user keyboard input.

SHIFT/DELETE will delete your response to the current prompt.

DOS 3.0 COMMANDS The following are commands specific to DOS 3.0:

A—Access DOS 2; C—Copy/Append; D—Duplicate a disk; E—Erase (delete) a file or files; F—Display or print the File index (previously known as the disk directory); G—Go at (run at) the following Hexadecimal address; H—Request HELP; I—Initialize (format) a disk; L—Load a binary or object code file; M—Create a MEM.SAV file; P—Protect (lock) a file or files; R—Rename a file or files; S—Save (binary save) RAM as a disk file; T—Leave DOS and turn over control to the cartridge; U—Unprotect (unlock) a file or files; X—Select a user-defined program.

Dot Matrix A method of forming characters by using small dots. Usually patterns are five by seven, or seven by nine, though for very high quality characters, patterns of eleven by thirteen dots or more are required. Used on displays, printers, and other output devices.

Double Precision Arithmetic Arithmetic operations which double the precision by using twice as many bits to represent numbers. These can include ATN, COS, EXP, LOG, SIN, and SQR.

Double-Density The technique used to store twice as much data on a magnetic storage medium.

Another diskette format is quad-density. Whereas the double-density drives write forty-eight tracks per inch (TPI) of diskette surface (forty-eight TPI), a quad drive writes the tracks twice as close together (ninety-six TPI), putting twice as much data on the disk as double-density and four times as much as single-density.

Double-Line Resolution When each byte of a player missile display occupies two horizontal scan lines on the screen, and each player is 128 bytes long.

Double-Sided Disk or Diskette A type of disk with both surfaces (sides) used for data storage.

Double-Strike Type Format Darker print produced by striking over type a second time. To set an Epson-compatible printer to double-strike mode, enter BASIC statement:

LPRINT CHR$(155);CHR$(199)

To return to normal-strike printing, this mode must be turned off. Enter BASIC statement:

LPRINT CHR$(155);CHR$(200)

Double-Width Type Format To set an Epson-compatible printer in double-width mode, enter BASIC statement:

LPRINT CHR$(142)

To return to normal printing, this mode must be turned off. Enter BASIC statement:

LPRINT CHR$(148)

To start extended printing on the Atari 825 Printer, use:

LPRINT CHR$(27);CHR$(14)

To return to normal letters, enter:

LPRINT CHR$(27);CHR$(15)

See also Type Formats, Atari 825 Printer.

Down Arrow (↓) Pressing CTRL and the down arrow moves the cursor down one line in the same column on the screen. This function is common in text entry and the command entry. See also Control Keys.

Downhill* Guide your skier in a downhill race against the clock through gates and around trees. A paddle is your steering control; the button is your speed control. Four courses offer different levels of difficulty. Downhill requires good hand-eye coordination. 16K cassette or 32K disk. APX.

DOWNLD* This utility copies single-stage boot files and binary load files from disk to cassette. DOWNLD will work with the Assemble/Editor Cartridge to customize a file for cassette. IJG, Inc.

DP Data Processing.

DPDT Double-Pole Double-Throw switch.

DPM Digital Panel Meter.

DPMA Data Processing Management Association
505 Busse Highway
Park Ridge, IL 60068
312-825-8124

Professional organization for managers of larger computer installations. Of interest to managers of programmers, and/or operators who want to learn about management techniques. For more information, find a copy of DPMA Journal at your library or contact DMPA.

DPSK Digital Phase Shift Keying. Encoding digital data with phase differences on a carrier. See Phase.

DPST Double-Pole Single-Throw switch.

Dr. Goodcode's Cavern* A low-key adventure game that requires patience as you move from room to room, avoiding the sonar of the local bats! Documentation and user instructions have some gaps. 40K; disk. Gebelli Software.

Dragon's Eye* You befriend the good magician—leader of the Seven Provinces—by locating the Dragon's Eye before its power can be misused by the evil magician. The graphics are well done, and the monsters are realistic. Children will like this program, because it is entertaining and not too difficult. 40K; disk. Automated Simulations.

Draw Pic* Three modes, plot point, draw line, and "rubberband," let you to draw designs in Graphics modes three to seven. A color register is available for choosing colors. 16K; disk or cassette. Artworx.

Drawit* A user friendly way to turn your Atari into an animated drawing board. This program offers sixteen different colors with eight separate shades. You can draw most any type of graphic design, outlined or filled in. There's a feature to help you create slide shows and a variety of other

graphics presentations, and an animation demonstration is included with the diskette version. 16K; disk or cassette. Atari Program Exchange.

DRAWTO Atari BASIC command. This command causes a line to be drawn from the last point of the previous DRAWTO or PLOT (q.v.) command to the point specified after DRAWTO.
Example:

DRAWTO 12,7

In this case, the line will be drawn to the point whose horizontal coordinate is 12 and whose vertical coordinate is 7, measuring positively to the right and downward from the origin (0,0) at the upper left corner of the screen.

Drive A mechanical and electrical/electronic device which operates a tape transport or a floppy disk. It may include several motors for rotation, head positioning, etc., as well as position sensors, control circuits, lights, and switches.

Drum Rotating magnetic memory similar to disk, but using the surface of a cylinder.

Drumesiser, The* A sound-synthesizing tool that helps you create music. Includes an editor, a player, and memory options. Sar-An Computer Products.

DS Data Strobe. Enters data into a holding register.

Dsembler* An all-purpose utility that deals with Assembler programs and 6502 Machine language allows disassembly, makes hex/decimal conversions, and loads small programs. 24K; cassette. Atari 400 only. Atari Program Exchange.

DSR Data-Set Ready (RS-232C Standard). A line on a modem indicating to the data terminal that the received carier is normal. See RS-232C, CTS.

DTE Data Terminal Equipment. Equipment which receives or originates data, as opposed to Data Communications Equipment, which merely transmits data from one device to another.

DTL Diode Transistor Logic.

DTR Data Terminal Ready (RS232C standard). A line on a terminal indicating to the modem that it is ready to send data. See RS 232C, DSR, CTS.

Dual Intensity A printer or display device which can reproduce symbols in regular and bold-faced or high-lighted formats.

Dual Processors Two CPUs in one computer provides redundancy to increase reliability or productivity, since tasks can be divided and can proceed independently.

Dual-Port Memory Memory equipped with dual data and address connections, plus a binary priority circuit. Primarily used for simple communication between multiple processors. Available in single-chip form for small memory sizes.

Dumb Terminal A low-cost data terminal, ordinarily a CRT, which does not have advanced features, such as editing keys and local processing.

Dummy Input Statement Holds or freezes screen display. To freeze the screen until the operator is done with it, put in a dummy input statement and instruct the operator to press Return to proceed. The input variable need not be used in your program:
1000 PRINT "Press RETURN to continue";:INPUTA$
To freeze the screen briefly while the operator using your program reads a message, just write a delay loop after you print the message:
    1000 FOR Y = 1 TO 2000
    1010 NEXT Y

Dummy Variable A stand-in, which will be altered when replaced by an actual variable name or literal value.

Dump Transfer the contents of one memory device to another. Internal registers can be dumped to memory; memory can be dumped to disk, printer, or screen.

Dunzhin* In this fantasy role-playing game, you are a warrior searching for valuable items in the depths of a monster-infested dungeon. You move the warrior with the keyboard, which tends to become tedious during a long game. The graphics and the game in general are fair. 32K. Screenplay.

Duplex Bi-directional communication method allowing simultaneous data transfers in both directions. May use separate lines or multiplex a single line.

DUT Device Under Test.

DVC File Extension. The extension (the one to three letters after the period) of a file name usually tells you what kind of file it is. DVC is the file extension for a device driver or configuration file for a particular device, such as the Epson printer, a Centronics printer, or a particular modem. See also Extensions.

Dyadic An operation employing two input values such as addition or multiplication. Contrast to a monadic operation with one input value, like squaring.

Dynamic Memory Allocation Varying allocation of memory to multiple concurrent programs, according *to their* needs and a strategy for optimizing performance.
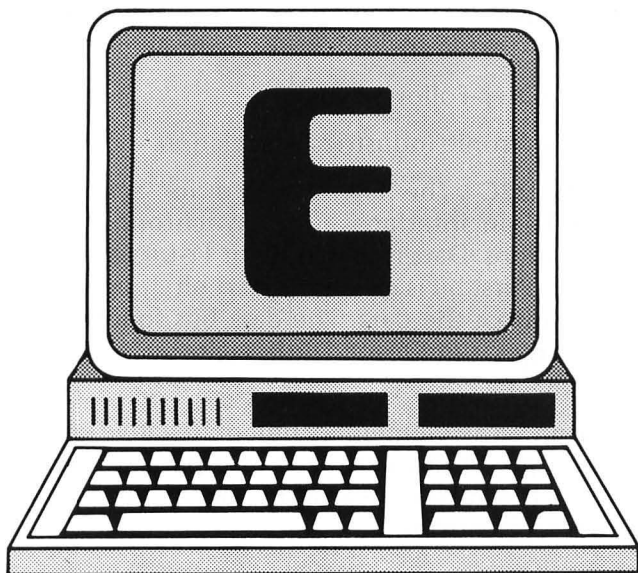
E Codes. ATASCII = 69, HEX = 45. e—ATASCII = 101, HEX = 65.

E See DOS Options.

E DOS 3.0 command to Erase a file or files.

E The hexadecimal symbol for the decimal number 14.

e, Powers of BASIC. Natural logarithms. See EXP.

EA Electronic Arrays.

Earthquake—San Francisco 1906* Race for your life, as the burning buildings crumble around you. Good historic accuracy and graphics. Logic and maze solving skills are the key to escaping the flames. 16K cassette or 32K disk. Adventure International.

Eastern Front* The best-designed computer game of 1981. It is a recreation of Germany's invasion of Russia in 1941. You enter orders from the joystick. The computer makes rapid responses to your attack. The entire battle takes place over a series of twenty screens, from the Polish border to beyond Moscow, and from Leningrad to the Black Sea; the weather changes from Summer through the muddy rains of Autumn to the freezing winds of Winter. Play is divided into one-week segments, and the game lasts forty-one weeks. Magnificent graphics and complicated war strategy, combined with ease of playing makes this game one of the best. 16K cassette or 32K disk. APX.

EBCDIC Pronounced "ep-si-dick." Extended Binary Coded Decimal Interchange Code. The 8-bit code used by IBM on their character set, based on the original punched card codes. Encodes essentially the same characters as ASCII, but with different bit patterns.

E-Beams Electron Beams.

Echo A loop-back or "Echo" technique is used to test the circuits of an input/output device by "looping" whatever is sent out back into the computer as if it were input. In this way, the circuits inside the computer are tested for faults in isolation from the circuits in the external device.

"Echo keyboard to screen" describes the process of sending characters keyed on the keyboard to the screen for a visual confirmation of what has been typed. There are no hard-wired connections between the keyboard and the screen. The keyboard simply enters characters into memory.

ECL Emitter-Coupled Logic.

ECM Electronic Counter Measures.

Edit To change the contents of a program or data file. Editors are classified as line-oriented editors, if they work on one line at a time and deal with text by line number.

Full screen editors, by contrast, allow you to change any data currently displayed on the screen. Most treat paragraphs, or even entire documents, as a unit, allowing reformatting, change of margins with justification, and block moves. Most word processing programs are fullscreen editors.

The BASIC editor lies between these two categories. It allows you to change any BASIC line on the screen, but still treats the data as a collection of lines. You must press RETURN while the cursor is on the line you have changed with the BASIC editor, or the changes are not effective. See also Control Keys.

Edit 6502* A co-resident editor/Assembler on cartridge. The editor is line-oriented and has most of the expected functions. The Assembler is fast, supports standard filespec parameters when addressing any device, will support conditional Assembly, and lists a symbol table. The monitor is also co-resident. LJK.

Editor A program which facilitates the entry and maintenance of text in a computer system. Typical operations include insert word/line, delete word/line, append, search for "string," and substitute. An Editor allows creation and modification *of data.* BASIC, and various word processors, provide for editing any line displayed on the screen. These are called full-screen editors. They are used to create and change text, such as letters, reports, programs

or books. Non-text editors usually display and modify a byte of storage, as either two hexadecimal digits, or a three-digit numeric ASCII value. See Edit.

EDP Electronic Data Processing. Processing data with electronic devices, such as adding machines, calculators, and computers.

Educational Aid Software See Algicalc; Analogies; Astrology; Astro-Quotes; Atari BASIC Subroutines; Atari Kid's Library; Atari Logo Activities Cards; Atlas of Canada; Blackjack Tutor; Block Buster; Calculator; Career Counselor; Character Graphics Tutorial; Chatterbox; Claim to Fame & Sports Derby; Compu-Math; Compu-Math Decimals; Compu-World; Computer Discovery; Connections; Controller; Conversational Spanish/French/German/Italian; Counter; Crossword Magic 2.0; Dorsett Educational Series; Edu-Ware Fractions; Elementary Biology; European Countries & Capitals; Factory: Explorations in Problem Solving, The; Fingerspelling; Flags of Europe; Fraction Program; Frogmaster; Fundamental Word Focus; Fundamentals of Basic Programming; Galactic Travel; Globe Master; GradeCalc; Hickory Dickory; Hi-Res Mastertype; Hodge Podge; Instructional Computing Demonstration; Invitation to Programming #2, An; Invitation to Programming #3, An; Juggle's Rainbow & Juggle's House; Kindercomp; Crell's College Board SAT; Lemonade; Magic Storybook; Market Place, The; Memory Map Tutorial; Monkey Math; Morse Code Tutor; Morsecode Master; Music Box Music Lessons; Music Major; Music 1 Terms and Notations; Musical Computer—A Musical Tutor; Musical Mathematics; My First Alphabet; My Spelling Easel; Polycalc; Prefixes; Presidents of the U.S.; Punctuation Put-On; Quiz Master; Rapid Reader; Sign Language Fun; Snooper Troops #1; Space Shuttle—Module One; Speedread+; Speed Reader; Speedreading; Starware; States and Capitals; Statistics I; Story Machine; Study Quiz File; Teacher's Aid; Three R Math Classroom Kit; Three R Math Home System; Three R Math System; Touch Typing; Tricky Tutorials; Video Math Flashcards; WAIS-R; and WISC-R Computer Report.

Edufun! Programs* This thirteen-program package includes games that teach mathematical skills through graphics. For ages five through twelve. 16K cassette or 32K disk. Edufun.

Edu-Ware Fractions* Parents and teachers set up tests for children with the Learning Manager Master Menu. Fractions are set up in a well-defined table. Post- or pre-test may be selected, as well as the number of questions per exam. 32K cassette or 48K disk. Edu-Ware.

EFL Emitter-Follower Logic.

EIA Electronic Industries Association.

EIA-RS-232C The EIA standard for serial data transmission interfaces for asynchronous communications. Data is sent in 10- or 11-bit serial bundles. The first bit is called the start bit. It signals the beginning of the data. The data bits follow, from least to most significant. The last data bit follows the stop bit.

Electron The elementary unit of negative electrical charge. Often visualized as a particle circling around the nucleus of an atom. Electrical current is a flow of electrons.

Electron Beam A straight beam of electrons used in manufacturing ICs and in CRT display systems.

Electronic Disk Same as RAM Disk (q.v.).

Elementary Biology* Three programs teach the circulatory system of fish, and fundamentals of the food chain. Students experience the fight for survival by pretending they are fish in the depths of the ocean. For grades two through eight. 16K; disk. APX.

Elephant Floppies* The EMS #2 is a 5 ¼-inch floppy diskette, single-sided, double-density, soft sector with hub ring certified 100% error-free. Leading Edge Products, Inc.

Eliminator, The* You speed along above an alien planet in your Eliminator ship, encountering wave after wave of enemy war ships. A lot of fast action, color graphics, and sound effects. 16K cassette or 32K disk. Joystick required. Adventure International.

ELINT ELectronic INTelligence.

Eliza* A non-directive psychotherapist that examines statements as they are typed in, and responds with its own questions or comments. Created at MIT in 1966, Eliza is designed to run on a large mainframe. Until now it has not been available to personal computer users except in condensed versions, which lack the sophistication of the original program. This new microcomputer version possesses all the power and range of expression of the original. Artificial Intelligence Research Group.

Embargo* You must smuggle contraband out of a robot-protected warehouse to a waiting spaceship. Difficulty increases after you've moved ten loads. 16K; cassette. Gebelli Software.

EMI ElectroMagnetic Interference. Interference caused by electrical fields produced by capacitive coupling, or magnetic fields produced by mutual inductance, or electromagnetic fields (e.g. radio waves).

Empire of the Overmind* In this challenging text adventure, you must locate and destroy the Overmind, and win the Princess's love. Use what magic and clues that come your way, as well as the aid of helpful characters. Your path is riddled with hazards, so the adventure is a tough one. 40K; disk or cassette. Avalon Hill.

Emulation Simulation in real time. One computer emulates another by executing an emulator program that makes it interpret the same instructions.

Enable To make a device ready or available to function. Opposite of disable.

Encounter at Questar IV* Fire lasers at the Zentarian as they enter your section. Be careful of the mines they planted near your ship. Difficulty increases with each new attack. 24K; disk or cassette. Artwork.

END A statement indicating the end of a program in several programming languages.

END Atari BASIC Command. When used in a program, this will stop execution of the program, close files, and shut off sounds. Used in direct mode, END will close files and shut off sounds. At the end of a program Atari BASIC automatically closes files and turns off sounds so that typing END is not necessary. A program stopped with END may be resumed with the CONT (q.v.) command.

End Current Line Press RETURN to end the current line, send the line to the requesting program, and put the cursor at the start of the next line. This is valid under DOS and BASIC. See also Control Keys.

End Of Line EOL. BASIC interprets an end of line as a carriage return. The EOL definition as an ASCII character is CHR$(155).

Energy Czar* As the new energy Czar, it is up to you to decide between fossil, nuclear, or solar power for the nation. Political questions arise, taxes must be established, supply and demand must be met, and environmental health must be maintained. At the end, you are either a national hero or out of a job. 16K; cassette. Atari, Inc.

Engineering, Mechanical, Scientific Software See Algicalc, Astrology, Circuit Lab, Graph It, Graph Master, Graphics Composer, Graphics Machine,

Hydraulic Program (HYSYS), Isopleth Map-Making Package, Mapware, and Polycalc.

Enhanced BASIC Commander* All the features of BASIC Commander, but you can also search your BASIC program for any phrase or command, and alphabetize listings of every variable in your BASIC program, with the line numbers in which each appears. 24K; disk. MMG Micro Software.

Enhancements To Graph It* Enhance the graphics created with the ATARI Graph It* program, and store the results on disk. The menu-driven program can load, save, retrieve, change, and erase the designs much faster than before. The screen can not be outputted to the printer. 24K; disk. Atari Program Exchange.

Ennumereight* A strategy game played on a figure-eight-shaped "board." You select a circle, from the board and the number in it is redistributed to other circles. The object is to get all the numbers on one side of the figure-eight, while accumulating points for yourself. There are multiple levels of difficulty, and you can play against the computer or another player. Includes sound effects and graphics. 16K cassette or 24K disk. Atari Program Exchange.

ENQ ENQuiry control character.

ENTER Atari BASIC Command. Loads an untokenized file into memory from cassette or diskette. This file must have been previously LISTed to the storage medium. Unlike LOAD and CLOAD, ENTER does not clear the old program from memory before loading the new one. By using LIST and ENTER, two or more programs may be chained.
Example 1:

ENTER"C:"

Example 2:

ENTER "D:FILENAME"

Example 1 will ENTER a file from cassette, while example 2 will ENTER the file whose file name is after the D:.

Environment The condition of all registers, memory locations, and other locations in a system. Also used to refer to a software environment such as DOS.

EOB End Of Block.

EOF End Of File.

EOR Exclusive OR (XOR). Also Electro-Optical Reconnaissance.

EOT End Of Transmission.

EPROM Pronounced "ee-prom." Erasable Programmable Read-Only Memory. Typically, an ultra-violet-erasable PROM which can be erased by exposing it for several seconds to hard ultraviolet light. It is then reprogrammed with a special PROM programmer and will retain its contents for years. UV-erasable EPROMs have a quartz window over the chip. Other EPROMs are electrically erasable.

Epson Printer—Control Characters BASIC. To set the Epson MX-80 printer's print size, strike method, or number of lines per inch, you must turn on the non-standard type-format by sending control codes to the printer.

To return to the normal 10 characters per inch and 6 lines/inch, the non-standard type size must be turned off. To do this, use the ASCII codes in the following table:

Type Format	Turn On	Turn Off
Compressed	143	146
Double Width	142	148
Emphasized	155,197	155,198
Double Strike	155,199	155,200
72/7 Lines/Inch	155,49	155,50
8 Lines/Inch	155,48	155,50
6 Lines/Inch*	155,50	155,50
72/n Lines/Inch#	155,193, n,155,50	155,193,12, 155,50

* Standard 12 dots per line (72/12 = 6 Lines/Inch) set when the printer is initialized or powered on. Not effective after use of 155,193,n to redefine result.

resets the definition of "Standard." See also Type Formats.

Erase BASIC Program Lines To start a new program, type:

NEW

This completely erases all lines now in BASIC's memory, so if it's something you want to keep and haven't already stored on diskette, SAVE it first. If you don't erase the program in memory before starting on another, you will probably wind up with an unuseable combination of mixed lines from your old and new programs. See NEW, Delete Current Line.

Erase Screen See Clear the Screen.

Error Codes A statement or code printed out or displayed on the screen by a program to let you know what is happening. Error messages tell you something about what went wrong.

ERROR #2—Memory insufficient. There is not enough memory available to perform the desired function.

ERROR #3—Value error. A negative value is detected when it should be positive, or a value is out of the expected range.

ERROR #4—Too many variables. You have exceeded the maximum of 128 variable names allowed.

ERROR #5—String length. The string is lower than the dimensioned value.

ERROR #6—Out of Data. The number of DATA statements in the input program is less than the number of READ statements in the program being run.

ERROR #7—A number greater than the maximum 32767 is being used.

ERROR #8—Input statement error. You are attempting to input a non-numeric value to a numeric variable.

ERROR #9—Array or string DIM error. An array reference is out of the range of the dimensioned size, dimensioned size is larger than 32767, an array or string has not been dimensioned, or is being redimensioned.

ERROR #10—Argument stack overflow. Too many GOSUBs, or too large an expression, is being used.

ERROR #11—Floating point overflow/underflow. Attempting to divide by zero, or reference garbage found in an array.

ERROR #12—Line number not found. A line number referenced in GOSUB, GOTO, or THEN does not exist.

ERROR #13—No matching FOR statement. There is a NEXT statement without a previous FOR.

ERROR #14—Line too long. The statement is too long or too complex for BASIC to handle.

ERROR #15—GOSUB or FOR line deleted. A FOR or GOSUB statement was deleted since the last RUN.

ERROR #16—RETURN error. No matching GOSUB for a RETURN is encountered.

ERROR #17—Garbage error. An execution of bad RAM was attempted. This may be a hardware problem, or caused by the use of an invalid POKE.

ERROR #18—Invalid string character. A string being referenced by the VAL statement does not begin with numeric data.

The following are INPUT/OUTPUT errors:

ERROR #19—LOAD program too long. The program being LOADed is too large for existing memory.

ERROR #20—Device number too large. The device number specified is greater than 7 or equal to 0.

ERROR #21—LOAD file error. You are trying to LOAD a unloadable file.

ERROR #128—BREAK abort. The BREAK key was pressed during I/O operation.

ERROR #129—IOCB (Input/Output Control Block) already open. The specified file number is already OPEN.

ERROR #130—Non-existent device specified.

ERROR #131—IOCB write-only. Trying to READ from a write-only device such as a printer.

ERROR #132—Invalid command. You have issued an invalid command for the specified device.

ERROR #133—Device or file not open. You have tried to use a device that has not been OPENed.

ERROR #134—Bad IOCB number. An illegal device or input/output control block number was used.

ERROR #135—IOCB read-only error. An attempt has been made to WRITE to a read-only device.

ERROR #136—EOF (End Of File). An attempt has been made to read past the end of a file.

ERROR #137—Truncated record. You are trying to read a record that is longer than 256 characters.

ERROR #138—Device timeout. There is no response from an I/O device.

ERROR #139—Device NAK. A disk drive or diskette error or garbage in the serial port.

ERROR #140—Serial bus input error.

ERROR #141—The cursor has been directed to move off the screen or out of range of a particular mode.

ERROR #142—Serial bus data frame overrun.

ERROR #143—Serial bus data frame checksum error.

ERROR #144—Device done error. Usually caused by trying to write on a write-protected disk. It can also indicate bad sector links on diskette.

ERROR #145—Read after write compare error, or bad screen mode handler.

ERROR #146—Function not implemented in handler.

ERROR #147—Insufficient RAM for operation in the selected graphics mode.

ERROR #160—Drive number error.

ERROR #161—Too many OPEN files.

ERROR #162—Disk full. There are no free sectors available on your disk.

ERROR #163—Unrecoverable system data I/O error.

ERROR #164—File number mismatch. Usually caused by bad sector links, or an error during random access updating of a data file.

ERROR #165—File name error. Make sure the file name begins with an uppercase, normal video letter, and does not contain more than eight characters, an optional ".", and then three more characters.

ERROR #166—Point data length error (random access write error).

ERROR #167—File locked.

ERROR #168—Command invalid.

ERROR #169—Directory full. You are trying to write a file to a diskette that already contains the maximum of 64 files.

ERROR #170—File not found. An attempt has been made to LOAD or OPEN a file that was not found on the specified disk. Check your spelling and disk label.

ERROR #171—POINT invalid.

Error Correcting Code   A data storage or transmission code using extra bits, which will automatically detect and correct single or multiple-bit errors.

Error Correction   Methods used to correct erroneous data produced by defective or unreliable data storage and transmission systems.

Error Messages   A statement or code printed out or displayed on the screen by a program to let you know what is happening. Error messages tell you something about what went wrong. See Error Codes.

ESC   ESCape. Makes the terminal and/or processor interpret subsequent characters differently. Escape codes are used to indicate a sequence of control messages in ASCII.

Escape   Enter ASCII 27 (ESCAPE) for printer control in LPRINT statements. This sets lines per inch, page length, and print size. See Type Formats, Atari 825 Printer.

Escape From Traam*   You pilot a spacecraft above the surface of Traam, where the wonders of the planet could ruin your voyage. 16K; cassette. Adventure International.

Escape From Vulcan's Isle*   An adventure game in which you buy supplies from village merchants and try to escape from the island. Recommended for youngsters. 40K; disk. Automated Simulations.

E.T. Phone Home*   Help E.T. locate parts for a transmitter, and signal the exploration crew before he dies. You must keep the government agents away from Elliott and E.T. until they reach the secret landing spot. Features various levels of difficulty. Recommended for eight- to twelve-year-olds; Reese's Pieces not included. 16K; cartridge. Atari, Inc.

ETB   End of Transmission Block.

Ethernet A standard for inter-computer communications networks, developed by Xerox Corporation.

ETX End of TeXt.

EUROMICRO EUROpean Association for MICRO-processing and Microprogramming.

European Countries & Capitals* European nations are displayed one at a time on a map. The student must identify the country, then its capital. 16K; cassette. Atari, Inc.

Even Parity A parity bit added to a byte or word that makes the total number of 1 bits even.

Excess 3 Code. A variation of BCD which uses the binary values of three through twelve to represent the decimal integers zero through nine.

Execute Cycle The third of the fetch-decode-execute cycle for program instruction execution. During this cycle, the actual operation is performed. See Fetch Cycle, Decode Cycle.

Execute BASIC program See RUN, LOAD.

Execution Time The time required to execute an instruction, including fetch-decode-execute. Also refers to the point in the processing of a program when it is given control of the CPU, as contrasted with compile time, link time, and load time.

Exerciser A test system or program which detects malfunctions in memory, disk, tape, or other devices, prior to shipping to customers, or during a maintenance operation.

EXP Atari BASIC Function. Type EXP (EXPonential) followed by a number in parentheses to have the computer calculate the value of e (the base of natural logarithms), raised to the power specified by the number in parentheses. The format is:

$$<variable>=EXP(<x>)$$

Expansion Board A printed circuit board which accommodates components or cards that expand a computer. It is called an expansion chassis if it connects an additional cabinet to the system.

Exponential BASIC. See EXP.

Extended Arithmetic Double-precision floating-point operations. Also used to refer to expanded capabilities, such as built-in trigonometric functions.

Extended fig-FORTH* A version of fig-FORTH used with Starting FORTH by Leo Brodie, to give you a good start in FORTH programming. Many of the extensions in the package are similar to Atari BASIC, giving those familiar with BASIC a slight advantage. A standard fig-FORTH Editor is included,

requiring memorization of many single-character commands. Documentation for the package is sketchy in some aspects. A full listing of implemented FORTH words is not included; however, source screens for all words, except the kernel, are provided. You should be very careful when using the package, as the disk is not write-protected. 16K; cassette or disk. Atari Program Exchange.

Extended WSFN* A language programming package designed around a programming language which does nothing. This is a positive attribute in this case, since the language is only used to teach programming. Programming is based on turtle graphics with simple one-key commands. The package has flaws, because it is an unchanged adaptation of ROM cartridge, but its entertainment and learning values far outweigh these problems. 16K cassette or 24K disk. Atari Program Exchange.

Extension and File Name A DOS file name is one to eight characters in length. It may be preceeded by an optional drive number (separated by a colon). Also, an optional one to three character file extension may follow (separated by a period). The entire specification for a file consists of the three parts (drive):(filename).(extension), and is often called a (filespec) in documentation. Example:

1:COMMAND.COM

You must include the extension for DOS to find the file.

Extensions The last three positions in a disk file name are known as the file name extension. The extension is generally used to define a file as a specific kind of data or program. The following is a list of file name extensions commonly used by Atari:

EXT	DESCRIPTION
	ATARI BASIC (NO EXT.)
ACT	ACTION SOURCE CODE
ASM	ASSEMBLER SOURCE CODE
AWD	ATARI WRITER DATA
BAP	BASIC A+
BAS	ATARI BASIC
BSM	BASM
BXL	BASIC XL
COM	COMMAND FILE OBJECT CODE
CMD	COMMAND FILE OBJECT CODE
DAT	DATA (MISC.)
DOC	ASCII DOCUMENTATION FILE
FIN	FINANCIAL DATA
FNT	FONT (CHARACTER SET DATA)
GR7	SCREEN DATA GRAPHICS 7
GR8	SCREEN DATA GRAPHICS 8

LAB	LABEL DATA
LIB	LIBRARY FILE
LPD	LETTER PERFECT DATA
LST	LISTED Atari BASIC
M65	MAC65 SOURCE CODE
MAC	MACRO
MBD	MUSIC BOX DATA
MPD	MICROPAINTER DATA
MSB	MICROSOFT BASIC
MUS	MUSIC COMPOSER DATA
OBJ	OBJECT CODE
PAS	PASCAL
SCR	SCREEN DATA
SRC	SOURCE CODE
SYN	SYNASSEMBLER SOURCE CODE
SYS	SYSTEM
TMP	TEMPORARY DATA OR PROGRAM
TST	TEST DATA OR PROGRAM
TWD	TEXT WIZARD DATA

External Device Ports Specific addresses provide a connection between the computer's internal processor and an external device, through the computer's ports. Ports are used to attach input and output devices.

External Memory Memory is any device which can store information to be retrieved when needed. The Atari relies primarily on Random Access Memory (RAM), Read-Only Memory (ROM), diskettes, and cassettes. Memory, by itself, usually refers to RAM. This is the general purpose, erasable, and reusable memory located inside the Atari.

ROM contains fixed data, usually programs such as the Atari's cassette BASIC ROMs and its ROM BIOS (BASIC Input/Output System). The ROM BIOS contains the fundamental Machine language programs that run the various devices such as monitor, printer, diskettes, cassettes, etc., that are attached to the Atari. ROM and RAM together make up the internal memory or main memory of the Atari, or any other computer.

This is different from external memory, such as cassette and diskette, which involve mechanical procedures to retrieve data, and are thus hundreds or thousands of times slower than internal memory. Data in internal memory is immediately available to programs for processing. Data in external memory must be copied into internal memory (READ or INPUT), processed, then copied back out to external memory (WRITE or OUTPUT).

If data has been created, it can be written out to external memory without a READ first. And, if data read in from external memory has not been modified, there is no need to write it back out, since the original copy is still there.

While external memory is very slow relative to internal memory, it does have advantages. It is much cheaper per character of data stored on-line (available for processing without manual intervention). In addition, the ability to store external memory data off-line (such as diskettes or cassettes) allows essentially unlimited storage of data. This, of course, requires inserting the diskette or cassette before the data can be loaded into the internal memory for processing.

F-8 Fairchild's 8-bit microprocessor.

Factory: Explorations in Problem Solving, The* You test machines, build a factory, and develop a product, while practicing inductive reasoning skills and understanding sequence, logic, and efficiency-related issues. For fourth grade through adult. 16K; disk. Sunburst Communications.

Fairchild The oldest manufacturer of semiconductors in the Silicon Valley, between San Francisco and San Jose, California.

Family Finances* A two-program household financial planning and management tool. Family Cash Flow helps record your income and expenses. Family Budget helps you create a budget to control your cash flow. The system can accomodate a sizable budget and can be used for financial planning in a variety of situations. You'll learn to set priorities and spend money wisely. The documentation is good, and includes a training session. 32K; disk. Atari BASIC cartridge required. Atari, Inc.

Family Financier* Keep track of the family checkbook and other finacial matters. Allows you to set up files for any purpose, keeping current data on the accounts. 16K. Swifty Software, Inc.

Family Vehicle Expenses* A versatile vehicle management package for the home or small business. You can keep track of six cars with nine expense categories for each. In addition, ten credit cards can be tracked and included in reports. Data is kept monthly for a full year. 48K; disk. Atari Program Exchange.

FAMOS Floating gate Avalanche MOS.

Fancy Fonts* Tricky Tutorial 15. Learn to create custom lettering and characters. There are demonstation programs and listings to help clarify the proceedure. It discusses twenty types of fonts from Greek to Computer print characters. All types of dot matrix printers can be used for the printed output. 16K tape or 32K disk. Educational Software, Inc.

Fan-Fold Paper Continuous sheets of paper joined along perforations and folded in a zigzag fashion. Often used with computer printers, because it can be continuously fed and folded without operator assistance.

Fan-In An electrical load presented to an output by an input.

Fan-Out The electrical load that an output is capable of driving. Ordinarily expressed as the number of inputs that can be driven from a given output signal.

F Codes. ATASCII = 70, HEX = 46. f—ATASCII = 102, HEX = 66

F See DOS Options.

F DOS 3.0 command to display or print the File Index (Disk Directory). See DOS.

F Flag, or the hexadecimal symbol for decimal 15, the largest hexadecimal digit (F base 16 = 15 base 10).

F1 Function Key XL computers only. Pressing F1 causes the cursor to move up one line on the screen. If F1 and SHIFT are pressed, the cursor will go to the HOME position in the upper left corner of the screen. F1 and CTRL act as a switch to enable and disable the keyboard.

F2 Function Key XL computers only. Pressing F2 causes the cursor to move down one position on the screen. If F2 and SHIFT are pressed, the cursor will move to the lower left corner of the screen. F2 and CTRL act as a switch to turn on and off the screen DMA. When screen DMA is off, the computer will process ten to forty percent faster.

F3 Function Key XL computers only. Pressing F3 causes the cursor to move left one position on the screen. If F3 and SHIFT are pressed, the cursor will move to the beginning of the line below. F3 and CTRL act as a switch to turn on and off the key-click.

F4 Function Key XL computer only. Pressing F4 causes the cursor to move right one position on the screen. If F4 and SHIFT are pressed, the cursor will move to the far right of the line below. F4 and CTRL are used to switch from the domestic character set to the international character set.

Fantasy Plaza* A home shopping program for Atari owners. Use your modem to buy various hardware and software products. Fantasy Plaza.

Farad The unit of electrical capacitance. A one-volt-per-second change in voltage across a one-farad capacitor will require 1 ampere of current flow.

Fast Eddie* Score points as you climb the ladder and touch floating objects. Look out for the little critters who are out to stop you. Difficulty increases with each level. 8K; cartridge. Sirius Software.

Fast Fourier Transform Application of the Cooley-Tukey algorithm to Fourier transforms. Allows computation of Fourier transforms with dramatically reduced time and storage requirements.

Fastgammon* The computer is a strong opponent in this backgammon game. Suitable for beginning to intermediate players. The pieces are Xs and Os—not very graphic! 8K; cassette. APX.

Fatal Error A condition occurring during the execution of a program which requires termination of the program.

Fault-Tolerant A program or system capable of correct operation even when one or more of its components have failed. Also called error-tolerant or fail-soft.

FCB See File Control Block.

FCC Federal Communications Commission.

FD Floppy Disk.

FDC Floppy Disk Controller.

FDM Frequency Division Multiplexing.

Feedback One or more outputs of a system is also used as an input in a control loop.

FET Pronounced "fett." Field Effect Transistor.

Fetch Cycle The first cycle in the fetch-decode-execute sequence of instruction execution. During the fetch cycle, the contents of the program counter is placed on the address bus, a Read signal is generated, and the Instruction Pointer is incremented. The data bytes arriving from the memory, i.e., the instruction which has been fetched, will be gated into the Instruction Register of the Control Unit.

FF See Flip-Flop.

FF Form Feed. A control character used with printers which advances the paper so that the top of the next sheet of paper, or the next form, is in position for printing.

FFFF The hexadecimal representation of the maximum simple address value on 8-bit microcomputers: FFFF in base 16 = 65535 in base 10; 177777 in base 8; and 111111111111111 in base 2.

FFT Fast Fourier Transform.

Field A logical grouping of data. It could be a group of related characters in a record (name field); a work area in memory; or, in the CPU, a zone within an instruction, such as op code, address, or comment.

FIFO Pronounced ("fife-oh"). First-In-First-Out structure. Data is added at one end and removed from the other, like cars lined up at a gas station. A fifo buffer is used to connect two devices operating asynchronously at different speeds. Each device is connected to one end of the fifo buffer.

File A logical grouping of information, given an identifying name, and considered as a unit by a user. A file may be divided into records, blocks, or other units, as required by the memory device.

File—Edit. To edit is to change the contents of a file.

Word processing programs and programming languages and software packages sometimes have built-in editing capabilities.

Line-oriented editors work on one line at a time and deal with text by line number. By contrast, full-screen editors allow you to change any data currently displayed on the screen. Most treat paragraphs, or even entire documents, as a unit, allowing reformatting, margins and justification changes, block moves, etc. Most word processing programs are full-screen editors.

The BASIC editor lies between these two categories. It allows you to change any BASIC line on the screen, but still treats the data as a collection of lines. You must press RETURN while the cursor is on a line you have changed with the BASIC editor, or the changes are not effective.

File—Kinds and Extensions File is used in two different ways in computer literature. In the context of DOS and diskettes, it means information stored on a diskette—the contents could be data or a BASIC program. File is also often used to refer to a collection of data, such as a payroll file with records of information on each of a number of employees, regardless of how it is stored. When used in this way, file is short for "data file."

For diskette files, the extension (the 1 to 3 letters after the period) of a file name tends to tell you what kind of file it is. See Extensions.

File, BASIC BASIC programs, identified by the .BAS extension are not executed as programs by DOS. They are interpreted as source code data by the BASIC interpreter, which is itself a program. See BASIC Interpreter.

File, Data A file which contains data to be processed by a program. This is a matter of function rather than content. For example, BASIC program called SAMPLE.BAS is a source program. If you submit it to the BASIC compiler to produce an object program, the BASIC compiler will treat SAMPLE.BAS as its input data, rather than as a program to be executed.

A BASIC source program looks more like a document text file than like an executable program with the .OBJ extension. How a file is used most often determines whether it is a data file; a program; or, in the case of a source program, both. In general, a program file contains some type of program instructions specifying how data is to be processed, while a data file contains the data that will be processed.

File, Delete See DOS Options.

File, Fragmented See Fragmentation.

File, Object See OBJ.

File, Program A program file contains program instructions specifying how data is to be processed. If you write a BASIC program called SAMPLE.BAS, this is a source program. If you then submit it to the BASIC compiler to produce an object program, the BASIC compiler will treat SAMPLE.BAS as its input data rather than as a program to be executed. The BASIC compiler will produce an object file with extension .OBJ, which contains a translation of your source program into the 6502 Machine language.

File, Temporary .TMP is the extension for a temporary file created by system programs. These files are usually deleted upon successful completion of listing or other system processes. See Extensions.

File, Text A file containing character data, letters, numbers, or special characters. These files may have any file extension. By contrast, an object file, such as the .COM file, may contain data which is not displayable as characters. Most data and programs that you write will be in text files. See Data File.

File, Write-Protected Write-protected files are protected from accidental modification or erasure, since some DOS Commands will not find them in the directory of files on the diskette. See DOS Options.

File Control Block An area of memory used by a Disk Operating System to keep track of a file's status, including such information as I/O status, current record, physical sector numbers, etc. Same as IOCB.

File Management Disk maintenance. Includes creating files, finding them by name, insuring that adequate free space is available on the diskette, maintaining backups, and deleting files no longer needed. These tasks are supported by various DOS functions, but thoughtful planning is still necessary to insure proper results.

Some database management systems attempt to automate part of this work by maintaining files of the control and tracking data.

File Management System A group of programs designed to format and manage user files in a transparent way. The system allows symbolic names and attributes, and manages the physical allocation of storage.

File Management System (FMS) The Atari FMS is a program that is also known as DOS.SYS. This is not to be confused with DUP.SYS or the utility programs of the Disk Operating System. FMS loads into RAM when you boot using a DOS master diskette and begins on page seven of RAM. This program controls disk Input/Output functions.

File Manager 800+* A versatile database program offering a variety of functions while storing files and data. It can handle stock portfolios, business inventory, home inventory, mailing labels, or recipe files. A number of help menus can be called from a list of abbreviations displayed on the screen. Setting up the fields within a file is easy, and can be defined as numeric, alphabetic, monetary, computed numeric, and more. Records can be redefined to include new types of data. Outputting the records is simple, either on-screen or printed; there are commands to direct the desired function. 40K; disk. Synapse Software.

File Name A DOS file name is one to eight characters in length. It may be preceded by an optional drive number, separated by a colon. Also, an optional one-to-three-character file extension may follow, separated by a period. The entire specification for a file name consists of the three parts (drive):(filename).(extension) and is often called a (filespec) in documentation. Example:

D1:COMMAND.COM

Only these characters are allowed:

A-Z 0-9

An extension may use the same characters as those allowed in a file name. If any character other than

those listed is used in either the file name or extension, DOS thinks the character is a separator. The file name is truncated from that point and will not be found correctly.

In DOS file names, a question mark (?) and an asterisk (*) can be used as special global file name characters to match a whole group of files, or one file from a partial specification. ? means any single character occurring in this position is considered a match; thus ABC? will match any four-character file name starting with ABC including ABCA, ABCZ, ABCS, etc. * indicates that from this point on in the name any characters (including blanks or none) are considered a match. So ABC* matches everything ABC? matches, plus all longer file names starting with ABC. The file ABCDE will match ABC*. but not ABC?. The file extension is considered a totally separate match, with ? and * used in exactly the same way as in the file name. See Extensions, Wildcard File Name Characters.

File Name Extension Same as Extension. Up to three characters after the "." in a file name. The extension tends to specify the type of file. See Extensions.

File Not Found—DOS Message. The file name entered in the command does not exist on the diskette in the default or specified diskette drive. See Error Codes.

File Separator A special pattern of bits or frequency which separates one file from another on magnetic media such as tape or disk.

File Specification See Filespec.

File-It C* Start your own database system on cassette tape. Any number of files with any type of information can be set up and stored with File-It C. An easy menu helps you use the program to create, store, sort, and edit files. Use it for all your records from financial to deed location, addresses and phone numbers. 16K. Swifty Software, Inc.

File-It 2+* A database package to store information for the home or small business. This is an updated version of File-It C*, with more financial management programs. Records concerning financial matters can be created and updated with the Financial Entry and Financial Report programs. User-defined total fields can be added for "bottom line" figures. Some utility programs provide easy access and updating of user-defined records. Multiple disk storage allows for storage of large data files, while any file can be sorted or merged by field. Graphic display of finacial data is provided by the Bar Graph program, and may be printed. Plenty

of documentation instructs the user in the full use of this package. 32K. Swifty Software, Inc.

Filespec File specification. A complete DOS file name, including the drive, file name, and extension. File specification, file spec or (filespec) is used to show where the file specification goes in a typical command format. A DOS filespec may have three parts:

(filespec) = (drive spec):(filename).(extension)
Example:

D2:FILE2.TXT

(drive spec) is always optional. (extension) may be omitted in some situations where the context provides a clear default value, such as .BAS for BASIC programs and either .COM or .EXE for names entered into the DOS prompt as command names.

Filing Systems for Diskettes* Library cases for diskettes, flip files, etc. Cases hold 100 diskettes, and filing enclosures for tapes and magazines. C.R.C. Wholesale

Fill-N-Bill* Completely automates charging and billing procedures of a dental office with up to sixteen practitioners. Uses the standard ADA codes, and stores 400 patients per disk, with up to 3000 procedures per patient. Extremely user-friendly and completely error trapped, allowing easy use by even computer novices. Produces insurance form output, and a wide variety of reports on all aspects of the practice, including some which are password protected. 48K; diskette or hard-disk. Dual disk drive required. MMG Micro Software.

Final Flight!* One of the best games, Final Flight! is the first real-time flight simulator available for the Atari. All Machine language programming allows real-time views out of the cockpit, and full instrumentation creates a true feeling of flying! Fly in good weather or bad, with or without instruments, at any of four levels of difficulty. 24K; cassette or disk. MMG Micro Software.

Financial Asset Management System* An asset portfolio evaluation tool. Input your asset portfolio for storage and updating, and the program calculates your yields, profits, and new balances. You can also generate reports on dividends and other data. 40K; disk. Printer required. Atari Program Exchange.

Financial Wizard* A home budget/checkbook management program with some limitations. You can have up to twenty-one expense categories but only one income category and one checkbook. However, information in the checkbook may be

searched with up to seven parameters. Includes checkwriting capabilities and bar graphs. 24K; disk. Computari.

Fine Scrolling   Movement of a screen image by one color clock or scan line. Fine scrolling is used in the popular game programs Eastern Front* and Astro Chase*.

Fingerspelling*   Children age four and up will have fun learning and practicing fingerspelling by letter and word. 16K cassette or 24K disk. Atari BASIC cartridge required. Atari Program Exchange.

Firebird*   While Firebird drops firebombs, you must maneuver the firefighting pig up and down a ladder to save the burning building and its occupants. Good graphics and action, but too easy. 16K; cassette. Gebelli Software.

Firmware   A program stored in a ROM. Originally, firmware was used only for microprograms inside the CPU. In microprocessors, many kinds of programs reside in ROM, and firm-ware designates any ROM-implemented program.

Fixed Media for Recording Information   The physical devices used for recording information, such as programs and data files, are called media. The main medium for the Atari is cassette, but diskette, RAM, ROM, and other devices are also used. Media are often classified as:

a) removable media, such as diskettes, cassettes and some hard disks; or

b) fixed media, such as most hard disks.

Fixed media are not removable from the device that drives them, so you can't store additional data or backup copies off-line (outside the computing system) for insertion when needed. See also Memory.

Fixed-Head Disk   A disk system with a head over each track. This eliminates positioning delay time by providing very high speed access, but at high cost.

Fixed-Point Representation   Integer representation with the decimal point assumed to be in a fixed position. Contrast with floating point.

Flag   A status indicator for a special condition. A flag is normally stored in a flip-flop or in a register. Typically, a microprocessor provides at least the following status flags: carry, zero, sign, overflow, and half-carry or auxiliary carry.

Flags of Europe*   A two-part program in which the student may type in the country for each flag, or select it from a multiple-choice list. Correct answers are rewarded with that country's national anthem. An incorrect answer generates a clue—the capital of that country. 40K; disk. Atari Program Exchange.

Flip and Flop*   You begin this eighteen-level game with Flip the kangaroo on a maze representing the "zoo of the future." You must turn on specially marked squares by landing on them. After all the squares are lit, Flip jumps onto a ladder and climbs down to the circus. The second level turns the playfield completely upside down to reveal Mitch the monkey swinging under the maze from square to square. To return to the circus, he too must turn on all the specially marked squares. In level three, Flip meets the zookeeper, who tries to catch him. Flip tries to lure him onto the flashing squares, which are like flypaper. While the zookeeper is stuck, Flip can turn on additional squares. On the fourth level, the flying net chases Mitch the monkey. Again, "the sticky squares" are the only hope. After the fourth level, the maze gets larger and larger. Fine scrolling combined with beautiful graphics makes Flip and Flop a pleasure. By James Nangano. Disk, cassette, or cartridge. First Star Software.

Flip-Flop   A circuit used to store one bit of information. An FF is bistable, with two stable states (0 and 1). Registers are generally assembled out of flip-flops.

Flippy   Another name for a mini-floppy. Also used to describe a single-sided diskette which has been turned (flipped) over to record data on the back side.

Floating Gate   A technique used for ultraviolet-erasable EPROMs. A silicon gate is isolated inside the silicon dioxide.

Floating-Point Package   A set of software routines or hardware features necessary to perform floating-point arithmetic: add, subtract, multiply, normalize. To assure precision, the design of an FPP requires careful analysis of error propagation phenomena.

Floating-Point Representation   Representation of numbers in a fixed length format, such as 24 or 32 bits. The number N is normalized and encoded as a mantissa field M and an exponent field. The name reflects the fact that the representation remains fixed as the decimal point floats, i.e., the changes in magnitude are reflected by adjustment of the exponent field with renormalization of the mantissa field. The precision of the representation is limited by the number of bits allocated to the mantissa field. Contrast with fixed-point.

Floppy Disk A flexible mylar disk (diskette) for mass storage of information. The diskette is sealed in a square plastic jacket, lined with a soft material which cleans the diskette as it rotates. A cut-out slot provides access for the moving head which must actually come in contact with the diskette surface in order to read or write. Other holes in the jacket provide access to sector index holes in the diskette. Diskettes are hard-sectored if the sector start points are marked by holes. Soft-sectored diskettes have only one (or a few) holes to mark the start of the track. The sector start marks are placed on the soft-sectored diskette, under software control, in a process known as formatting.

Diskettes are also classified as single-or double-sided, single-, double-, or quad-density.

Floppy Mini A floppy disk that is 5¼ inches square compared to 8 inches for the original floppy. This is the standard size for the Atari.

Flowchart A symbolic representation of a process. Boxes represent commands or computations. Diamonds represent tests and decisions (branches). A flowchart is a useful step between process specification and program writing. It aids in understanding and debugging the program, by segmenting it into logical, sequential steps.

Floyd of the Jungle* Battle with alligators, forge raging rivers, and avoid hostile natives, in your attempt to save the kidnapped Janice. You'll need a quick eye to swing your way through the jungle. 32K; disk or cassette. Microprose.

Flying Ace* A good game that requires considerable skill as you pilot a World War I biplane. You must attack and destroy enemy trucks carrying ammunition to the front. These trucks are easy targets, but they're protected by anti-aircraft guns and planes. The battlefield, with landing areas at each end, scrolls as you fly. Manipulating the joystick makes the plane's nose drop or rise, and activates the guns. Graphics and sound are minimal. 16K. Avalon Hill.

FMS File Management System.

Font A font is the data that defines a character set. When stored on a diskette, the file name extension .FNT is often used to designate a font file. Font files are usually comprised of 1024 bytes of data.

FOR Atari BASIC Command. This command, together with TO, STEP, and NEXT, sets up a loop in a program and tells the computer how many times to perform the loop before proceeding to the next command.

Format:

```
FOR avar = aexp1 TO aexp2 [STEP aexp3]
NEXT avar
```

Example 1:

```
FOR P = 1 TO 15
NEXT P
```

Example 2:

```
FOR Q = 5 TO 17 STEP 3
NEXT Q
```

Example 3:

```
FOR R = A TO 3*A
NEXT R
```

The loop variable (avar) starts at the value of aexp1 and is increased by the value of aexp3 each time the statement NEXT avar is executed. When avar is over the limit set by aexp2, the program goes to the command immediately after NEXT avar, and the loop is completed. The STEP portion of the command is optional and defaults to a value of 1 for aexp3. Each time the loop is processed, all commands between aexp2, or aexp3 if present, and NEXT will be processed.

In example 1 above, the loop will be performed fifteen times. In example 2, the loop will be performed five times (5, 8, 11, 14, 17). In example 3, the number of loops depends on the value of the variable A.

Loops may be nested within one another. In such cases, each loop will be completed before the next one is started, beginning with the innermost and progressing to the outermost loop.

Forecaster* Helps you make current and future business decisions, based on past experience and performance. This program will permit you to forecast almost anything—costs, prices, test scores, or sales. The program also determines a rating for its prediction, ranging from "invalid" to "excellent". 24K; disk. The Programmers Workshop.

Foreground See Playfield.

Foreground Program In a multi-programming environment, a higher priority program. Also, a program in charge of interfacing with a user or a process.

Forest Fire Two* You are a forest ranger and there is a forest fire somewhere in your twenty-mile district. You have three crews at your disposal: aircraft, heavy land machinery, and a foot unit with portable extinguishers. You position your crews with the joystick and watch the fire's progress on your scanner. The computer provides details such as wind strength and direction. 24K; disk or cassette. Artworx.

Formatter A circuit or program which writes the file marks, track marks, address marks, preambles, postambles, and check characters on external storage media. See DOS Options.

Fort Apocalypse* You fly a helicopter over hazardous lands and down narrow tunnels to rescue your comrades. While you're doing the tricky maneuvering, enemy forces are firing blasters at you. Penetrating the fort is a difficult challenge for the best game player. 32K; disk or cassette. Synapse.

FORTH A programming language and operating system, FORTH is characterized by threaded code and postfix, or reverse Polish notation. FORTH is an extendable language; you can create new commands defined in terms of the existing commands, or in Machine language. Your new commands then become part of the FORTH language in exactly the same way as the standard commands. This feature allows you to build up commands to suit a particular application or type of problem. FORTH is also highly transportable from one microcomputer to another—more so than BASIC and most other languages. FORTH tends to run fast because it is closer to Machine Code than higher level languages like BASIC. FORTH may be somewhat harder to master than BASIC, but it offers many advantages. APX and Valpar International.

FORTH on the Atari* *This book is for the novice* programmer. It explains the advantages and limitations of the language FORTH. Sample programs include: controlling input and output; math applications; sound and color graphics; using the game ports (joysticks and paddles); and a mailing list program. IJG, Inc.

FORTRAN FORmula TRANslator. One of the first high-level languages, FORTRAN is especially popular among scientists and engineers. BASIC is largely based on FORTRAN, using statement numbers and a similar set of commands. The differences are slight and mostly concern Input/Output statements. FORTRAN is rich in mathematical functions, and supports an extended precision calculations mode for scientific problems.

FORTRAN is a compiled language, not interpeted like BASIC. A program is edited in a file, then submitted to a compiler for translation into executable object code. FORTRAN and BASIC are so similar that BASIC could be called an interpreted dialect of FORTRAN.

Fortune Hunter* Similar to the arcade game Venture (tm). You must find the treasure in each of six danger-filled rooms. 16K; cartridge. Romox, Inc.

Fourier Transform The mathematical analysis of a complex wave-form into harmonic components.

FPGA Field Programmable Gate Array.

FPLA Field Programmable Logic Array. A PLA which can be programmed by the user. FPLAs are used to implement the control section of bit-slice processors.

FPLS Field Programmable Logic Sequence.

FPP Floating-Point Package.

Fraction Factory* A sound and graphics tutorial for primary graders. Lessons include simple multiplication, addition, and subtraction of fractions. Disk. Counterpoint Software, Inc.

Fraction Program* Perfect your ability to perform fraction mathematics. Add, subtract, convert, multiply, or divide them with ease. 16K cassette or 24K disk. Peninsula Instant Replay.

Fragmentation When mass memory (diskette, hard disk, cassettes, etc.) is used in such a way that it has many unallocated areas (fragments) that are too small to be useful. The remedy for fragmentation is combining all of the unallocated areas to make one large block.

Frame The necessary underlying structure for a record, file, or other data item. The frame creates an organization within which the data takes its place.

FRE Atari BASIC Function. Gets the number of bytes of unused RAM still available in the computer's memory. FRE can be used in direct or deferred mode, but is most frequently used in direct mode when a programmer wants to ascertain whether the computer has enough memory left to complete a program. Format:

$$FRE(<aexp>)$$

Example 1:

$$PRINT\ FRE(0)$$

Example 2:

$$1000\ DIM\ A\$(FRE(0)-1024)$$

In Format, $<aexp>$ is a dummy variable. Any number may be inserted, but a number must be inserted. Example 1 shows how to get the number of available RAM bytes printed on the screen in direct mode. Example 2 shows how the FRE function might be used in a program to dimension the string A$ to the current amount of available RAM less 1024 bytes (1K).

Freeze Screen Display To freeze the screen briefly while the operator using your program reads a

message, just write a delay loop after you print the message:

```
1000 REM Pause 1 second
1010 POKE 540,60
1020 IF PEEK (540) THEN 1020
1030 REM 1 second elapsed
```

To freeze the screen until the operator is done with it, put in a dummy input statement and instruct the operator to press RETURN to proceed. The input variable need not be used in your program:

```
1000 PRINT "Press RETURN
    to continue";:INPUTA$
```

Freeze System Operation   CTRL/1 acts as a toggle to freeze and continue operation. See also Control Keys.

Frequency   Cycles per second. F = 1/T where T is the period in seconds over which cycles are counted.

Frogger*   Atari's version of the Sega-Gremlin arcade game. You must maneuver your frog across a busy street and then across a river by jumping on passing logs and turtles. Various skill levels are available. 16K cassette or 32K disk. Sierra On-Line.

Frogmaster*   Learn the concept of conditioning as tadpoles grow and adapt to the environment, then mature, lay eggs, and die. It is done in a game-like fashion, as teams of tadpoles jump their way to the opposition's goal. Designed for young children. 24K; disk. APX.

Front-End Processor   A processor which acts as an interface with the user or a process. The front-end may perform pre-processing translations or file handling, while the main processor performs interpretation, execution, or other processing.

Frozen Keyboard   SYSTEM RESET resets the system. Upon resetting the system and reloading DOS, any applications program will be stopped, and any current work on a BASIC program not previously saved will be lost, erased from internal memory. See also Control Keys.

FS   File Separator.

FSC   Full SCale range.

FSK   Frequency Shift Keying. Zero is represented by one frequency, and one is a different frequency. These two tones are transmitted over telephone or radio links and converted back to digital signals upon reception. See also Modem.

Full Duplex   A communication technique which allows data to be transmitted and received simultaneously.

Full-Screen Editor   Editing is changing the contents of a file. Editing programs, such as word processors, have built-in editing capabilities.

Editors are classified as line-oriented editors if they work on one line at a time and deal with text by line number. By contrast, full-screen editors allow you to change any data displayed on the screen. Most treat a paragraph, or even an entire document, as a unit, allowing reformatting, margins, and justification changes, block moves, etc. Most word processing programs are full-screen editors. See also Edit, Cursor.

FULMAP*   A BASIC program cross-reference utility. It provides a variable cross-reference, a cross-reference of the constants used, and a map of the line numbers referred to. May be used with the BASIC cartridge, Atari Assembler Editor cartridge, or no cartridge at all. 40K; cassette or disk. Vervan Software.

Fun n' Games*   A package of games for having fun with your Atari. Leapfrog is a takeoff on Chinese Checkers, with colorful frogs jumping on the screen. In Wordjumble, you must unscramble a word with the help of "play-on-word" hints and hidden clues. You can create your own scrambled words for added fun. Possible gives all possible words compiled from a given set of letters. A good helper for creating your own wordjumble puzzles. In Guessit, the players try to find the mystery word one letter at a time. One or two players can play, and you can expand the vocabulary. Votrax (q.v.) is supported by Guessit in the disk version. 16K cassette or 24K disk. Swifty Software, Inc.

Function   A unit of data processing work, such as deletion of a character of text, copying a file, or executing a program. Often many functions supported by a software package are listed in a "menu" to facilitate locating and requesting a desired function.

Fundamental   The base or carrier signal on which a data signal will be superimposed. It is usually a pure sine wave with no distortion.

Fundamental Word Focus*   A series of ten programs that offers practice and testing in word analysis skills. Subjects include vowels, prefixes and suffixes, compound words, syllabification, and alphabetical order. Each program is like a game and uses color graphics and sound to highlight its multilevel format. For first through ninth graders. 48K; disk. Random House School Division.

Fundamentals of Basic Programming*   Introduces users to Atari BASIC and the computer through a

six-lesson tutorial. Teaches the keyboard, BASIC keywords, math functions, line numbering and editing, numeric and string variable concepts, and simple color and sound functions. There is a voice tutor on the tape to go along with the visuals on the screen. 8K; cassette. Atari, Inc.

F/V Frequency-to-Voltage Converter.
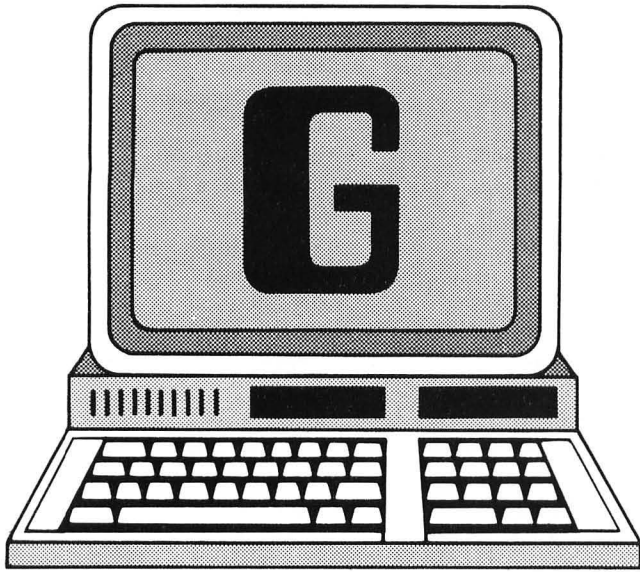
G Codes. ATASCII = 71, Hex = 47. g—ATASCII = 103, Hex 67

G See DOS Options.

G DOS 3.0 command to Go at (run at) the following HEX address.

G Ground. Also Generate signal. The output from an adder connected to a carry look-ahead circuit. It requires a propagate signal.

Gain The output-to-input amplification ratio.

Galactic Avenger* This is a blast-him-out-of-the-sky game for eight-to ten-year-olds. Three rows of enemy ships are lined up and ready to fire. They speed up as their casualty list grows. 16K cassette or 32K disk. Cosmi.

Galactic Chase* Aliens line up at the top of the screen waiting to attack. After the battle has begun, they reform their ranks if they're not shot down. 16K; disk or cassette. Prism Computers.

Galactic Travel* This space travel simulation program teaches students about the stars and galaxies. Also teaches three-dimensional Cartesian and polar coordinate systems. 48K; disk. Centurion Software.

Galahad and the Holy Grail* An arcade-style adventure game in which Knights of the Round Table search for the Holy Grail. Includes two levels of difficulty, with fights, mazes, traps, and secret portals. It's a very difficult and challenging game, but it contains some programming errors. 32K; disk. Atari Program Exchange.

Galaxians* A version of Space Invaders with several skill levels. A fleet of Galaxians arrive from outer space to attack Earth. Your defense team consists of five earthships. The attacking force is five rows deep. Pleasant and fun. 16K. Atari, Inc.

Games*

A2-PB1 Pinball	Abuse
Acey-Deucey	Action Quest
Adventure	Adventure on a Boat
Adventureland Saga #1	Adventures of Proto, The
A.E.	Air Traffic Controller
Airline	Airstrike
Air-Raid	Alexander the Great
Algebra Arcade	Ali Baba and the Forty Thieves
Alien Ambush	Alien Egg
Alien Garden	Alien Hell
Alien Swarm	Amphibian
Andromeda	Anteater
Anti-Sub Patrol	Apple Panic
Archon	Arena 3000
Arex	Assault on the Astral Rift
Asteroid Miners	Asteroid Miners Tutorial
Asteroids	Astro Chase
Astron IV	Astrowarriors
Atari Kid's Library	Atlantis
Attack at EP-CYG-4	Attank!
Avalanche	Aztec Challenge
Baccarat	Backgammon 2.0
Baja Buggies	Bandits
Basketball	Bean Machine, The
Beta Fighters	Bishop's Square/Maxwell's Demon
Black Forest, The	Blackjack
Blade of Blackpoole, The	Block Buster
Block 'Em	Boing
Bootleg	Botticelli
Bridge 2.0	Bristles
Bridgemaster	Bruce Lee
Bug Attack	Bug Off
Bulldog Pinball	Bumper Pool
Buried Bucks	Can't Quit
Canyon Climber	Captain Cosmo
Carnival	Castle
Castle Wolfenstein	Caverns of Mars
Centipede	Chatterbee
Checker King	Checkers
Chess 7.0	Chicken
Chinese Puzzle	Choplifter
Chopper Rescue	Claim Jumper
Claim to Fame & Sports Derby	Clipper
Clowns and Balloons	Codecracker
Codename: Cobalt	Commbat
Computer Chess	Connections
Controller	Convoy Raider
Count with Bunky	Creepy Corridors
Cribbage	Crisis Mountain
Crossfire	Crossword Magic 2.0
Crush, Crumble, and Chomp	Crypt of the Undead
Crypts of Plumbous	Crypts of Terror
Curse of Crowley Manor, The	Curse of Ra
Cyborg	Cyclod

Cypher Bowl
Darts
David's Midnight Magic
Defender
Demon Attack
Dice Poker
Diggerbonk
Dog Daze
Downhill
Dragon's Eye
Earthquake–San Francisco 1906
Edufun! Programs
Embargo
Encounter at Questar IV
Ennumereight
Escape from Vulcan's Isle
European Countries & Capitals
Fastgammon
Firebird
Flip and Flop
Flying Ace
Fort Apocalypse
Fraction Factory
Frogmaster
Fundamental Word Focus
Galactic Chase
Galaxians
Getaway
Ghost Hunter
Go
Gorf
Guns of Fort Defiance
Gypsy
Haunted Hill
Hearts
Hellcat Ace
Hexmaster
Hi Score Database
Hodge Podge
Institute, The
Jawbreaker
Jax-O
Jerry White's Game Machine
Juice
Jumpman
Kayos
Kindercomp
Kingdom
K-Razy Kritters
K-Star Patrol
Labyrinth of Crete
Lemonade
Lifespan
Lost Colony
Lunar Lander
Mad Netter
Mar Tesoro
Market Place, The
Matchboxes

Dandy
Datastones of Ryn
Deadline
Deluxe Invaders
Devil's Dare
Dig Dug
Dodge Racer
Donkey Kong
Dr. Goodcode's Cavern
Dunzhin
Eastern Front
Eliminator, The
Empire of the Overmind
Energy Czar
Escape from Traam
E.T. Phone Home
Fast Eddie
Final Flight
Flags of Europe
Floyd of the Jungle
Forest Fire Two
Fortune Hunter
Frogger
Fun 'n Games
Galactic Avenger
Galahad and the Holy Grail
Genetic Drift
Ghost Encounters
Ghostly Manor
Golden Gloves
Guardian of the Gorn
Gwendolyn
Hangman
Hazard Run
Heathcliff
Hellfire Warrior
Hi-Res Mastertype
Hockey
Hot Lips
Intruder
Jawbreaker II
Jeepers Creepers
Journey to the Planets
Jumbo Jet Pilot
Kaiv
Kid Grid
King Arthur's Heir
K-Razy Antics
K-Razy Shoot Out
Labyrinth
Legionaire
Letterman
Lookahead
Lucifer's Realm
Lunar Leepers
Mania Miner
Marauder
Match Racer
Mathematic Tic-Tac-Toe

Maze of Death
Memory Match
Metric & Problem Solving
Midas Touch, The
Miner 2049er
Missile Command
Monkey Math
Monster Maze
Moonbase Io
Motocross
Mr. Cool
Name that Song
Necromancer
Nuclear Bomber
Number Blast
Operation Whirlwind
Pacific Coast Highway
Paris in Danger
Pharaoh's Curse
Phobos
Picnic Paranoia
Pinhead
Planet Miners
Plattermania
Poker Tourney
Pool
Pool 400
Preppie II
Preschool Library, The
Pro Bowling
Protector
Pushover
QS Reversi
Rabbotz
Rally Speedway
Rat Race
Rear Guard
Rescue at Rigel
Reversal
Rhymes and Riddles
Robby The Robot Catcher
Safetyline
Salmon Run
Sargon II
Scram
Sea Bandit
Sea Fox
Serpentine
Shamus
Shooting Arcade
Sleazy Adventure
Smasher
Snapper, The
Sneakers
Snooper Troops #1
Solitaire
Space Chase
Space Invaders
Spare Change
Spider Invasion

Meltdown
Meteor Storm
Microsailing
Midway Campaign
Minotaur
Mission: Asteroid
Monkey Up a Tree
Moon Patrol
Morloc's Tower
Mousekattack
Mugwump
Nautilus
Nominos Jigsaw
Nukewar
Odin
Outlaw/Howitzer
Pac-Man
Pathfinder
Pharoh's Pyramid
Phoenix Lair
Pilot
Pirate Adventure Saga #2
Plato's Cave
Pogoman
Pokersam
Pool 1.5
Preppie
Preschool Games
Princess and the Frog
Pro Golf
Protector II
Qix
Quarxon
Race in Space
Raster Blaster
Reading Flight
Rent Wars
Rescue at 94K
Reversi II
Ricochet
Robin's Halloween
Saigon: The Final Days
Sammy the Sea Serpent
Scott Adams' Adventure Series
Scraper Caper
Sea Dragon
Sentinel One
Seven Card Stud
Shattered Alliance
Sky Blazer
Slime
Snake Byte
Snark Hunt
Snokie
Soccer
Space Ace
Space Eggs
Space Shuttle—Module One
Speedway Blast
Spy's Demise

Star Island
Star Sentry
Starbowl Football
StarQuest/StarWarriors
Stocks and Bonds
Story Machine
Streets of the City/Trucker
Stun Trap
Sultan's Palace
Super Breakout
Survival
Suspended
Tact Trek
Temple of Apshai
Thunder Island
Timber
Time Trials
Treasure Quest
Trion
Tumblebugs
Tutti Frutti
Typo Attack!
Ulysses & the Golden Fleece
Vaults of Zurich
War
What's Different
Wizard of Wor
Word Race
Wordmaker
Zeppelin
Zork I
Zork III
747 Landing Simulator

Star Raiders
Starbase Hyperion
Starcross
Stellar Shuttle
Stone of Sisyphus
Stratos
Strip Poker
Submarine Commander
Sunday Golf
Super Cubes and Slip
Survivor
Swamp Chomp
Tax Dodge
Threshold
Tigers in the Snow
Time Runner
Track Attack
Triad
Trivia Trek
Turmoil
Tycoon
Ultima I
Valdez
Wallwar
Wayout
Wizard and the Princess, The
Wizard's Gold
Word Wiz
Zaxxon
Zombies
Zork II
3-D Tic-Tac-Toe

Games for the Atari* This book explains the fundamentals of game programming. Subjects include drawing and moving figures in BASIC and Machine language, collision detecting, sounds and special effects, listings for nine games. IJG, Inc.

Games—Primary Education Level

Adventures of Proto, The
Asteroid Miners Tutorial
Botticelli
Claim to Fame & Sports Derby
Count with Bunky
European Countries & Capitals
Forest Fire Two
Fundamental Word Focus
Hodge Podge
Kindercomp
Lifespan
Mathematic Tic-Tac-Toe
Monkey Math
Number Blast
Preschool Library, The
Snooper Troops #1
Story Machine
Trivia Trek
What's Different
Wordmaster

Alexander the Great
Atari Kid's Library
Chatterbee
Connections
Edufun! Programs
Fraction Factory
Frogmaster
Hi-Res Mastertype
Jerry White's Game Machine
Lemonade
Market Place, The
Metric & Problem Solving
Monkey Up a Tree
Preschool Games
Rhymes and Riddles
Space Shuttle—Module One
Time Trials
Typo Attack!
Word Race

Games—Secondary Education Level

Air Traffic Controller
Algebra Arcade
Botticelli
Claim to Fame & Sports Derby
Controller
European States & Capitals
Forest Fire Two
Hi-Res Mastertype
Jumbo Jet Pilot
Mathematic Tic-Tac-Toe
Pilot
Snooper Troops #1
Streets of the City/Trucker
Typo Attack!
Word Wiz
747 Landing Simulator

Alexander the Great
Alien Garden
Chatterbee
Connections
Crossword Magic 2.0
Flags of Europe
Fundamental Word Focus
Jerry White's Game Machine
Lifespan
Microsailing
Snark Hunt
Space Shuttle—Module One
Trivia Trek
Word Race
Wordmaker

Gap The space between two records or two blocks of information in magnetic media. A gap is usually set to a predetermined value, such as "ones." It allows blocks to be rewritten in a slightly expanded or reduced format, due to speed variations of the drive.

Garbage Collection A technique for collecting unavailable, unused space in a mass memory and making it available for reuse.

Gate A single logic function. The NAND, NOR, AND, OR, XOR, and NOT functions are examples of gates.

Gauss A unit of flux density (1 Maxwell per square cm.), named for German mathematician Karl F. Gauss.

GCR Group Coded Recording.

GE General Electric. Also Greater than or Equal to (represented by $\geq$ or $=>$).

Genesis* With only three lives, you, the scorpion, must keep insects from invading your domain. If the deadly sting of your tail misses a target, you lose one of your lives. Cassette, cartridge, or disk. Datasoft.

Genesis II* This book by Dale Peterson describes how artists, musicians, and writers use computers in their creative endeavors. Very well illustrated. Reston Software.

Genetic Drift* An arcade-style game that requires rapid reflexes. A space fortress is being attacked. You must shoot down the attacking missiles and change them into what the author considers a benign life form: TV sets. Good graphics are featured in this enjoyable game. 16K; 32K. Broderbund.

GET Atari BASIC Command. GET reads the byte (ATASCII 0-255) at the cursor position and stores it as an arithmetic variable. An input/output control block (#1-#7) is used.
Format:

GET#aexp,avar

Example:

GET#2,V

In this example, the ATASCII code number for the character at the current cursor position will be stored as the variable V.

Getaway* A maze chase game where thieves roam a town searching for loot. The town, which is protected by four police cars, is illustrated with thirty-five scrolling screens. You can advance to the next level when the stolen money has been returned to the hideout. This game features colorful graphics and requires sharp wits and good driving skills. 32K. Atari Program Exchange.

Ghost Encounters* A sequel to Action Quest*. This game is more adventurous because the puzzles are more complex. The ghost can be transformed into whatever is necessary to solve the puzzles, if the appropriate key is pressed. Like Action Quest, it may take several hours to solve all the puzzles and get to the treasure. 16K; cassette or disk. JV Software.

Ghost Hunter* The ghost hunter negotiates the maze, eats dots, and evades ghosts under the player's joystick control. Can be played by two people simultaneously on the same screen. The players have a choice of sixteen different mazes in which to play. 16K; disk or cassette. Arcade Plus.

Ghostly Manor* Find the magic key among the objects in each room. There are friendly spirits, as well as evil ones, and the only way out of each room is with the right key. This game uses sound effects and provides clues when you're stuck. For children. 32K; disk. Sublogic.

GI General Instruments, a manufacturer.

Gibson Mix A statistically balanced mix of instructions that is representative of general data processing applications. It is one of many similar variations used for benchmark testing.

Glitch A pulse or burst of noise. A small pulse of noise is called a snivitz. The word glitch is usually reserved for the more dangerous types of noise pulses which cause crashes and failures.

Global File Name Characters In DOS, question mark (?) and asterisk (*) can be used as special "wildcard" characters when searching to allow matching a whole group of files (or one file) from a partial specification. ? means any single character occurring in this position is considered a match; thus ABC? will match any four-character file name starting with ABC, including ABCA, ABCZ, ABCS, etc. * indicated that from this point on in the name any characters (including blanks or none) are considered a match. So ABC* matches everthing ABC? matches, plus all longer file names starting with ABC. The file ABCDE will match ABC*, but not ABC?

The file extension is considered a totally separate match, with ? and * used in exactly the same way as in the file name. Global file name characters can be used in many DOS commands. Global file name characters are not allowed in a command name. They may only be used in command parameters.

Global Variable A variable whose name and value are accessible throughout the program or application system. Contrast with a local variable, accessible only within the block where it is defined.

Globe Master* Test your knowledge of world geography with this nine-game, high-resolution package. Learn capitals, lakes, countries, and more. Maps are wonderfully colored. 32K; disk. Versa Computing.

GND GrouND.

Go* The ancient Oriental game of strategy has made it into the computer age. The object is to control as much of the board as you can while losing as few of your pieces as possible. You can play against the computer or another person. The rules seem simple, but it's difficult to master. 32K; cassette, disk. Hayden Software.

Going to the Dogs* A handicapping program for dog racing enthusiasts. 24K; disk. Atari BASIC cartridge requied. Atari Program Exchange.

Golden Gloves* Enter the ring with a friend or challenge the computer. It's difficult to use any strategy—just punch as much as you can. 16K cassette or 32K disk. Artworx.

Gorf* A four-game package in which one or two players try to destroy the Gorfian Empire. Included are Astro Battles, Laser Attack, Space Warp, and Flag Ship. Difficulty increases with score. 16K; disk or cartridge. Roklan.

GOSUB Atari BASIC Command. A consecutive series of commands to compute a certain value, print a certain message on the screen, etc., is called a subroutine.

When a subroutine is needed several times in a program, you can save memory and time by not rewriting it. The GOSUB statement allows you to write the subroutine once and call it up for processing at any point in the program where it is needed. This procedure also makes programs easier to read and debug.

GOSUB, followed by a number will send the program to the line bearing that number, which should be the first line of the subroutine you want. The last statement of the subroutine must be RETURN. The RETURN statement sends the program back to the physical line after the GOSUB statement. The subroutine may be placed anywhere in the program. It is good practice to place an END statement on the line immediately before the beginning of the subroutine to prevent starting the subroutine when you don't want it. The following program illustrates the use of GOSUB:

```
50 PRINT CHR$(125):POKE 752,1
60 X=1:GOSUB 500
70 X=2:GOSUB 500
80 X=3:GOSUB 500
90 X=4:GOSUB 500
100 X=5:GOSUB 500
110 GOTO 110
490 END
500 Y=X*2:Z=X*3
510 PRINT X,Y,Z
520 RETURN
```

Line 50 clears the screen and eliminates the cursor. Line 110 holds the table on the screen without going to the READY prompt. Running this program will bring the following table to the screen:

	2	3
2	4	6
3	6	9
4	8	12
5	10	15

GOTO (or GO TO) A branch instruction in a high-level language.

GOTO Atari BASIC Statement. GOTO followed by a number branches the program to the number. The program then continues by consecutive line numbers unless branched again. A GOTO branch to a preceding line may start an endless loop. Statements after a GOTO statement, but before the target line, will not be executed unless there is a branch after the target line back to the intervening lines.

GP General Purpose.

GPIB General Purpose Interface Bus. The IEEE 488-1975 interface bus standard. Also called ANSI Standard MC 1.1-1975, or the IEC Bus in Europe.

GradeCalc* Helps teachers keep grades and attendance records. Averages grades by several methods. 40K; disk. Tamarack Software.

Graph It* Lets you plot mathematical and statistical data. Features include ten-column bar charts, twelve-segment pie charts, and two-dimensional arithmetic graphs. 16K; cassette. Atari, Inc.

Graph Master* Create professional looking charts. Graphic images can be drawn on one side of the screen and later transferred to the other, which contains the desired design. Unfortunately limited to graphics mode eight. 40K; disk. Datasoft.

Graphic Generator* A utility package that creates and edits character sets for the user's BASIC and Assembly language program. Uses a grid and joystick to define the shape or character, while a set of shapes can be defined for animation. Colors can also be incorporated into the design process. 32K; disk. Joystick required. Datasoft.

Graphic Master* Eight different sized paintbrushes and ten colors will help you to graphically display almost any image. Figures may also be skewed or rotated. 40K; disk. Datasoft.

Graphic Titler* Most screen-drawing utilities allow pictures to be produced, but not text. Graphic Titler allows both on the same screen! It also has the capability to scroll the text horizontally or vertically, within your own BASIC program. Make the text any size or form, from tiny to so large one letter can fill your screen. For drawing, the REPLICATE command allows you to draw a figure once, then duplicate it anywhere with a single keystroke. Even adds text to pictures produced with other utilities. 24K; disk. MMG Micro Software.

Graphics BASIC. See BASIC Statements, DRAWTO, COLOR.

GRAPHICS Atari BASIC Command. GRAPHICS, followed by a number, is used to select one of the eight Atari graphics modes. If 16 is added to the number for modes 1 through 8, the text window will be eliminated. The command "GRAPHICS 0" will clear the screen and return to the GRAPHICS 0 mode. Adding 32 to the number for the GRAPHICS mode will prevent the GRAPHICS command from clearing the screen.

Graphics Composer* A graphics package which allows you to draw, color, and write. Design and

document geometric shapes for engineering or scientific purposes. 32K; cassette or disk. Versa Computing.

Graphics Indirection This feature of Atari computers allows indirect pointers to determine color and character set values.

Graphics Machine* Create your own graphics with the help of this software package. Draw a variety of geometric shapes on the screen and include text. Drawings can be changed, saved for later use, or erased. A HELP command will let you access a menu at any time during the process. 48K; disk. Educational Software, Inc.

Graphics Packages See AESD II; Atari Touch Table; Atari World; Basics of Animation; Block Buster; Character Graphics Tutorial; Colortrack and Soundtrack; *COMPUTE's First Book of Atari Graphics; COMPUTE's Second Book of Atari Graphics*; Display Lists; Draw Pic; Drawit; Enhancements to Graph It; Graph It; Graph Master; Graphic Master; Graphic Titler; Graphics Composer; Graphics Machine; GTIA Draw; Horizontal & Vertical Scrolling; Kaleidoscope; Micro Painter; Movie Maker; Paint; Player Generator; Player Missile Editor; Player Missile Graphics; pm Animator; Screen Printer Interface; Softeach for UCSC Pascal; Stereo 3-D Graphics; Ultimate Player Missile Editor, The; Video Easel; Video Kaleidoscope; 3-D Supergraphics & Color Game Development System.

Graphics Tutorial The following programs will teach you a great deal about Atari graphics. The REM statements will give you guidance, but the real learning comes from keying in and running the program to see what happens.
CIRCLE PLOT:

```
100 REM CIRCLE PLOT BY JERRY WHITE
110 REM
120 GRAPHICS 24:SETCOLOR 2,0,0:COLOR 1
130 FOR ME=0 TO 360:PLOT COS(ME)*79.4+
    160,80-SIN(ME)*79.4:NEXT ME
140 FOR BUZZ=0 TO 8:POKE 53279,BUZZ:NEXT
    BUZZ:REM BUZZ SPEAKER
150 REM
160 REM PRESS START KEY TO EXIT
170 REM
180 IF PEEK(53279)≠6 THEN 180
190 GRAPHICS 0:LIST:?:?"BASIC":?"IS";:END
```

PMLOGO:

```
0 GOTO 19:REM PMLOGO BY JERRY WHITE
10 S=STICK(0):IF S=15 THEN 15
11 IF S=13 THEN J=USR(ADR(PM2$),P0):REM
   DOWN
12 IF S=14 THEN J=USR(ADR(PM2$)+26,P0):REM
   UP
13 IF S=11 THEN H=H-1:H1=H+8:J=USR(ADR-
   (PM2H$),H,H1):REM LEFT
14 IF S=7 THEN H=H+1:H1=H+8:J=USR(ADR-
   (PM2H$),H,H1):REM RIGHT
15 IFNOT STRIG(0) THEN POKE 623,4:GOTO
   10:REM PLAYERS APPEAR BEHIND TEXT
16 POKE 623,1:GOTO 10:REM PLAYERS
   APPEAR IN FRONT OF TEXT
19 GRAPHICS 17:POKE 712,0:POKE 708,140:?
   #6:? #6;"P/M GRAPHICS DEMO":
   ? #6:? #6;"BY JERRY WHITE"
20 DIM PM2$(52):REM 2 PLAYER VERTICAL
   MOVE
22 DIM PM2H$(12):REM 2 PLAYER HORIZ-
   ONTAL MOVE
23 DIM PL0$(20),PL1$(20):REM PLAYERS FOR
   SWIFTY LOGO
30 REM MOVE CHARACTER ROUTINE TO
   CLEAR P/M AREA (USED AT LINE 2420)
32 DIM MC$(42):REM JW=USR(ADR(MC$),
   START ADR,HOW MANY)
40 GOSUB 3000:REM CREATE STRINGS
2100 POKE 704,27:POKE 705,27:REM **** P/M
   SETUP ***
2200 P=PEEK(106)-24:POKE 559,46:POKE 53256,0:
   POKE 53257,0:POKE 54279,P
2300 P0=P*256+1024/2:P1=P*256+1280/2
2400 POKE 53248,120:POKE 53249,128:H=120:
   REM H=HORIZONTAL POSITION
2420 JW=USR(ADR(MC$),P0,256):REM CLEAR
   P/M AREA
2500 J=0:FOR ME=P0+70 TO P0+89:J=J+1:POKE
   ME,ASC(PL0$(J,J)):NEXT ME:REM
   ORIGINAL VERTICAL POSITIONS
2600 J=0:FOR ME=P1+70 TO P1+89:J=J+1:POKE
   ME,ASC(PL1$(J,J)):NEXT ME
2700 POKE 53277,3:REM ENABLE P/M
   GRAPHICS
2800 GOTO 10:REM JOYSTICK LOOP
3000 REM CREATE PM2$
3010 FOR ME=1 TO 52:READ IT:PM2$(ME,-
   ME)=CHR$(IT):NEXT ME
3100 DATA 104,104,133,209,104,133,208,160,
   255,177
3200 DATA 208,72,200,177,208,170,104,145,
   208,138
3300 DATA 72,200,208,245,104,96,104,104,
   133,209
3400 DATA 104,133,208,160,1,177,208,72,
   136,177
3500 DATA 208,170,104,145,208,138,72,136,208,
   245,104,96
4000 REM CREATE PM2H$
```

```
4010 FOR ME=1 TO 12:READ IT:PM2H$(ME,-
     ME)=CHR$(IT):NEXT ME
4100 DATA 104,104,104,141,0,208,104,104,141,
     1,208,96
5000 REM CREATE PL0$
5010 FOR ME=1 TO 20:READ IT:PL0$(ME,
     ME)=CHR$(IT):NEXT ME
5100 DATA 0,13,13,127,255,255,255,255,255,
     255,0,255,255,255,127,13,25,
49,225,0
6000 REM CREATE PL1$
6010 FOR ME=1 TO 20:READ IT:PL1$(ME,
     ME)=CHR$(IT):NEXT ME
6100 DATA 0,176,176,254,255,127,127,0,255,255,
     127,127,127,255,254,176,
152,140,135,0
7000 REM CREATE MC$
7010 FOR ME=1 TO 42:READ IT:MC$(ME,
     ME)=CHR$(IT):NEXT ME
7100 DATA 104,104,133,204,104,133,203,104,
     133,206,104,133,205,166,206,
160,0,169,0,145,203
7200 DATA 136,208,251,230,204,202,48,6,208,
     244,164,205,208,240,198,204,
160,0,145,203,96
8000 ? #6:? #6:? #6;"USE JOYSTICK TO":?
     #6:? #6;"MOVE THE LOGO"
8100 ? #6:? #6:? #6;"USE TRIGGER TO":?
     #6? #6;"CHANGE PRIORITY"
8200 ? #6:? #6:? #6:? #6;"SYSTEM RESET":?
     #6:? #6;"TO EXIT"
9000 RETURN
```

Ground The point of reference in an electrical circuit (not necessarily the physical ground). The ground point is considered to be at nominal zero potential, and all other potentials in the circuit are compared with it.

GT Greater Than (also represented by $>$).

GTIA Draw* Gives you three additional graphic modes that will allow you to erase horizontal or vertical lines, add text to pictures, zoom in on certain areas of a picture, shift the screen in any direction, and work on two different screens at once. Sar-An Computer Products.

GTIA, Graphics 9 to 11* Tricky Tutorial 9. Expand your graphic capabilities using the sixteen-color capability of your computer. 16K cassette or 24K disk. Educational Software.

Guardian of the Gorn* A graphically interesting arcade-style game where you must save four spaceships that have been caught in a huge spider web. Beware of giant spiders and the Gorn (a mammoth butterfly)! This is similar to the chase/maze games, but the maze is a web of diagonal connections. The more difficult levels have more, faster spiders. 16K cassette or 24K disk. In-Home Software.

Guns of Fort Defiance* A simulation of archaic cannon warfare in which your forces try to deter an advancing line of enemy soldiers with a single cannon and a choice of projectiles. Each projectile has different ballistic properties and requires a different kind of aim. 32K; disk or cassette. Avalon Hill.

Gwendolyn* You must save the princess who was kidnapped from your kingdom. Features over ninety screens, 3-D graphics, animation, and sound effects. The obstacles you must overcome before rescuing the princess make your quest even more difficult. Artworx.

Gypsy* As a gypsy moth, your object is to eat as many leaves as possible. The enemies are mushrooms that can paralyze your mouth, and ants and bees who sting. Mediocre graphics and sound make this an unexciting game. 23K disk or 16K cassette. Avalon Hill.
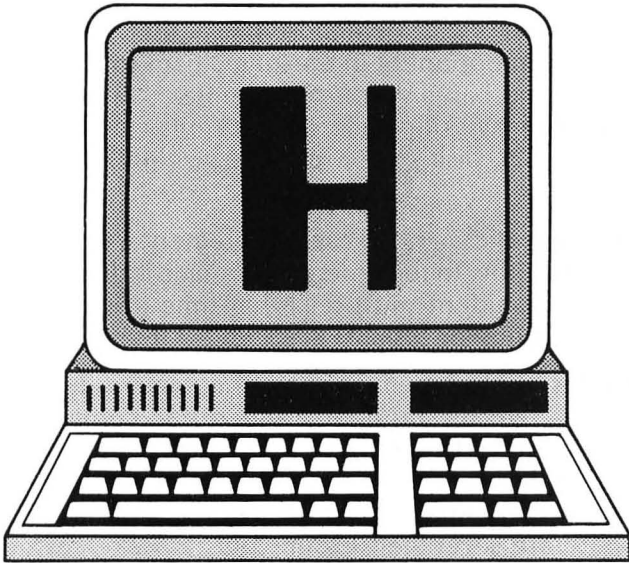
H Codes. ATASCII = 72, HEX = 48. h—ATASCII = 104, HEX = 68.

H See DOS Options.

H DOS 3.0 command to request help.

Half-Duplex A mode of communication in which data may be transmitted in only one direction at a time.

Halt When a computer stops all activity.

Halt System Operation Pressing BREAK stops system operation.

Hamming Code A 7-bit, error-correcting code named after the inventor.

Handler A program used to control or communicate with an external device, such as a disk drive.

Handshaking A basic communications synchronizing technique using two signals: ready ?, yes/no acknowledgment. The handshaking procedure is carried out prior to any data tranfer when establishing a connection between two data communication devices. For example, a CPU will ask an I/O:Is input buffer 1 empty? If yes, it can be reloaded. If no, the CPU must wait.

Hangman* The classic word-game computerized with good presentation. 16K; cassette. Atari, Inc.

Happy Warp Drive Software* A selection of utility programs including Warp Speed Happy Backup Program, Warp Speed Multi Drive Happy Backup Program, Warp Speed Happy Compactor Program, Happy Warp Drive DOS, Happy Warp Drive Sector Copy Program, and Happy Customizer Program. All sold separately. Happy Computing.

Happy 810 Enhancement* A plug-in P.C. board that does not require permanent modifications, comes completely assembled, and is the only extra hardware needed to run all Happy Warp Drive software. Happy Computing.

Hard Copy Computer output printed on paper.

Hard Disk A disk composed of a magnetic coating applied to a rigid substrate, such as aluminum or ceramic. The term is generally used in contrast with "soft" (floppy) disks, which are flexible. Floppy disks are slower and have less storage capacity.

Hardware The physical boards, chips, wires, etc. of a system.

Hardware See Atari Numerical Keypad, Atari 600XL, Atari 800XL, Atari 1010 Program Recorder, Atari 1020 Color Printer, Atari 1025 80 Column Printer, Atari 1027 Letter Quality Printer, Atari 1030 Direct Current Modem, Atari 1050 Disk Drive, Atari 1400XL, Atari 1450XLD, ATR8000, Axiom AT-100 Printer, Cyberdrive, Happy 810 Enhancement, Microprism, Mxplus, NEC 1202 Monitor, Omnimon!, PG 1000 Color Printer, Pinball Construction Kit, Printout Basket, RAMCRAM Plus 48K, Starplex Controller, Voice Box II, Winchester Disks, Winchester Hard Disk Drive 5M, Winchester Hard Disk Drive 10M, Winchester Hard Disk Drive 20M, Winchester Hard Disk Drive 40M, Winchester Hard Disks.

Hardware vs. Software Computer programs of all kinds are called software. Hardware is the actual chips, wires, boards, etc. which make up the computer. A special case is Read-Only Memory (ROM) (q.v.), which is hardware that contains a permanent copy of software. BASIC ROM, means a ROM (hardware) containing a copy of a BASIC interpreter program (software). Such ROMs are often called firmware, to distinguish them from non-program hardware and from software in changeable media (diskette, cassette, etc.).

Harmonic An integer multiple of a fundamental sound frequency.

Harmonic Distortion Distortion due to the signal's non-linear characteristics, resulting in output which includes harmonics of a harmonic-free sine input.

Haunted Hill* Try to shoot vampire bats as they stream toward you between tombstones. If you hit a tombstone by mistake, you awaken its ghost owner. You die if you are touched by either a bat or a ghost. 16k; disk or cassette. Swifty Software.

Hayes Stack Smartmodem* An RS-232C auto-answer, auto-dial data communications system

compatible with virtually all personal computers. Standard features are Touch-Tone or pulse dialing, and direct connection to single or multiline telephones. The system can be program-controlled by any language through ASCII character strings. Operating parameters are changed with ease by a series of unique "Set" commands and eight configuration switches. Smartmodem's operating level is full- or half-duplex up to 1200 baud. Seven LED indicators on the front panel provide a visual check of system status, and the user can monitor the progress of calls with an audio speaker. The system features automatic baud rate, parity sense, and word size detection. Covered by a two-year limited warranty. Hayes.

Hazard Run* Escape from the sheriff as you drive your speeding car around obstacles and through hazards. Response to the joystick is poor. 16K; cassette or disk. Artworx.

Hearts* Play regulation Hearts against two computer opponents. Cards are displayed in text rather than graphics format. 16K; disk or cassette. Artworx.

Heathcliff* This delightful, fun-loving animated cat will steal your heart away as you play with him in his nine different personalities. Excellent graphics. Disk, cassette, or cartridge. Datasoft.

Hellcat Ace* Fight the Japenese in the skies above the Pacific. Your two-gunned airplane can maneuver like a bird as you dodge return fire. 40K; disk or cassette. Microprose Software.

Hellfire Warrior* Similar to Temple of Apshai, this high-resolution action game has no time limits. You explore various rooms, avoid monsters, and search for treasures and the sleeping beauty. 32K; disk. Automated Simulations.

HELP Key XL Computers Only. The HELP key may be used to initiate self testing when the color logo appears on your screen. Other HELP key functions will vary depending on the software in control. The following BASIC program shows how to sense the HELP key.

```
10 POKE 732,0:PRINT "HELP FLAG CLEARED"
20 IF PEEK(732)=0 THEN GOTO 20:KEEP CHECK-
   ING
30 HELPFLAG=PEEK(732)
40 IF HELPFLAG=17 THEN PRINT"HELP KEY
   PRESSED"
50 IF HELPFLAG=81 THEN PRINT"SHIFT/HELP
   PRESSED"
60 IF HELPFLAG=145 THEN PRINT"CTRL/HELP
   PRESSED"
70 GOTO 10
```

Hexmaster* A fast action game that pits you against an opponent in creating a path to connect two home bases. Requires complex strategy. Includes many skill levels, instant replay, and game timers. 32K disk or 16K cassette. Dolphin Microware.

Hickory Dickory* Teaches elementary school children how to tell time. A clock face is displayed, and the student must tell what time it indicates. 16K; cassette or disk. APX.

Hi-Res Mastertype* A game that teaches typing. Letters, words, numbers, and other commands appear in the four corners of the screen. You must type them as quickly as possible to prevent a collision with the spaceship in the center of the screen. There are seventeen lessons plus a Make Lesson program which allows the user to create lessons to save on disk. An entertaining and effective way to learn how to type. 32K; disk. Lightning Software.

Hi Score Database* A nice little database program which keeps track of the high scorers on your Atari games. The detailed documentation and printed program listing also provide an Atari BASIC tutorial on data storage and Input/Output techniques. Dynacomp.

Hockey* Fun hockey action, but poor sound effects and average graphics. For two to four players. 16K; cassette or disk. Gamma Software.

Hodge Podge* Sound effects and pictures help pre-schoolers learn to identify the letters of the alphabet. 32K; disk or cassette. Dynacomp.

Hold Screen Display See Freeze Screen Display.

Holding Register A register that holds data temporarily to bridge a speed or timing gap between two devices.

Home Accountant, The* This package will help anyone get a grasp on his finances. You can manage up to sixty budget categories for income and expenses and five checkbooks with check printing as an added feature. A personal balance sheet and monthly income statements can be generated from your data. Includes graphics features for charting all accounts, including trendline and bar graphs. 48K; disk. Continental Software.

Home Filing Manager, The* Like having an index card file in your computer. Information is stored in a card format for later access. Cards are sorted by first line and can be retrieved in the same manner or by specific phrases. In the latter case, any card with the specific phrase is flagged. Can insert and

delete characters, phrases, and files. 16K; disk. Atari, Inc.

Home Finances—Software See Car Costs; CCA Data Management System; Data Management System; Decision Maker; Family Finances; Family Financier; Family Vehicle Expenses; Fantasy Plaza; File Manager 800+; Financial Wizard; Home Accountant, The; Home Filling Manager, The; Home Inventory; Home Loan Analysis; Household Finance; Loan Analyzer; Mailing List—Ver 3.0; Mailing List; Money Manager; Mortgage and Loan Analysis; Personal Finance System; Retirement Planning; Shopping List; Tax Advantage, The; Weekly Planner.

Home Inventory* Helps you make that tedious, but vital, home inventory. You can include serial numbers, descriptions, current value, purchase date, and price. Search using categories you select. 32K; cassette or disk. Creative Software.

Home Loan Analysis* Helps you decide which loan alternative best suits your needs. Calculates monthly payments, amortization schedules, maximum purchase price, appreciation rates, and more. It's an easy-to-use program with good documentation, including helpful examples to get you started. 16K cassette or 24K disk. Atari BASIC cartridge required. Atari Program Exchange.

Horizontal Blank Refers to the time during which the electron beam of your television turns off as it returns from the right edge of the screen to the left edge.

Horizontal Position Register Used to position a player missile horizontally at a specified color clock position. These registers begin at hex address $D000. See Memory Map.

Horizontal & Vertical Scrolling* Learn to scroll your text and graphics programs like a pro. Includes routines that will allow you to scroll horizontally, vertically, diagonally, and just part of a screen. Several routines are in Machine language for speed. See Tricky Tutorials for other programs in this series. 16K cassette or 24K disk. Educational Software, Inc.

Hot Lips* This maze game features a pair of munching teeth that indiscriminately eat you and your enemies. Your goal is to maneuver between the teeth, luring your (hopefully) less agile pursuers to their toothy doom. There are also special boxes that are worth extra points when they first appear. If you don't reach them in time, they become blockers that will slow you down, but not your enemies. Features multiple levels of play. 16K; disk. London Software.

Household Finance* A very basic budget tracking program. Includes fifteen expense and general categories with fixed titles, and no possibility of changes or additions. 32K; cassette or disk. Creative Software.

How to Program Your Atari in 6502 Machine Language* A tutorial on the 6502 microprocessor and an introduction to Machine language. Subjects discussed include digital concepts, numbering systems, and microprocessor architecture.

The sample programs demonstrate loading the screen with characters, setting color registers, relocating program, generating ASCII output, and a random number generator. The book also shows how to access Machine language from BASIC. IJG, Inc.

Hue Hue is the color setting, or the second operand of the BASIC SETCOLOR command. The following line of BASIC code sets the background color of a GRAPHICS 0 screen to dark blue:

HUE=7:LUMINANCE=0:SETCOLOR 2,HUE, LUMINENCE

Human Engineering If you are writing programs that others might someday use, you should never forget to give clear prompts for input data, to freeze the screen long enough to be read, to provide clear error messages, etc. Taking care of these issues is often referred to as "human engineering"—because it makes the program easy to use, as well as technically correct. Another term for this side of programming is making the program "user friendly."

Several guidelines exist for writing user friendly programs. If a complex series of data items has been typed in and some entries turn out to be invalid, the user should be able to reenter only the bad items without redoing everything. Error messages should indicate not only that an entry is invalid, but also show it is invalid and, if possible, hints on correcting it.

Hydraulic Program (HYSYS)* Aids in the design of hydraulic systems. Consists of a cylinder program, and a pump and motor program. Each program can create a tally sheet table based on calculations performed on various input parameters. The program is limited by its inability to deal with multiple motors or cylinders within circuits, and its willingness to accept irrational values for parameters. 32K; disk. Atari Program Exchange.

This line in a program will cause the word CORRECT to be printed on the screen if the variable A, perhaps the answer to an arithmetic problem, currently has the value of 9.

Illegal Device Name   DOS Message. See Error Codes.

Immediate Mode   The mode used when a BASIC command is to be executed immediately, rather then when a program is RUN. To use immediate mode, enter a valid BASIC command without a line number, then press the RETURN key.

Indexed Sequential Access Method   ISAM. A program or package that supports files organized with one or more indexes. Records may be retrieved from the file either sequentially or randomly by the key used in the index.

*Infoworld**   A weekly newspaper about microcomputers. Valuable for keeping current on new developments. Most computer stores and larger bookstores carry *Infoworld*, as well as a good assortment of other relevant magazines. See Magazines.

Initialize a Diskette   DOS Command. See DOS Options.

INPUT   READ data into memory. Memory is any device which can store information and allow it to be retrieved when needed. The Atari relies primarily on random access memory (RAM), read-only memory (ROM), disks, cassettes, and hard disks. ROM and RAM together make up the internal memory or main memory of the Atari, or any other computer.

This is in contrast with external memory, such as cassette, disk, and hard disk, which involve mechanical motion to retrieve data and are thus hundreds or thousands of times slower than internal memory. Data in internal memory is immediately available to programs for processing. Data in external memory must be copied into internal memory (READ or INPUT), processed, then copied back out to external memory (WRITE or OUTPUT).

INPUT   Atari BASIC Command. When INPUT followed by a variable name is executed by the computer, a ? is printed on the screen and the program stops. The user must then type in a number or string previously requested and then press RETURN. When this is done the program will *store the* response in the selected variable name and continue execution with the next command after the INPUT.

I   Codes. ATASCII = 73, HEX = 49. i—ATASCII = 105, HEX = 69.

I   DOS 3.0 command to Intitialize (format) a disk.

I   See DOS Options.

I Speak BASIC To My Atari*   Intended for classroom instructional use, but can be used at home by a beginning Atari user. Subjects covered are hardware, software, programming tools, scientific notation, relational operators, using the calculator mode and sizing memory, using the cassette recorder and the disk drive, using FOR/NEXT/STEP statements, video display graphics, arrays, INT(X), ABS(X), and RND(X) functions, and subroutines. Hayden Book Company.

IC   Integrated Circuit.

IEEE Bus Controller*   The IEEE-488 bus controller is for use with all IEEE-488 compatible devices. Orion Software Associates.

IEEE-488 Interface*   The IEEE-488 Interface is used for equipment and testing devices that communicate using the industry-standard IEEE 488 protocol. This product can operate as a controller, listener, or talker to IEEE-488-compatible devices. The IEEE-488 meets the requirements of the IEEE-488 standard, and makes the Atari Computer an effective tool for industrial and instrument interfacing. Tecmar, Inc.

IF   Atari BASIC Statement. IF sets the conditions for the IF/THEN conditional branch statement; THEN introduces the consequential commands that are executed only if those conditions are true. Whether the branch is executed or not, the program goes to the next numbered line. For example:

30 IF A=9 THEN PRINT "CORRECT"

Example 1:
```
100 PRINT "TYPE YOUR NAME"
110 INPUT N$
```
Example 2:
```
100 PRINT "WHAT IS 3 X 9 ?"
110 INPUT A
```
In example 1, the screen will show "TYPE YOUR NAME" and a ?. When the name is typed and RETURN pressed, N$ will become the name typed in and the program will continue. In example 2, the screen will show "WHAT IS 3 X 9 ?" and another ? as a prompt. When the answer is given, right or wrong, the variable A will take on the value of the number typed, and the program will continue.

When the INPUT is for a string variable, the variable must have been dimensioned previously. If more than one string is to be input from the screen, type the first string and press RETURN, then the next string, and so on. A series of arithmetic numbers to be input may be typed on the same line, separated by commas.

Input Output Control Block IOCB. An IOCB number (0-7) is assigned to a device so a program may easily communicate with the operating system's CIO routines. The number 1 in the following BASIC command is the IOCB number:

```
OPEN #1,8,"P:":REM IOCB #1=PRINTER
```

INPUT Statement, Dummy Use a dummy input statement to hold or freeze the screen display. To freeze the screen briefly while the operator using your program reads a message, write a delay loop after you print the message:

```
1000 FOR Y = 1 TO 2000
1010 NEXT Y
```

To freeze the screen until the operator is done with it, put in a dummy input statement and instruct the operator to press RETURN to proceed. The input variable need not be used in your program:

```
1000 PRINT "Press RETURN to continue"
          ;:INPUTA$
```

Input/Output See Input, and Output.

Insert Character Pressing CTRL/INSERT will insert the next character entered in the line at the place where the cursor is currently placed, but will not advance a character in the template. See also Control Keys.

Insert Characters Placing characters in between those already on a line. Could be an omitted letter in a word or an omitted word in a line.

Insert Line To place a line between two existing lines. Press SHIFT/INSERT to insert a blank line on the screen. See also Control Keys.

Inside Atari BASIC: A fast, Fun, Friendly Approach* A clearly written book which makes learning to operate the Atari Home Computer painless. An introduction to Atari Graphics and sound is included, as well as many other features. Reston Publishing Company.

Inside Atari DOS* The subjects covered in this book include DOS overview, disk organization, FMS File Control Blocks (FCB), FMS Initialization, FMS entry, FMS exit, device dependent commands, FMS open routines, FMS close routine, the get byte routine, the put byte routine, burst I/O, reading the directory as a file, sector I/O routines, file name decode routine, directory searching, write next sector, read next sector, get and free sector routines, the boot process, maintaining the boot record, Atari DOS 2.0S listing. COMPUTE! Books.

Instedit, Rev.2.* A utility to create your own set of characters and shapes. A grid and the joystick makes it easy to form customized shapes and incorporate them into your BASIC or Assembler programs. There are simulation screens to see how it will look on the screen as well as view it in a variety of positions (invert, mirror image, rotate 90 degrees, etc.) The menu-driven commands guide you through all phases of creation and storage. 16K tape or 24K disk. Joystick required. Atari Program Exchange.

Institute, The* You are trapped in an "institute", or are you? Is this all in your mind, or is it reality? In this text adventure game, you must escape from the "institute", but how can you if it doesn't exist? 16K; disk. Screenplay.

Instructional Computing Demonstration* A demonstration of the Atari's capabilities, and how computer instruction can be an important part of a school's curriculum. This is a good way to introduce schools to their Atari computers. 16K; disk. Atari Program Exchange.

Instructions A statement that causes a computer to carry out a specific action. Commands differ from instructions in several ways. A command is usually a complete specification of an action, while instructions must usually be combined in dozens or hundreds to make a useful program. Commands are usually acted upon immediately by the basic operating system of the computer. Instructions are saved in groups, processed by a particular program, such as the BASIC interpreter, Pascal compiler, etc. and then executed. See Command Processor, Disk Operating System.

INT Atari BASIC Function. INT followed by an arithmetic expression (in parentheses) returns the

largest whole number, positive or negative, that is less than or equal to the expression. It is well to keep in mind that, whereas 4 is larger than 3, for example, -4 is smaller than -3.

Integer BASIC XL* This version of BASIC XL is limited to integer numbers. Since floating-point routines are bypassed, programs written using this cartridge run much faster. Execution speed rivals that of compiled BASIC programs. See BASIC XL and BASIC A+. Optimized System Software.

Integrated Circuit A complete electronic circuit with multiple components (transistors, diodes, resistors, capacitors, etc.) all constructed on a single small silicon chip.

Integrity of Data Insuring that data (or programs) cannot be altered improperly. For example, in a payroll system, steps must be taken to insure that employees can not alter their pay rates or hours worked. Data security consists of guaranteeing both data integrity and data secrecy or privacy.

Inter Record Gap A space between records of data on a cassette comprised of a post-record gap and a pre-record tone.

Interface The point at which two systems make contact. Most microcomputers have multiple interfaces or "ports," such as a serial port to connect serial devices, a parallel port, TV or monitor ports, power port, joystick ports, etc. Interface is also used to refer to the type of interconnection, with respect to its size or shape (subminiature 25-pin D connector), its mode of function (serial, parallel, etc.), or its electrical characteristics (RS-232, IEEE, etc.).

Internal Commands The command processor is a program which accepts a command (usually from a keyboard) and causes it to be carried out. Some command processors contain the programming required for all commands they process. Others do not carry out any commands directly. Instead, these examine the command, determine what other program (if any) can carry it out, locate the required program, and start it running. Still another type of command processor carries out some commands directly (internal commands), but also locates and runs other programs (external commands).

Internal Memory Memory is any device which can store information and allow it to be retrieved when needed. The Atari relies primarily on Random Access Memory (RAM), Read-Only Memory (ROM), disk, and cassettes. Memory, by itself, is usually a reference to RAM. This is the general purpose, erasable and reusable memory located inside the Atari.

ROM contains fixed data, usually programs like the Atari's cassette BASIC ROMs. The ROM contains the fundamental Machine language programs to run the devices attached to the Atari, such as monitor, printer, disk, cassettes, etc. ROM and RAM together make up the internal memory or main memory of the Atari, or any other computer.

Interpreter Any programs that run directly on the Atari are in Machine language, the numeric instruction code of the Atari's 6502 microcomputer chip. Most were originally written by a programmer as source programs (text files). The source program contains readable statements in a language such as COBOL or BASIC. These were translated by a compiler program, producing an object program.

The BASIC stored in ROM is a program (in Machine language) that uses your BASIC program as a guide to what it should do. It is therefore an interpreter, processing each line of your source program and interpreting what should be done. Since it must re-interpret your source program each time you run it, interpreted BASIC can be as much as 100 times slower than compiled BASIC.

Interrupt A signal to an MPU that an event has occured that requires attention. The MPU will save enough information to resume the task it is currently working on, then execute code from an interrupt servicing program. There may be multiple interrupt lines or other ways of distinguishing interrupts, in which case the MPU can tell from which interrupt signal it receives, what type of event has occurred (these are vectored interrupts). Interrupts provide a much more efficient way of managing external events (such as a key press at a keyboard) than continually checking to see if any event has occurred (polling).

Intruder* You are confronted with the task of shutting down four damaged nuclear reactors before they melt down. Two killer robots are your enemies, and can only be trapped in packing cases that you quickly construct. 16K; cassette or disk. In-Home Software.

Invitation to Programming #2, An* A two-part approach which makes learning BASIC fun and easy. It allows individuals to work at their own pace, while acquiring a thorough understanding of each step before going to the next. A valuable tool for students and teachers. 8K; cassette. Atari, Inc.

Invitation to Programming #3, An* A two-part package which teaches sound and graphics pro-

gramming. This is presented in the same style as An Invitation to Programming #2*. 8K; cassette. Atari, Inc.

I/O   Input/Output.

IOCB   Input Output Control Block. See File Control Block.

IPL   Initial Program Load. The process of starting up the Atari using the power-on switch.

IR   Instruction Register. In most MPUs, the IR contains the address of the next instruction to be executed. Branches are implemented by loading a new value into the IR.

ISAM   See Indexed Sequential Access Method.

Isopleth Map-Making Package*   Three programs to create isopleth maps. These are maps which plot lines of constants, i.e., constant pressure on a weather map, constant elevations on a topographical map, etc. Maps are generated in high resolution color. Map generation can take up to one hour. 32K. Atari Program Exchange.
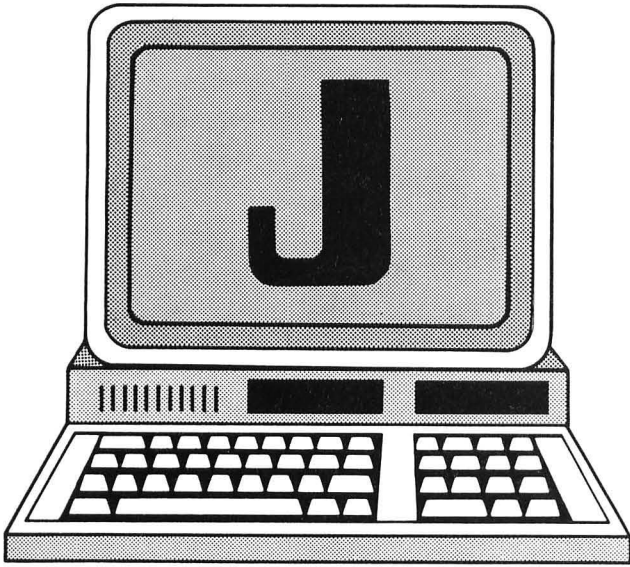
J Codes. ATASCII = 74, HEX = 4A. j—ATASCII = 106, HEX = 6A.

J See DOS Options.

Jawbreaker* Another eat-the-dots in the maze game, but with a twist. Your hungry player is a set of munching teeth, and his enemies are four life saver candies that roll in hot pursuit through a maze-like candy factory. Your character needs to eat power dots, located at the corners of the screen, before he is able to ingest the life savers. The multiple skill levels differ only slightly. 16K; disk or cassette. Sierra On-Line.

Jawbreaker II* A revised version of the action game. Just as much of a challenge, and sure to be a best-seller. Cartridge. Sierra On-Line.

Jax-O* A video version of Jacks, where the object is to pick up jacks with your hand and catch the bouncing ball. You can control the direction of your "hands" by the joystick and try to pick up the nine jacks by twos, threes, fours, etc. You lose when you don't get the right number in the time allowed. There are four floor sizes, and the ball is able to move at two speeds. Graphics and sound aren't so terrific, and the joystick control is awkward. 16K cassette or 24K disk. Atari Program Exchange.

Jeepers Creepers* You are a bug who must fill in rectangles in a maze before the wasp gets you. You find helpful bonuses such as keys, free jumps, and beetles that eat wasps. There are three mazes of increasing difficulty. The game has a lot of fun and surprises. 36K cassette or 32K disk. Quality Software.

Jerry White's Game Machine* This five-game package should keep any player amused for hours. Included are: Leapfrog, for puzzle fans; Horse Racing, with betting and oddsmaking; Musical Letters, a word and sound learning game; Gotcha, similar to a light cycle game; Bowling, a realistic one-to four-player simulation. All games are colorful, with excellent graphics and sound. Program Design, Inc.

Jiffy A time measurement used to indicate one 60th of a second.

Journey to the Planets* An original game that challenges the player's hand-eye coordination skills and problem solving abilities. The player must capture nine treasures, one from each of nine hostile planets. Maneuvering to the planets and landing is tricky because fuel supply is low and obstacles abound. The solution to these obstacles lies in logical thinking. Some of these puzzles require hours of heavy thinking, and for those who wish it, answers are available from the vendor for one dollar. 32K. J.V. Software.

Joystick* A popular game aid with a stick, a base, and fire button. Primarily used to maneuver game shapes and graphics. Long, hard use causes fatigue in the hands and wears out the joystick. Atari, Inc.

Joystick Button BASIC. See STRIG.

Joysticks* These joysticks feature instantly selectable "spring centering" or "free-floating" stick control, without internal modification. These precision controls have been fatigue-tested to over two million cycles and come with an exclusive one-year limited warranty. Kraft Systems, Inc.

Joysticks, Paddles and Trackballs See Aerobics Joystick, The; Command Control Joystick; Command Control Trackball; Joystick; Le Stick; Paddles; Pointmaster; Prostick; Starplex Controller; Video Command.

Juggles' Rainbow & Jugglers' House* Children between three and six, learn about two concepts. Juggles' Rainbow provides exercises for using above, below, right and left. Juggles' House drills children on the correct uses of inside, outside, upper, and lower. Good visual and sound effects make this a delightful learning experience. 16K; disk. Atari, Inc.

Juice* You help an android keep up production of computer parts, despite many kinds of interference. Nohms, Flash (the lightning bolt), and *Killer-watt* are only a few of the problems you encounter. 32K; disk or cassette. Tronix.

Jukebox #1* Includes eight classical music selections that can be displayed in four color graphics. They can be played separately or as an entire play list. 32K; disk. Atari Program Exchange.

Jumbo Jet Pilot* You become a jumbo jet pilot with this flight simulator. Fly from one airport to another about forty-five minutes away. The cockpit is equipped with an entire set of flight instruments. The aircraft is slow and hard to control and land. However the graphics are very nice. There is a 3-D view of the ground (shown as a grid) that remains in perspective as you gain altitude. 16K. Thorn.

Jumpman* Deactivate the explosives at Jupiter's Headquarters. Avoid destructive robots, pitfalls, and more, or your seven lives will soon be gone. Five levels of difficulty. 32K; disk. EPYX.

Justify To make the edges of a text file line up straight. Left justification is almost universal in English text. Right justification is usually present only in text that has been typeset or processed by a word processor or special typewriter to insert a variable amount of space between words or letters (proportional spacing).
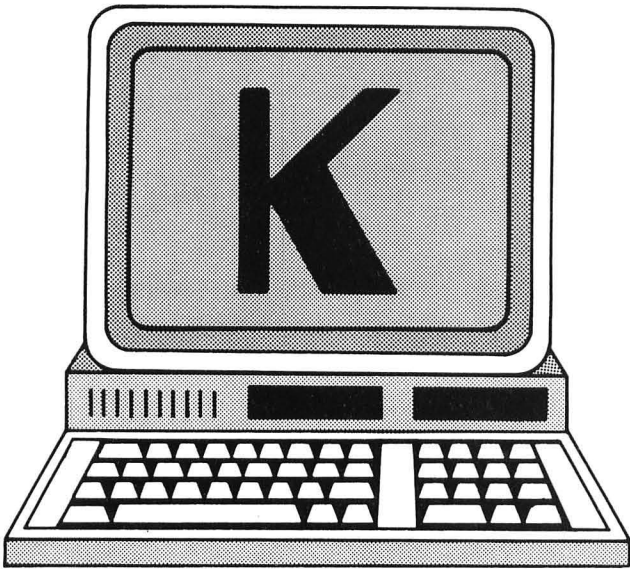
K Codes. ATASCII = 75, HEX = 4B. k—ATASCII = 107, HEX = 6B.

K See DOS Options.

K A byte (abbreviated B) is the capacity to hold one character (letter, digit, etc) in computer memory, internal or diskette. A thousand bytes is a kilobyte, abbreviated KB or simply K. (Actually, 1K = 1024, because this is an even power of 2.) Atari often has 48K (or 48KB) of internal memory, or 48,000 (to be precise, 48K = 48 x 1024 = 49,152 bytes).

K: Keyboard Device.

Kaiv* Only strong and skillful warriors dare enter the Kaiv in search of treasure. You are outfitted with a sword, chain-mail and a few other weapons. While exploring the Kaiv, your experience grows as you learn more secrets and journey further. 48K; disk. Screenplay.

Kaleidoscope* Generates designs on the screen in a continuous pattern. You define the parameters. 16K; disk or cassette. Artworx.

Kayos* Fire at the large and small aircraft that dart across the screen in a random fashion. 16K; disk or cassette. Computer Magic, Ltd.

KB Measurement of Bytes in thousands. See K.

Keyboard In general, microcomputers use one of two types of keyboards:
1) The Fully Encoded Keyboard used when a complete set of alphanumeric keys is needed. Supplies the ASCII code that corresponds to the key that has been pressed. Such a keyboard has debounce and multiple rollover protection. See also Rollover, Debouncing.

2) Non-Encoded Keyboard. Generally the simplest type, it consists of a matrix of rows and columns and is read by the resident software.

Keyboard Organ* Converts your computer keyboard into an organ. You can record, play back, and store your creations on disk or cassette. 24K; disk. Atari Program Exchange.

Keypad Controller* This utility lets you use two twelve-key Atari keypads, which gives you one-key command or keyword entry. The program includes default values for keypads, as well as a file for reassigning key values. 8K cassette or 24K disk. Atari Program Exchange.

Keyword A word which has special significance to a program. It must not be misspelled or used for other purposes, or erroneous results may occur. See BASIC—Reserved Words.

Kid Grid* Use your wits to avoid the bullies who will try to keep you from connecting the colors on the grid. They are fast—and with names like Thuggy, Moose, Muggy, and Squashface, you know they mean business. 32K; disk or cassette. Tronix.

Kids and the Atari* An introduction to BASIC for youngsters, with notes to parents and teachers. Each chapter is a lesson in the BASIC language. The later chapters explain debugging and advanced BASIC programming. Datamost.

Kindercomp* Helps young children become familiar with the computer keyboard. Features six programs: Scribble, Draw, Names, Sequence, Letters, and Match. Has entertaining sound and graphics. 48K; disk. Spinnaker.

King Arthur's Heir* You must search for the Book of Truth and return it to the king for your reward. As you wander the land, you encounter dragons, wizards, and other perils, that can only be defeated with the items you gather. Not very challenging but contains good documentation. 40K; disk. Automated Simulations.

Kingdom* You are responsible for providing food for the people of an ancient city. Decisions must be made on selling goods to buy food or buying land to grow food. Natural factors must be taken into account, such as rodents and population increases. 8K; cassette. Atari, Inc.

K-Razy Antics* This maze game casts the player as a white ant, making his way in the hostile world of a multi-level anthill. The hill is populated by enemy ants, harrassed by an anteater, and beset by periodic floods. Besides trying to stay alive, your ant's

task is to eliminate as many enemy eggs as possible. Enemy ants can be destroyed by a direct hit with one of their own eggs. The floods and the anteater are lethal to both you and the bad ants. When your ant is killed, you can continue playing if you've managed to place one of your white eggs in a safe spot. 16K; cartridge. CBS Software.

K-Razy Kritters*   This easy "shoot-at-the-kritters" game requires little strategy for point accumulation. When you hit the blocks, a kritter is released which must be shot before it hits the ground. 16K; cassette. CBS Software.

K-Razy Shoot Out*   Killing all the robots in the first room warms you up for what will happen in the rooms to come. Difficulty level increases, and strategy becomes necessary. 16K; cassette. CBS Software.

Krell's College Board SAT*   A series of exam preparation programs that are presented in Scholastic Aptitude Test format, and are the same level of difficulty found in the SAT Exams. Krell Software Corp.

K-Star Patrol*   Armed with an assortment of weapons and a patrol of eight Star Ships, you must defeat the aliens in ten enemy sectors. Use your defense shields when all else fails. 16K; cartridge. CBS Software.
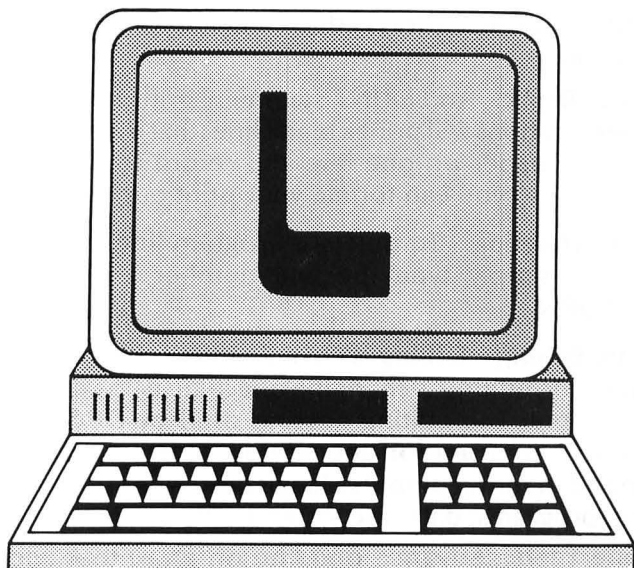
L Codes. ATASCII = 76, HEX = 4C. l—ATASCII = 108, HEX = 6C.

L See DOS Options.

L DOS 3.0 command to Load a binary or object code file.

Lab Master* A 12-bit, analog-to-digital, digital-to-analog converter for use on more demanding data conversion applications. The unit features a 16-channel, 12-bit, analog-to-digital converter with a 30 KHz conversion rate; a two-channel, 12-bit, digital-to-analog converter; three 8-bit parallel ports; and five timer/counters, as standard features. Options are programmable gain, 14-and 16-bit resolution, 40, 100, and 125 KHz conversion rates, and expansion up to 256 channels. Tecmar, Inc.

Lab Tender* An 8-bit, analog-to-digital, digital-to-analog converter. The unit provides sixteen 8-bit, analog-to-digital channels, and sixteen 8-bit, digital-to-analog channels. Also includes three 8-bit parallel ports for digital interfacing, and five timer/counters. Provides a low-cost solution to less demanding data acquisition and control applications. Tecmar, Inc.

Labyrinth* A maze game in which you must rescue four people who are locked in boxes. Monsters in the maze prevent you from making the rescues and you have only three shots to protect yourself (bonus shots if you're quick enough). The better you get at the rescue, the more difficult the game becomes. 16K cassette or 32K disk. Broderbund.

Labyrinth of Crete* An epic game that inspires you to seek the golden fleece. The labyrinth is well guarded by mystical animals, and traps abound. The rewards are great, but many who enter never return. 48K; disk. Adventure International.

Largest Line Number BASIC. The largest possible line number for a BASIC program is 32767.

Le Stick* This unit has moving parts. It is be used with one hand by tilting the stick in the desired direction. The fire button is on the top, and fired by the thumb. Datasoft.

Left Arrow (←) Pressing the left arrow while the CTRL key is depressed will move the cursor left one character. This function is common in text and command entry. Although this is the recommended function, this key may be defined differently by various application programs. See also Control Keys.

Left Justify See Justify.

Leggs* A set of four special legs for the Epson MX-80 that are installed in existing holes in the printer. This raises the printer so that a 3-inch pad of paper can be slid underneath. No tools or drilling are needed. Paper can be accessed from all four sides. Leggs are made of clear acrylic plastic. Argus, Inc.

Legionaire* You command Caesar's Roman legions against the barbarian tribes of southern France in this graphically excellent game (created by the author of Eastern Front*). Enter commands with the joystick, as you battle either the infantry tribe or the cavalry tribe. The screen is a fine-scrolling map of Southern Gaul. The war is over when the tribes are defeated, or Caesar (you) has been killed. 16K; cassette. Avalon Hill.

Lemonade* Teaches young children about business through an imaginary lemonade stand. They become familiar with supply and demand, advertisement costs, profits, inflation, and much more. 16K; disk or cassette. APX.

LEN Atari BASIC Function. This function returns the number of bytes (characters) in a given string. This is not the number of characters for which the string was dimensioned, but the actual number of characters, spaces included, currently existing in the string.
Format:

LEN(<sexp>)

Example:
```
10 DIM N$(25)
20 N$ ="GEORGE WASHINGTON"
30 PRINT LEN(N$)
```
This program displays the number 17 on the screen.

LET   Atari BASIC Statement. This statement may be used to set a variable at a specific value. The use of LET, however, is optional in most cases, and the same results are achieved by omitting it completely. The exception to the optional rule is the case where BASIC may interpret your variable as a keyword. An example of this situation would be ONE=1. BASIC would interpret this as an ON statement. In order to make the variable ONE equal to the value of 1, you would have to say LET ONE=1.

Format:

LET<var>=<exp> or <var>=<exp>

Example:

LET X=10

or

X=10

Letter Perfect*   One of the few word processing systems available for the Atari, this package includes most of the standard features. It is menu driven, and easy to learn and use. Includes editor, formatter, and print functions. A useful feature allows you to merge data and generate form letters and reports. 24K; disk. Printer recommended. LJK Enterprises, Inc.

Letter Writer*   Allows the user to create files in memory, using keyboard or previously created disk input, then print them out on a printer. Very limited text editing is possible because both line length and page length are fixed. Not intended for use as a word processor. 32K; disk. The Programmer's Workshop.

Letterman*   Similar to Hangman*, this program helps you improve your vocabulary and spelling ability by guessing words, one letter at a time. Words may be supplied by the computer or you. Three levels of difficulty. 16K, cassette or 32K, disk. APX.

LIB   File Extension. The extension (one to three letters after the period) of a file name tends to tell you what kind of file it is. LIB is the extension for a *library file*, used with various application programs. See also Extensions.

Lifespan*   Follow the life of a character from birth through various stages of development. Many interesting situations arise that are sometimes humorous, and always educational. 16K; cartridge. Roklan.

Line, Blank   An LPRINT statement with no other specifications will print a blank line (that is, feed the printer paper up one line and return to the left margin) so you can format your print out neatly.

Line Deleting   To delete a program line in Atari BASIC simply type the line number and press RETURN.

Line Editing   Editing is changing the contents of a file. Line editing is changing one logical line of text at a time. The editing keys, as used by DOS and BASIC, are used for line editing. Line editors are found in most computer languages, word processing programs, database systems, Visicalc, etc.

Line Feed   Advance one line on a printout and return to the left margin (carriage return). To effect this on the printer enter BASIC statement:

LPRINT

or use the line feed (LF) button on the printer.

Line Listing   To display on the screen all or part of a BASIC program in memory, use the following formats:

To display program line 100 only, enter:

LIST 100

To display program lines from line 10 to line 200, enter:

LIST 10,200

To display all program lines, enter:

LIST

CTRL/1 acts as a toggle to stop and start scrolling. You can stop the program to read it, then let it continue.

Line Number   The number on the left end of every line in a BASIC program. You can use up to 32767 lines.

Lines, Erasing   To start a new program and erase all old program lines type:

NEW

This completely erases all lines in BASIC's memory. If it's something you want to keep and haven't already stored on diskette, SAVE it first. If you don't erase the program in memory before starting on another, you will usually wind up with an unusable combination of lines from your old and new programs.

Lines Per Inch   To set lines per inch on the Epson-compatible Printer enter BASIC statement:

LPRINT CHR$(27);"0"

To print at 8 lines/inch.
                LPRINT CHR$(27);"2"
To print at 6 lines/inch.
                LPRINT CHR$(27);"1"
See also Type Formats, Atari 825 Printer.

Lines Per Page   To set page length on the Epson-compatible Printer enter BASIC statement:
                LPRINT CHR$(27);"C";CHR$(55)
This example sets the page length at 55 lines.

Link Time   The point in the processing of a program with a language translator (Compiler or Assembler) when the program is tailored for a specific memory location. This occurs after compiling (compile time) but before execution (execution time). Some small systems do not require linking.

LISP   LISP is a programming language that is oriented towards symbols in the way that other languages are oriented towards numbers. It is ideally suited to the representation of information whose structure cannot be completely specified in advance. LISP permits the building of intermediate structures and the discarding of them without causing the user any worries about how to find and later reuse the space necessary for their storage. The syntax of LISP is simple and elegantly defined. The natural method of building programs in LISP by function composition encourages good programming style and facilitates modular programming. 48K; disk. Datasoft, Inc.

LIST   Atari BASIC Command. The LIST command, with no line number specified, will output all lines of the program in memory (in numerical order) to the device specified. If a line number is given, only that line will be output. To get a range of lines, specify the first and last line numbers, separated by a comma. A program, or any part thereof, may be LISTed to screen, printer, disk, or cassette.
Example 1:

                LIST 30
Example 2:

                LIST "P" 60,120
Example 3:

                LIST "D:BOOK.LST"
Example 4:

                LIST "C:"
In the first example, line 30 of the RAM resident program will be printed to the screen. In example 2, lines 60 through 120 will be printed by the printer. Example 3 would be used to LIST all the lines of a program named BOOK.LST to disk. Example 4 shows how to LIST an entire program to cassette.

List Disk Directory   All or any of the file names of the programs on a diskette can be listed to screen or printer from DOS. Press:
                A
and RETURN (when you are in the DOS menu) and you will get the prompt:
                SEARCH SPEC and LIST FILE
The default values for these two parameters are all files on disk in drive 1 and list to screen respectively. If this is what you want (the usual case) then simply press RETURN again and your screen will display a list of the file names of all the files on the diskette currently in drive 1. The extension, if any, will be included, together with the size of each file in sectors, and the number of free sectors remaining on the disk.

As indicated above, the default value for the SEARCH SPEC parameter is:
                D1*.*
(Wild cards may be used with the disk directory option.) If you want any other selection of file names, enter what you want, press RETURN, and the screen display shows what you asked for. For example, if, at this point, you enter:
                D2:*.DAT
you will get a list of the file names of all the programs on the disk currently in drive 2 that have the extension. DAT. (Usually all data files on the disk.)

The second parameter, LIST FILE, tells the computer where you want the directory listed. If you want to print a hard copy enter:
                P:
If your printer is properly connected you get a printout of the listing you requested, instead of a screen display. For example:
                P:
followed by RETURN gives you a printed list of the file names of all the programs on the disk in drive 1.

LOAD   Atari BASIC Command. Causes the tokenized version of a program on disk to be put into the computer's memory.

Format:

                LOAD "<filespec>"
Example:

                LOAD "D2:FILENAME.EXT"
The D2 in the example designates disk drive number 2. To LOAD from disk drive number l, 3, or 4, replace the 2 with 1, 3, or 4, as desired. When using only one disk drive it is not necessary to type any number after the D, since 1 is the default in this situation.

Load DOS Without a cartridge such as BASIC in the computer, any disk that contains DOS files and does not contain an AUTORUN.SYS file will boot directly to DOS. If the BASIC language cartridge is in the computer, again without AUTORUN.SYS on the disk, it will boot to the BASIC READY prompt. At this point, simply type DOS and press RETURN to load and execute DUP.SYS (the DOS utilities program).

If, at any point in any application, you want to go to DOS, if you can press BREAK and get the READY prompt, or get to READY in any other way, you can again type DOS and then RETURN. You must bear in mind, however, that any time you call DOS you will lose any current data in memory not previously saved. Before DOS is put into the computer's memory everything that is there is completely erased.

Load Module A file containing object code ready to load into memory.

Load Time The point in the processing of a program when all translation and linking are completed and the program is loaded from disk or tape into memory for execution.

Load'n Go* A program to make your BASIC programs automatically load and run when the disk is booted. 16K; disk. Atari Program Exchange.

Loan Analyzer* An excellent program for analyzing fixed rate and fixed term loans. Enter any three of the variables loan amount, monthly payment amount, loan period, or annual interest rate, and the program will calculate the fourth. The program's amortization table will show you number of payments, total interest paid, total principal paid, current interest, loan balance, and total of payments. 32K; cassette or disk. Creative Software.

LOCATE Atari BASIC Command. This command places an invisible cursor at the indicated location in the graphics window and stores the data found at that point in the specified variable. The data referred to is the ATASCII code number for the character at the designated location, if the graphics mode is a text mode. If it is a graphics mode, the data is 0 or 1 for the 2-color modes, and 0, 1, 2, or 3 for the 4-color modes.
Format:

LOCATE <aexp1>,<aexp2>,<var>
<aexp1> is the x coordinate of the desired point.
<aexp2> is the y coordinate.
<var> is the variable name in which the data is to be stored.

Location of Cursor Cursor location is indicated on the screen by a white square. Its position can be controlled by using the arrow keys together with the CTRL key, the RETURN key, the BACK S key, the SPACE BAR, and the TAB key. See Line Editing, Cursor.

Locked-Up Keyboard Unfortunately, such a catastrophe can and does occur. The only recovery is to reboot by turning the computer off and on again. This procedure, of course, means loss of everything in the computer's memory. Any application program will be stopped, and any current work not previously saved will be lost. On the brighter side, it is comforting to know that neither the computer itself nor any associated hardware can possibly be damaged by such a freeze-up.

LOG Atari BASIC Function. LOG, with an arithmetic expression in parentheses after it, will return the natural logarithm of the designated expression. The format is:

$$<var> = LOG (<n>)$$

Lookahead* This game pits two people against each other or one against the computer. One player moves vertically and the other horizontally to accumulate points by landing on numbered squares. 16K; cassette or disk. Atari Program Exchange.

Loop BASIC. See FOR, NEXT.

Loop-Back Synonym for echo. Loop-back or echo is used to test the circuits of an input/output device by "looping" whatever is sent out back into the computer, as if it were input. In this way, the circuits inside the computer are tested in isolation from the circuits in the external device (and vice-versa), to help isolate a fault.

Loop-Delay Freezing the screen within a BASIC program to allow a set time for reading a message. Here are two simple examples of delay loops:

```
1000 REM TELL BASIC TO COUNT TO 2000
1010 FOR WAIT=1 TO 2000:NEXT WAIT
2000 REM USE A COUNTDOWN TIMER FOR
2010 REM A 2 SECOND DELAY (120 JIFFIES)
2020 POKE 540,120
2030 IF PEEK(540) THEN 2030
```

In the example at line 1010, the length of the wait depends on two factors. The first is, of course, the value of the loop count (2000). The second is the position of the loop with respect to the beginning of the program. A FOR...NEXT loop near the beginning of a program will execute much faster than the same loop near the end of a program.

The example shown in lines 2020 and 2030 is more precise. RAM location 540 contains a countdown timer. The value poked into this location must be from 0 to 255 and represents 60ths of a second. The value of this location will decrement until it reaches zero.

To freeze the screen for an indefinite length of time depending on the needs of the user; use an INPUT statement and instruct the operator to press RETURN when ready. The example below assumes that DUMMY$ has previously been dimensioned (DIM DUMMY$(1)). The input variable may be just a dummy and need not be used in the program:

```
1000 PRINT "PRESS RETURN WHEN READY"
1010 INPUT DUMMY$
```

You may also wait for the operator to press the START button as shown in the following example:

```
2000 PRINT "PRESS START WHEN READY"
2010 IF PEEK(53279)≠6 THEN 2010
```

Lost Colony* This game of economic strategy makes you the leader of a space colony, cut off from your home planet by war. Your job is to allocate enough of your limited resources to adequately provide for the peoples' needs. A mistake early in the game can seriously affect the outcome, and will be felt in your colony for years to come. 40K; disk. Acorn Software.

LPRINT Atari BASIC command. LPRINT followed by any arithmetic expression, string variable, message within quotes, or any combination of these separated by semicolons, will cause the printer to print out the specified data.

LPRINT An LPRINT statement with no other specifications will print a blank line (that is, feed the paper up one line and return to the left margin), so you can space your printout neatly.

LPRINT—Double Comma (,,) Space in a Print Line. To leave space on the print line between items, put an extra comma (,,) in the print line. Enter the BASIC statement:

LPRINT A,,B

This prints A in print zone 1, nothing in print zone 2, and a B in print zone 3. See Print Zones.

LPRINT—Double Quotes (" ") To get one or more spaces between fields printed by your BASIC programs, use a literal of spaces like: " ". To get several spaces between the printed values of A$ and B$ use:

LPRINT A$;"''";B$C$

See also Print Zones.

LRC Longitudinal Redundancy Check. See CRC.

Lucifer's Realm* Can you escape from the halls of hell? Within this fiery pit, notorious past mortals are organizing a revolution. Through strategy and persuasion, you may be able to get out alive. Cassette or disk. Med Systems Software.

Luminance Atari's term for brightness. In the BASIC SETCOLOR command, the third operand is the luminance. The number 15 provides maximum brightness while zero provides a deep, dark color.

Lunar Lander* You are at the controls of a module landing on the surface of the moon. You have thrusters to soften the landing, but your fuel supply is limited. If you come down too hard, or drift into one of the steep walls, it's a crash landing with no return. 24K cassette or 32K disk. Joystick required. Adventure International.

Lunar Leepers* You fly your spaceship to rescue your friends from the man-eating Leepers. The Leepers' spring loaded legs and ability to digest metal belies their innocent appearance. Learning how to control your ship takes practice, because it lacks brakes. Once you have rescued your friends or killed all the Leepers, you can move on to stage two. There your mission is to kill Queen Trabant, who is located at the end of a tunnel. This is a silly, fun game. 32K. Sierra On-Line.
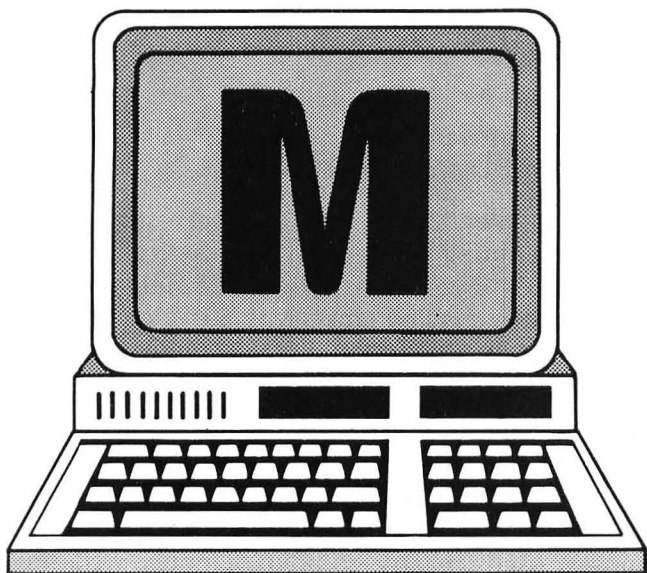
M Codes. ATASCII = 77, HEX = 4D. m—ATASCII = 109, HEX = 6D.

M See DOS Options.

M DOS 3.0 command to create a MEM.SAV file.

MAC65* A powerful macro Assembler and debugger. The Assembler and editor co-reside in memory. The debugger, since it is a separate program, must be loaded separately, but can be loaded at LOMEM and co-reside with the Assembler/editor. The line-oriented editor has all the usual features. Disk. Optimized Systems Software.

Machine Language Monitor* A utility for Machine language/Assembler programmers. Also useful to BASIC and FORTH programmers. It is a powerful utility with twenty-three commands. 8K cassette or 16K disk. Eastern House Software.

Machine Language Program Any program that runs directly on the computer uses the numeric instruction code of its 6502 microprocessor chip. Such programs are variously designated by a file name extender such as .OBJ, .EXE, .COM, or .BIN. Many Machine language programs were originally written as text files known as source programs. The source program contains readable statements in a language such as Pascal, ACTION, or BASIC. The source program is compiled or assembled to produce an object program.

When you write a program in a language such as BASIC, you have produced a source program in text form. Your computer's BASIC (or any other language) program, itself a Machine language program, must then interpret your statements into the numeric instruction code to which your 6502 can

respond properly. Your language, therefore, is an interpreter, processing each line of your source program and interpreting what you want to be done into the proper 6502 commands to control its execution. Since this interpretation must take place for each command in your source text every time your program is run, it can be as much as 100 times slower than compiled BASIC. When your program is translated by a compiler program, it does not have to be re-translated every time it is run.

The BASIC compiler will translate your BASIC source program into a Machine language program, which can be read by the microprocessor chip directly (and very speedily). Some such programs run only with the BASIC cartridge in place, some run only without the BASIC cartridge, and some run either way. In any case, the program can be loaded and run from DOS by using the L selection of the DOS MENU.

Machine language subroutines may also be written directly into BASIC programs by using the USR function (q.v.).

Macro-Assembler* Since the assembler and the editor are in two separate files on disk, their use involves a rather cumbersome procedure. The Assembler is very fast, supports conditional assembly, local labels, has a complete set of pseudo-ops, and a complete macro facility. Disk. Atari, Inc.

Mad Netter* Features a little man trying to catch butterflies with a net. Obstacles appear and disappear randomly, and avoiding them is largely a matter of luck, not skill. Graphics are only so-so, and the game itself is mediocre. 16K. Computer Magic, Ltd.

MAE* A powerful macro Assembler that is co-resident with the full screen text editor and debugger/monitor. Disk. Eastern Software House.

Magazines A number of popular computer-oriented magazines contain useful information concerning Atari computers, and available hardware and software. Most computer stores and larger bookstores carry a good assortment of these magazines.

Many are excellent sources of information on microcomputers in general. Information specifically relevant to the Atari computers, however, is buried amid voluminous ads and articles on other machines and general topics. Five of the most popular are *BYTE, COMPUTE!, Creative Computing, Microcomputing,* and *SoftSide.*

There are three computer magazines devoted

exclusively to the Atari computers. These are *A.N.A.L.O.G., Antic,* and *Atari CONNECTION.*

- **A.N.A.L.O.G.**
  P.O. Box 23
  Worcester, MA 01013
- *Antic*
  297 Missouri Street
  San Francisco, CA 94107
- *Atari CONNECTION*
  Atari Home Computer Division
  P.O. Box 50047
  San Jose, CA 95150
- *BYTE*
  Subscription Department
  P.O. Box 590
  Martinsville, NJ 08836
- *COMPUTE!*
  P.O. Box 5406
  Greensboro, NC 27403
- *Creative Computing*
  P.O.Box 789-M
  Morristown, NJ 07960
- *Microcomputing*
  Pine St.
  Peterborough, NH 03458
  Phone: 603-924-9471
- *SoftSide Publications*
  100 Pine Street
  Holmes, PA 19043

Magic Dump* A screen dump utility that lets you dump a hi-res graphics picture to a printer in many different sizes. Sar-An Computer Products.

Magic Storybook* See the Three Little Pigs come to life before your very eyes in this beautiful scrolling storybook. Features animation, musical narrative, soundtrack, script, and coloring insert. 16K; cassette. Amulet.

Magnum Isolator, ISO-17* Four isolated channels, each quad-filtered, provide isolation between processor and peripherals, and also provide isolation from outside interference. The system includes integral heavy-duty spike suppression for added protection from lightning and heavy-equipment voltage kickback. Recommended for extremely hostile industrial environment or laboratories using very sensitive instruments. Electronic Specialists, Inc.

Mail List* Need to establish a mailing list of customers, friends, birthdays, enemies, anniversaries, or Christmas cards? This powerful, menu-driven program is the fastest available. Seven fields are at your disposal, including two reference fields which

can be used for any purpose. Machine language searching and sorting! 40K; disk. MMG Micro Software.

Mail List Software See Mail List; Mail List—Ver. 3.0; Mailing List; and Master List.

Mail List—Ver. 3.0* Sorts and accesses mailing lists and printing labels. Sorts alphabetically and by zip code, and searches by selected fields. Generates printed mailing labels with a choice of three label formats. Documentation is sketchy; and programming skills are helpful. Disk. Artworx.

Mailing List* A flexible mailing list program with limited database capabilities. Handles your everyday business or home mailing list needs, and also accomodates "extra information." This extra field can be used for any number of notes including product purchased, areas of personal interest, etc. You can sort by any field, but only by one field at a time. A three-variable sort generates three separate lists. Also included is a "General List" function that lets you generate lists to your own specifications. 24K; disk or cassette. Atari, Inc.

Main Memory The internal memory of the microcomputer. See Memory.

Maintenance, Disk File management and disk maintenance are terms describing keeping track of files on diskettes. This includes creating them, finding them by name, insuring that adequate free space is available on the disk, maintaining backups, and deleting files no longer needed. These functions are supported by the DOS functions, but require thoughtful planning by the user to insure proper results.

Some database management systems (DBMS) attempt to automate part of the work of keeping track of files and disks. A DBMS may maintain files of control and tracking data on other files and disks, and may provide alternatives to DOS functions.

Management of Files File management and disk maintenance are terms that describe keeping track of files on disks. See Maintenance, Disk.

Maniac Miner* You are a crazy miner in the Goldbrick Mine looking for rubies, diamonds, and gold. If you avoid the bats and spiders and collect five jewels, you can go to a lower level for even more riches. 48K, disk. Gentry Software.

Mantis Boot Tape Development System* A utility program for programmers who are developing self-booting, Machine Code programs for the 16K cassette market. A programmer can load his Machine

language cassette into RAM, debug the program, and store it on a disk. He can run it as if the computer were a 16K cassette configuration and then save that version on cassette. The program does have some limitations: all files to be worked on must be in boot-tape format whether on cassette or disk; there is no capability for converting Assembler to boot-tape format; and the documentation is somewhat dense. 40K; cassette or disk. Atari Program Exchange.

Manual   A process done by hand, not automated or programmed.

Manual   A reference book, booklet, or other document.

Map Mode   A map mode is a display mode of colored dots or pixels.

Mapping the Atari*   The subjects covered in this book are memory map; vbland processes; a graphic memory map; Atari timing values; old and new ROMs; color; sound and music; player/missile graphics memory map; display lists; numerical conversions; and ATASCII and internal character code values. COMPUTE Books.

Mapware*   Gives you the ability to map almost any area of the world on your Atari. Mapware includes complete digitized files of world coastlines, islands and inland seas, and four types of projections: azimuthal equidistant, orthographic equatorial, cylindrical and general perspective. Map generation takes from fifteen minutes to several hours, depending upon the type of projection. Maps saved on disk take about three minutes for redisplay. The package does not allow you to add your own coordinate files for additional features. Documentation is good. 40K; disk. Atari Program Exchange.

Mar Tesoro*   A nonviolent family game that is relaxing, yet requires clever wits. You rent a boat and diving gear to search for sunken treasure. You encounter sea monsters along the way and must constantly refinance your expedition by selling your treasure or taking out loans. 32K disk or 24K cassette. Syncro.

Marauder*   A fun arcade-style game with multi-room mazes. This is a two-part assault on an alien city. The object is to destroy all defenses, then enter the city through a crater beneath a fireball launcher. The city's defenses include the fireball launcher, two aerial mine launchers, and two missile bases. There are nine levels of difficulty. The more difficult levels have moving shields, fast moving fireballs, and aerial mines. 32K. Sierra On-Line.

Mark I Epson Reinker*   When the printing ribbon starts getting dry, the Reinker will refresh the ribbon in a short time. The unit clips onto the ribbon cartidge; through capillary action, the ink seeps in and rejuvenates the printed output. SAS Electronics.

Mark II Epson Reinker*   For longer lasting cartidge ribbons on the Epson MX-80 and MX-100. Save a fortune on new ribbons. The motor turns the ribbon as it feeds through an ink reservoir, for between twenty minutes and an hour. SAS Electronics.

Market Place, The*   Students learn about economics as they sell items such as bicycles, fruit, and lemonade. Public demand, advertising costs, and more must be taken into consideration to maximize profit. For third through eighth graders. 16K; disk. Atari Program Exchange.

MASHER   Assigns numeric variables to the most frequently used numeric constants in your program, deletes REM statements, and concatenates lines of code whenever possible. Although MASHER is a very slow utility program, it can cut program size down by as much as one-third. APX.

Master List*   This versatile mailing list program allows you to store up to 600 addresses on one disk. You can address envelopes or labels and, in conjunction with Letter Writer and Merge, produce business letters. 40K, disk. The Programmers Workshop.

Master Memory Map*   Find your way around the Atari memory. A very comprehensive and detailed list of memory locations for the Atari 400/800. Educational Software.

Master Menu   A menu is a screen display which lists a number of possible options and asks the user to select one. A selection is made by keying in an identifying number or letter, positioning the cursor beside the desired item, using a light pen, etc. This may require either a branch or subroutine call to the code for the function; alternately the program to carry out this function may be loaded into memory and executed.

Many application packages use a system of multiple menus. A Master Menu lists the major functions allowed. Selection of an option on the Master Menu causes another menu to be displayed, indicating more detailed options for the selected function. This can be followed by even more detailed menus, and so on. Often completion of a function will cause re-display of the Master Menu. Such a system is called menu-driven.

Match Racer* Scrolling graphics offer a realistic obstacle course for one or two players. Initial skill level can be set, then increases as the game progresses. You'll slide on oil slicks and ice, lock wheels with other cars, bounce along over brick roadway, and, if you're not quick enough, probably crash. 16K; cassette or disk. Gebelli.

Matchboxes* A puzzle game that pits you against an opponent or the computer. A grid of thirty-six numbered boxes hides a variety of colorful figures and objects. To win, you must match identical squares and solve a puzzle. Disk or cassette. Broderbund.

Mathematic Tic-Tac-Toe* Each unit of the grid contains a mathematical problem that is displayed if that unit is selected. Correct answers receive an X, and incorrect answers receive a O. All equations must be answered in a given amount of time. 16K cassette or 24K disk. Atari Program Exchange.

Maze of Death* One of the few really playable games written in BASIC rather than Machine language. It is a timed scenario, in which you explore the inside of a nuclear reactor one room at a time. Your goal is to place all the control rods back in the reactor core before it explodes. Along the way, you encounter a variety of hazards, such as deadly robots, deep pits, and electric zaps. 24K; disk or cassette. Syncro.

MC Machine Code. Actual Machine language instructions, whether written directly in Machine Code or resulting from translation of a source program.

Media Modes for recording and storing information are called media. The main medium for Atari is disk, but cassette, hard disk, RAM, ROM, and other devices are also used. Media are often classified as:

a) removable media, such as floppy disks, cassettes, and some hard disks, and

b) fixed media, such as most hard disks.

Fixed media are not removable from the device that drives them, so there is no way to store additional data or backup copies off-line (outside the computing system) for insertion when needed. See also Memory.

Meltdown* Five nuclear reactors must be deactivated *before* meltdown occurs. A thermometer at the bottom of the screen lets you see how close you are to disaster. You must get past a series of obstacles in your attempt to save your men. 16K; cassette or disk. Cosmi.

Memory Any device which can store information for retrieval when needed. Microcomputers rely primarily on random access memory (RAM), read-only memory (ROM), floppy disk, hard disk, and cassettes. The term memory, by itself, is usually a reference to RAM, the general purpose, erasable and reusable memory.

External memory devices, such as cassettes and diskettes, require mechanical motion to retrieve data, so they are hundreds or thousands of times slower. Data in internal memory is immediately available to programs for processing. Data in external memory must be copied into internal memory (GET or INPUT#), processed, then copied back out to external memory (PRINT#).

ROM contains fixed data, usually programs necessary at all times for the proper functioning of the computer. These programs include the disk operating system (DOS) and programs to run the cassette recorder, printer, monitor, and the input and output systems. ROM and RAM together make up the internal memory, or main memory, of the computer.

If data has been created, it can be written out to external memory without an INPUT first. And, if data read in from external memory has not been modified, there is no need to write it back out, since the original copy is still there.

While external memory is slower than internal memory, it does have advantages. It is much cheaper per character of data stored on-line (available for processing without manual intervention). Storing external memory data off-line (on diskettes or cassettes) allows essentially unlimited storage of data. Of course, this requires a manual step of inserting the diskette or cassette before the data can be loaded into the internal memory for processing. See also Virtual Memory, Memory Map, Bubble Memory.

Memory—Amount Free BASIC. See FRE.

Memory, Change BASIC. See POKE.

Memory Address A number or variable designating a location in memory.

Memory Card A card containing RAM or ROM memory to expand or enhance the computer's main memory.

Memory Map BASIC storage organization. A memory map is a description of where things are in memory. The Atari's memory map follows.

O. S. REV. B
BASIC REV. A
DOS 2.0S

	ADDRESS HEX DEC		ATARI LABEL	BRIEF DESCRIPTION
$	0	0	LINZBS	MONITOR RAM
$	2	2	CASINI	CASSETTE INIT VECTOR
$	4	4	RAMLO	POINTER FOR RAM MEMORY TEST
$	6	6	TRAMSZ	REGISTER FOR RAM SIZE
$	7	7	TSTDAT	RAM TEST DATA REGISTER
$	8	8	ARMST	WARM START FLAG
$	9	9	BOOT	SUCCESSFUL BOOT FLAG
$	A	10	DOSVEC	DISK START VECTOR
$	C	12	DOSINI	DISK BOOT INIT ADDRESS
$	E	14	APPMHI	USER MEMORY HI LIMIT
$	10	16	POKMSK	MASK FOR POKEY IRQ ENABLE
$	11	17	BRKKEY	BREAK KEY FLAG
$	12	18	RTCLOK	REAL TIME CLOCK
$	15	21	BUFADR	INDIRECT BUFFER ADDRESS REGISTER
$	17	23	ICCOMT	COMMAND FOR CIO VECTOR
$	18	24	DSKFMS	FILE MANAGER POINTER
$	1A	26	DSKUTL	DISK UTILITIES POINTER
$	1C	28	PTIMOT	PRINTER TIMEOUT REGISTER
$	1D	29	PBPNT	PRINT BUFFER POINTER
$	1E	30	PBUFSZ	PRINT BUFFER SIZE
$	20	32	ICHIDZ	HANDLER INDEX NUMBER
$	21	33	ICDNOZ	DEVICE NUMBER
$	22	34	ICCOMZ	COMMAND CODE
$	23	35	ICSTAZ	STATUS OF LAST IOCB ACTION
$	24	36	ICBALZ	BUFFER ADDRESS/LOW BYTE
$	25	37	ICBAHZ	BUFFER ADDRESS/HIGH BYTE
$	26	38	ICPTLZ	PUT BYTE ADDRESS/LOW BYTE
$	27	39	ICPTHZ	PUT BYTE ADDRESS/HIGH BYTE
$	28	40	ICBLLZ	BUFFER LENGTH/LOW BYTE
$	29	41	ICBLHZ	BUFFER LENGTH/HIGH BYTE
$	2A	42	ICAX1Z	AUXILIARY INFO 1ST BYTE
$	2B	43	ICAX2Z	AUXILIARY INFO 2ND BYTE
$	2C	44	ICAX3Z	AUXILIARY INFO 3RD BYTE
$	2D	45	ICAX4Z	AUXILIARY INFO 4TH BYTE
$	2E	46	ICAX5Z	AUXILIARY INFO 5TH BYTE
$	30	48	STATUS	STATUS STORAGE
$	31	49	CHKSUM	DATA FRAME CHECKSUM
$	32	50	BUFRLO	POINTER TO DATA BUFFER
$	33	51	BUFRHI	POINTER TO DATA BUFFER
$	34	52	BFENLO	POINTER TO DATA BUFFER END
$	35	53	BFENHI	POINTER TO DATA BUFFER END
$	36	54	CRETRY	NUMBER OF COMMAND FRAMES RETRIES
$	37	55	DRETRY	NUMBER OF DEVICE RETRIES
$	38	56	BUFREF	DATA BUFFER FULL FLAG
$	39	57	RECVDN	DONE FLAG
$	3A	58	XMTDON	TRANSMISSION DONE FLAG
$	3B	59	CHKSNT	CHECKSUM SENT FLAG
$	3C	60	NOCKSM	NO CHECKSUM DATA FLAG
$	3D	61	BPTR	CASSETTE BUFFER POINTER
$	3E	62	FTYPE	INTER-RECORD GAP TYPE
$	3F	63	FEOF	CASSETTE END OF FILE FLAG
$	40	64	FREQ	BEEP COUNT RETAIN REGISTER
$	41	65	SOUNDR	NOISY I/O FLAG
$	42	66	CRITIC	CRITICAL I/O REGION FLAG
$	43	67	ZBUFP	FMS PAGE ZERO BUFFER POINTER
$	45	69	ZDRVA	FMS PAGE 0 DRIVE POINTER

| | ADDRESS | | ATARI | BRIEF |
	HEX	DEC	LABEL	DESCRIPTION
$	47	71	ZSBA	FMS PAGE 0 SECTOR BUFFER POINTER
$	49	73	ERRNO	DISK I/O ERROR NUMBER
$	4A	74	CKEY	CASSETTE BOOT REQUEST FLAG ON COLDSTART
$	4B	75	CASSBT	CASSETTE BOOT FLAG
$	4C	76	DSTAT	DISPLAY STATUS REGISTER
$	4D	77	ATRACT	ATTRACT MODE FLAG
$	4E	78	DRKMSK	DARK ATTRACT MASK
$	4F	79	COLRSH	COLOR SHIFT MASK
$	52	82	LMARGN	COLUMN OF LEFT MARGIN OF TEXT
$	53	83	RMARGN	COLUMN OF RIGHT MARGIN OF TEXT
$	54	84	ROWCRS	CURRENT CURSOR ROW
$	55	85	COLCRS	CURRENT CURSOR COLUMN
$	57	87	DINDEX	DISPLAY MODE/CURRENT SCREEN MODE
$	58	88	SAVMSC	LOW ADDRESS OF SCREEN MEMORY
$	5A	90	OLDROW	PREVIOUS CURSOR ROW
$	5B	91	OLDCOL	PREVIOUS CURSOR COLUMN
$	5D	93	OLDCHR	PREVIOUS VALUE OF CHARACTER UNDER CURSOR
$	5E	94	OLDADR	ADDRESS OF CURRENT CURSOR LOCATION
$	60	96	NEWROW	ROW TO WHICH DRAWTO AND XIO 18 WILL GO
$	61	97	NEWCOL	COLUMN TO WHICH DRAWTO AND XIO 18 WILL GO
$	63	99	LOGCOL	POSITION OF CURSOR IN A LOGICAL LINE
$	6A	106	RAMTOP	RAM SIZE ON POWER UP
$	6B	107	BUFCNT	BUFFER COUNT
$	6C	108	BUFSTR	EDITOR LOW BYTE POINTER
$	6E	110	BITMSK	BIT MASK
$	6F	111	SHFAMT	PIXEL JUSTIFICATION
$	70	112	ROWAC	CONTROL OF ROW POINT PLOTTING
$	72	114	COLAC	CONTROL OF COLUMN POINT PLOTTING
$	74	116	ENDPT	END POINT OF THE LINE TO BE DRAWN
$	76	118	DELTAR	DELTA ROW
$	77	119	DELTAC	DELTA COLUMN
$	79	121	ROWINC	ROW INCREMENT OR DECREMENT
$	7A	122	COLINC	COLUMN INCREMENT OR DECREMENT
$	7B	123	SWPFLG	SPLIT-SCREEN CURSOR CONTROL
$	7C	124	HOLDCH	CONTROL AND SHIFT CHARACTER TEMP.
$	7E	126	COUNTR	CONTAINS THE LARGER VALUE DELTAR OR DELTAC
$	80	128	LOMEM	POINTER TO BASIC'S LOW MEMORY
$	82	130	VNTP	BEGINNING ADDRESS OF VARIABLE TABLE
$	84	132	VNTD	ENDING ADDRESS OF VARIABLE TABLE
$	86	134	VVTP	ADDRESS FOR THE VARIABLE VALUE TABLE
$	88	136	TMTAB	ADDRESS OF THE STATEMENT TABLE
$	8A	138	STMCUR	CURRENT BASIC STATEMENT POINTER
$	8C	140	STARP	POINTER TO THE END OF A BASIC PROGRAM
$	8E	142	RUNSTK	ADDRESS OF RUNTIME STACK
$	90	144	MEMTOP	POINTER TO THE TOP OF BASIC MEMORY
$	BA	186	STOPLN	LINE WHERE A PROGRAM WAS STOPPED
$	C3	195	ERRSAVE	ERROR CODE NUMBER THAT CAUSED STOP
$	C9	201	PTABW	NUMBER OF COLUMNS BETWEEN TAB STOPS
$	D2	210	USRVAL	VALUE RETURNED TO BASIC USR
$	D4	212	FR0	FLOATING POINT REGISTER ZERO
$	DA	218	FRE	FLOATING POINT EXTRA REGISTER
$	E0	224	FR1	FLOATING POINT REGISTER 1
$	E6	230	FR2	FLOATING POINT REGISTER 2
$	EC	236	FRX	FLOATING POINT SPARE REGISTER
$	ED	237	EEXP	VALUE OF E (THE EXPONENT)
$	EE	238	NSIGN	SIGN OF THE FP NUMBER
$	EF	239	ESIGN	SIGN OF THE EXPONENT
$	F0	240	FCHFLG	FIRST CHARACTER FLAG
$	F1	241	DIGRT	NUMBER OF DIGITS TO THE RIGHT OF THE DECIMAL
$	F2	242	CIX	CHARACTER INDEX

	ADDRESS		ATARI	BRIEF
	HEX	**DEC**	**LABEL**	**DESCRIPTION**
$	F3	243	INBUFF	INPUT TEXT BUFFER POINTER
$	FB	251	DEGFLG	TRIG. FUNCTIONS SET TO RADIANS(0) OR DEGREES(6)
$	FC	252	FLPTR	POINTS TO USER'S FP NUMBER
$	FE	254	FPTR2	POINTER TO USER'S SECOND FP NUMBER
$	200	512	VDSLST	VECTOR FOR NMI DISPLAY LIST INTERRUPTS(DLI)
$	202	514	VPRCED	PROCEED LINE VECTOR
$	204	516	VINTER	SERIAL INTERRUPT VECTOR
$	206	518	VBREAK	SOFTWARE BREAK INSTRUCTION VECTOR
$	208	520	VKEYVD	POKEY KEYBOARD INTERRUPT VECTOR
$	20A	522	VSERIN	POKEY SERIAL I/O RECEIVE DATA READY VECTOR
$	20C	524	VSEROR	POKEY SERIAL I/O TRANSMIT READY VECTOR
$	20E	526	VSEROC	POKEY SERIAL I/O TRANSMIT COMPLETE VECTOR
$	210	528	VTIMR1	POKEY TIMER 1 INTERRUPT VECTOR
$	212	530	VTIMR2	POKEY TIMER 2 INTERRUPT VECTOR
$	214	532	VTIMR4	POKEY TIMER 4 INTERRUPT VECTOR
$	216	534	VIMIRQ	IRQ IMMEDIATE VECTOR
$	218	536	CDTMV1	COUNT DOWN TIMER 1
$	21A	538	CDTMV2	COUNT DOWN TIMER 2
$	21C	540	CDTMV3	COUNT DOWN TIMER 3
$	21E	542	CDTMV4	COUNT DOWN TIMER 4
$	220	544	CDTMV5	COUNT DOWN TIMER 5
$	222	546	VVBLKI	VBLANK IMMEDIATE REGISTER
$	224	548	VVBLKD	VBLANK DEFERRED REGISTER
$	226	550	CDTMA1	SYSTEM TIMER 1 JUMP ADDRESS
$	228	552	CDTMA2	SYSTEM TIMER 2 JUMP ADDRESS
$	22A	554	CDTMF3	SYSTEM TIMER 3 FLAG
$	22B	555	SRTIMR	SOFTWARE REPEAT TIMER
$	22C	556	CDTMF4	SYSTEM TIMER 4 FLAG
$	22E	558	CDTMF5	SYSTEM TIMER 5 FLAG
$	22F	559	SDMCTL	DIRECT MEMORY ACCESS ENABLE
$	230	560	SDLSTL	STARTING ADDRESS OF DISPLAY LIST LOW BYTE
$	231	561	SDLSTH	STARTING ADDRESS OF DISPLAY LIST HIGH BYTE
$	232	562	SSKCTL	SERIAL PORT CONTROL REGISTER
$	233	563	SPARE	NOT TO BE USED SPARE BYTE
$	234	564	LPENH	LIGHT PEN HORIZONTAL VALUE
$	235	565	LPENV	LIGHT PEN VERTICAL VALUE
$	236	566	BRKKY	BREAK KEY INTERRUPT VECTOR
$	23A	570	CDEVIC	COMMAND FRAME BUFFER
$	23B	571	CCOMHD	SIO BUS COMMAND CODE
$	23C	572	CAUX1	COMMAND AUXILIARY BYTE
$	23D	573	CAUX2	COMMAND AUXILIARY BYTE
$	23E	574	TEMP	TEMPORARY RAM REGISTER FOR SIO
$	23F	575	ERRFLG	SIO ERROR FLAG
$	240	576	DFLAGS	DISK FLAGS
$	241	577	DBSECT	NUMBER OF DISK BOOT SECTORS READ
$	242	578	BOOTAD	ADDRESS TO WHERE DISK BOOT LOADER WILL BE
$	244	580	COLDST	COLDSTART FLAG
$	246	582	DSKTIM	DISK TIME-OUT REGISTER
$	247	583	LINBUF	40 CHARACTER LINE BUFFER
$	26F	623	GPRIOR	GLOBAL PRIORITY CELL
$	270	624	PADDL0	VALUE OF PADDLE 0
$	271	625	PADDL1	VALUE OF PADDLE 1
$	272	626	PADDL2	VALUE OF PADDLE 2
$	273	627	PADDL3	VALUE OF PADDLE 3
$	274	628	PADDL4	VALUE OF PADDLE 4
$	275	629	PADDL5	VALUE OF PADDLE 5
$	276	630	PADDL6	VALUE OF PADDLE 6
$	277	631	PADDL7	VALUE OF PADDLE 7
$	278	632	STICK0	VALUE OF JOYSTICK 0
$	279	633	STICK1	VALUE OF JOYSTICK 1

ADDRESS			ATARI	BRIEF
	HEX	DEC	LABEL	DESCRIPTION
$	27A	634	STICK2	VALUE OF JOYSTICK 2
$	27B	635	STICK3	VALUE OF JOYSTICK 3
$	27C	636	PTRIG0	PADDLE TRIGGER 0
$	27D	637	PTRIG1	PADDLE TRIGGER 1
$	27E	638	PTRIG2	PADDLE TRIGGER 2
$	27F	639	PTRIG3	PADDLE TRIGGER 3
$	280	640	PTRIG4	PADDLE TRIGGER 4
$	281	641	PTRIG5	PADDLE TRIGGER 5
$	282	642	PTRIG6	PADDLE TRIGGER 6
$	283	643	PTRIG7	PADDLE TRIGGER 7
$	284	644	STRIG0	JOYSTICK TRIGGER 0
$	285	645	STRIG1	JOYSTICK TRIGGER 1
$	286	646	STRIG2	JOYSTICK TRIGGER 2
$	287	647	STRIG3	JOYSTICK TRIGGER 3
$	288	648	CSTAT	CASSETTE STATUS REGISTER
$	289	649	WMODE	READ OR WRITE MODE CASSETTE REGISTER
$	28A	650	BLIM	CASSETTE DATA RECORD BUFFER SIZE
$	290	656	TXTROW	TEXT WINDOW CURSOR ROW
$	291	657	TXTCOL	TEXT WINDOW CURSOR COLUMN
$	293	659	TINDEX	TEST WINDOW INDEX
$	294	660	TXTMSC	ADDRESS OF UPPER LEFT CORNER OF TEXT WINDOW
$	296	662	TXTOLD	SPLIT-SCREEN CURSOR DATA
$	2A0	672	DMASK	PIXEL LOCATION MASK
$	2A2	674	ESCFLG	ESCAPE FLAG
$	2A3	675	TABMAP	MAP OF TAB STOPS
$	2B2	690	LOCMAP	LOGICAL LINE START BIT MAP
$	2B6	694	INVFLG	INVERSE VIDEO FLAG
$	2B7	695	FILFLG	FILL FLAG FOR DRAW COMMAND
$	2BB	699	SCRFLG	SCROLL FLAG
$	2BE	702	SHFLOK	SHIFT AND CONTROL KEYS FLAG
$	2BF	703	BOTSCR	BOTTOM OF SCREEN
$	2C0	704	PCOLR0	COLOR OF PLAYER 0
$	2C1	705	PCOLR1	COLOR OF PLAYER 1
$	2C2	706	PCOLR2	COLOR OF PLAYER 2
$	2C3	707	PCOLR3	COLOR OF PLAYER 3
$	2C4	708	COLOR0	COLOR REGISTER 0
$	2C5	709	COLOR1	COLOR REGISTER 1
$	2C6	710	COLOR2	COLOR REGISTER 2
$	2C7	711	COLOR3	COLOR REGISTER 3
$	2C8	712	COLOR4	COLOR REGISTER 4
$	2E0	736	RUNAD	RUN ADDRESS
$	2E2	738	INITAD	INITIALIZATION ADDRESS
$	2E4	740	RAMSIZ	RAM SIZE HIGH BYTE ONLY
$	2E5	741	MEMTOP	POINTER TO TOP OF FREE MEMORY
$	2E7	743	MEMLO	BOTTOM OF USER MEMORY
$	2EA	746	DVSTAT	DEVICE STATUS REGISTER
$	2EE	750	CBAUDL	CASSETTE BAUD RATE LOW
$	2EF	751	CBAUDH	CASSETTE BAUD RATE HIGH
$	2F0	752	CRSINH	CURSOR INHIBIT FLAG
$	2F1	753	KEYDEL	KEY DELAY FLAG
$	2F2	754	CH1	PRIOR KEYBOARD CHARACTER CODE
$	2F3	755	CHACT	CHARACTER MODE REGISTER
$	2F4	756	CHBAS	CHARACTER BASE REGISTER
$	2FA	762	CHARACTER	INTERNAL CODE VALUE FOR CURRENT CHARACTER
$	2FB	763	ATACHR	ATASCII CHARACTER
$	2FC	764	CH	GLOBAL VARIABLE FROM KEYBOARD
$	2FD	765	FILDAT	COLOR DATA FOR FILL REGION
$	2FE	766	DSPFLG	DISPLAY FLAG
$	2FF	767	SSFLAG	START/STOP FLAG FOR PAGING
$	300	768	DDEVIC	DEVICE SERIAL BUS ID

ADDRESS		ATARI	BRIEF
HEX	**DEC**	**LABEL**	**DESCRIPTION**
$ 301	769	DUNIT	DEVICE UNIT NUMBER
$ 302	770	DCOMND	NUMBER OF DEVICE OPERATION
$ 303	771	DSTATS	STATUS CODE
$ 304	772	DBUFLO/HI	DATA BUFFER ADDREQS
$ 306	774	DTIMLO	TIME-OUT VALUE
$ 308	776	DBYTLO/HI	NO. OF BYTES TRANSFERRED TO OR FROM DATA BUFFER
$ 30C	780	TIMER1	INITIAL BAUD RATE TIMER VALUE
$ 30E	782	ADDCOR	ADDITION CORRECTION FLAG
$ 30F	783	CASFLG	CASSETTE MODE
$ 310	784	TIMER2	FINAL TIMER VALUE
$ 316	790	QAVIO	SAVE SERIAL DATA-IN PORT
$ 318	792	STACKP	STACK POINTER
$ 31A	794	HATABS	HANDLER ADDRESS TABLE
$ 340	832	IOCB0	I/O CONTROL BLOCK 0 SCREEN EDITOR
$ 350	848	IOCB1	I/O CONTROL BLOCK 1
$ 360	864	IOCB2	I/O CONTROL BLOCK 2
$ 370	880	IOCB3	I/O CONTROL BLOCK 3
$ 380	896	IOCB4	I/O CONTROL BLOCK 4
$ 390	912	IOCB5	I/O CONTROL BLOCK 5
$ 3A0	928	IOCB6	I/O CONTROL BLOCK 6 SCREEN DISPLAY
$ 3B0	944	IOCB7	I/O CONTROL BLOCK 7 LPRINT AND LIST
$ 3C0	960	PRNBUF	PRINTER BUFFER
$ 3FD	1021	CASBUF	CASSETTE BUFFER
$ 580	1408	LBUFF	BASIC LINE BUFFER
$ 709	1801	SABYTE	NUMBER OF FILES ALLOWED OPEN AT A TIME
$ 70A	1802	DRVBYT	MAXIMUM NUMBER OF DISK DRIVES
$ 76C	1900	BSIO	FMS DISK SECTOR I/O ROUTINES
$ 772	1906	BSIOR	FMS DISK HANDLER
$ 779	1913	WVFLAG	WRITE VERIFY FLAG
$ 7CB	1995	DFMSDH	FMS DEVICE HANDLER
$ 7E0	2016	DINIT	FMS INITIALIZATION ROUTINE
$ 8AB	2219	DFMOPN	OPEN ROUTINES
$ 900	2508	DFMPUT	PUT ROUTINES
$ ABF	2751	DFMGET	GET ROUTINES
$ B01	2817	DFMSTA	DISK STATUS ROUTINES
$ B15	2837	DFMCLS	CLOSE ROUTINES
$ BA7	2983	DFMDDC	DEVICE-DEPENDENT COMMAND ROUTINES
$ BD9	3033	XRENAME	RENAME A FILE
$ C32	3122	XDELETE	DELETE A FILE
$ C7C	3196	XLOCK,XUNLOCK	LOCK AND UNLOCK FILES
$ CBA	3258	XPOINT	POINT COMMAND
$ D03	3331	XNOTE	NOTE COMMAND
$ D18	3352	XFORMAT	FORMAT COMMAND
$ DAD	3501	LISTDIR	LIST DISK DIRECTORY
$ E9E	3742	FNDCODE	WILDCARD VALIDITY TEST
$ F0A	3850	FDSCHAR	STORE FILE NAME
$ F21	3873	SFDIR	DIRECTORY SEARCH ROUTINES
$ F94	3988	WRTNXS	WRITE DATA ROUTINE
$ 100F	4111	RDNXTS	READ DATA ROUTINES
$ 1063	4206	RDDIR	READ AND WRITE DIRECTORY ROUTINES
$ 108B	4235	RDVTOC	READ OR WRITE VOLUME TABLE ROUTINES
$ 10C5	4293	FRESECT	FREE SECTOR ROUTINE
$ 1106	4358	GETSECTOR	GET SECTOR FOUTINE
$ 1164	4452	SETUP	INITIALIZE OPTION CHOSEN
$ 120A	4618	WRTDOS	WRITE NEW DOS.SYS FILE
$ 12B5	4789	ERRNO	FMS ERROR NUMBER TABLE
$ 12D3	4819	RETURN	FMS EXIT
$ 1381	4993	FCB	FMS FILE CONTROL BLOCKS
$ 1401	5121	FILDIR	FILE DIRECTORY BUFFER
$ 1501	5377	ENDFMS	DISK DIRECTORY BUFFER

	ADDRESS		ATARI	BRIEF
	HEX	**DEC**	**LABEL**	**DESCRIPTION**
$	1540	5440	DOS	STARTING ADDRESS OF SUP.SYS
$	159E	5534	OPT	DISK MENU OPTION CHOSEN
$	15A4	5540	SFLOAD	BINARY LOAD
$	15C8	5576	RDLF	BINARY LOAD IOCB#1 FILE
$	1746	5948	MWRITE	WRITE MEM.SAV
$	179F	6047	MNDUP	DOS CALL ENTRY POINT
$	1912	6418	CLMJMP	JUMP TO CARTRIDGE
$	1939	6457	LDMEM	MEMSAVE LOADING ROUTINES
$	1979	6518	INITIO	DUP.SYS WARMSTART
$	1A7D	6781	DDBUFR	DRIVE AND DATA BUFFERS
$	1DA4	7588	LINE	80 BYTE LINE BUFFER
$	1DF4	7668	DBUF	256 BYTE DATA BUFFER
$	1F0F	7951	DMENU	DISK MENU SCREEN DATA
$	2075	8309	DOSOS	DOS UTILITY MONITOR
$	2139	8505	DIRLST	DIRECTORY LISTING
$	21C9	8649	DELFIL	DELETE FILE
$	2637	9783	RENFIL	RENAME A FILE
$	2680	9856	FMTDSK	FORMAT ENTIRE DISK
$	26EE	9966	STCAR	START CARTRIDGE
$	274C	10060	BRUN	RUN A BINARY FILE
$	27D9	10201	WBOOT	WRITE DOS/DUP FILES
$	291A	10522	LDFIL	LOAD A BINARY FILE
$	2970	10608	LKFIL,ULFIL	LOCK AND UNLOCK FILES
$	29C2	10690	DDMG	DUPLICATE DISK
$	2F2E	12078	SAVFIL	SAVE A BINARY FILE
$	BDA7	48551	SIN	CALCULATE THE SINE FUNCTION
$	BDB1	48561	COS	CALCULATE THE COSINE FUNCTION
$	BE77	48759	ATAN	CALCULATE THE ATANGENT FUNCTION
$	BEE5	48869	SQR	CALCULATE SQUARE ROOT
$	D000	53248	HPOSP0	HORIZONTAL POSITION OF PLAYER 0 (WRITE)
			M0PF	MISSILE 0 TO PLAYFIELD COLLISION (READ)
$	D001	53249	HPOSP1	HORIZONTAL POSITION OF PLAYER 1 (W)
			M1PF	MISSILE 1 TO PLAYFIELD COLLISION (R)
$	D002	53250	HPOSP2	HORIZONTAL POSITION OF PLAYER 2 (W)
			M2PF	MISSILE 2 TO PLAYFIELD COLLISION (R)
$	D003	53251	HPOSP3	HORIZONTAL POSITION OF PLAYER 3 (W)
			M3PF	MISSILE 3 TO PLAYFIELD COLLISION (R)
$	D004	53252	HPOSM0	HORIZONTAL POSITION OF MISSILE 0 (W)
			P0PF	PLAYER 0 TO PLAYFIELD COLLISIONS (R)
$	D005	53253	HPOSM1	HORIZONTAL POSITION OF MISSILE 1 (W)
			P1PF	PLAYER 1 TO PLAYFIELD COLLISIONS (R)
$	D006	53254	HPOSM2	HORIZONTAL POSITION OF MISSILE 2 (W)
			P2PF	PLAYER 2 TO PLAYFIELD COLLISIONS (R)
$	D007	53255	HPOSM3	HORIZONTAL POSITION OF MISSILE 3 (W)
			P3PF	PLAYER 3 TO PLAYFIELD COLLISIONS (R)
$	D008	53256	SIZEP0	SIZE OF PLAYER 0 (W)
			M0PL	MISSILE 0 TO PLAYER COLLISIONS (R)
$	D009	53257	SIZEP1	SIZE OF PLAYER 1 (W)
			M1PL	MISSILE 1 TO PLAYER COLLISIONS (R)
$	D00A	53258	SIZEP2	SIZE OF PLAYER 2 (W)
			M2PL	MISSILE 2 TO PLAYER COLLISIONS (R)
$	D00B	53259	SIZEP3	SIZE OF PLAYER 3 (W)
			M3PL	MISSILE 3 TO PLAYER COLLISIONS (R)
$	D00C	53260	SIZEM	SIZE OF ALL PLAYER (W)
			P0PL	PLAYER 0 TO PLAYER COLLISIONS (R)
$	D00D	53261	GRAFP0	SHAPE OF PLAYER 0 (W)
			1PL	PLAYER 1 TO PLAYER COLLISIONS (R)
$	D00E	53262	GRAFP1	SHAPE OF PLAYER 1 (W)
			P2PL	PLAYER 2 TO PLAYER COLLISIONS (R)
$	D00F	53263	GRAFP2	SHAPE OF PLAYER 2 (W)
			P3PL	PLAYER 3 TO PLAYER COLLISIONS (R)

	ADDRESS		ATARI	BRIEF
	HEX	**DEC**	**LABEL**	**DESCRIPTION**
$	D010	53264	GRAPF3	SHAPE OF PLAYER 3 (W)
			TRIG0	JOYSTICK TRIGGER 0 (R)
$	D011	53265	GRAFM	SHAPE FOR ALL MISSILES (W)
			TRIG1	JOYSTICK TRIGGER 1 (R)
$	D012	53266	COLPMO	COLOR OF PLAYER AND MISSILE 0 (W)
			TRIG2	JOYSTICK TRIGGER 2 (R)
$	D013	53267	COLPM1	COLOR OF PLAYER AND MISSILE 1 (W)
			TRIG3	JOYSTICK TRIGGER 3 (R)
$	D014	53268	COLPM2	COLOR OF PLAYER AND MISSILE 2 (W)
			PAL	PAL OR NTSC COMPATIBLE (R)
$	D015	53269	COLPM3	COLOR OF PLAYER AND MISSILE 3
$	D016	53270	COLPF0	COLOR OF PLAYFIELD 0
$	D017	53271	COLPF1	COLOR OF PLAYFIELD 1
$	D018	53272	COLPF2	COLOR OF PLAYFIELD 2
$	D019	53273	COLPF3	COLOR OF PLAYFIELD 3
$	D01A	53274	COLBK	COLOR OF BACKGROUND
$	D01B	53275	PRIOR	PRIORITY REGISTER
$	D01C	53276	VDELAY	VERTICAL DELAY REGISTER
$	D01D	53277	GRACTL	TURN ON PLAYER/MISSILES
$	D01E	53278	HITCLR	CLEAR P/M COLLISION REGISTERS
$	D01F	53279	CONSOL	CONSOLE BUTTON REGISTER
$	D200	53760	AUDF1	AUDIO FREQUENCY 1
$	D201	53761	AUDC1	AUDIO CONTROL 1
$	D202	53762	AUDF2	AUDIO FREQUENCY 2
$	D203	53763	AUDC2	AUDIO CONTROL 2
$	D204	53764	AUDF3	AUDIO FREQUENCY 3
$	D205	53765	AUDC3	AUDIO CONTROL 3
$	D206	53766	AUDF4	AUDIO FREQUENCY 4
$	D207	53767	AUDC4	AUDIO CONTROL 4
$	D208	53768	AUDCTL	AUDIO CONTROL
$	D209	53769	STIMER	POKEY TIMERS
$	D20A	53770	RANDOM	READ RANDOM NUMBER
$	D20D	53773	SEROUT	SERIAL PORT DATA INPUT/OUTPUT
$	D20E	53774	IRQEN	INTERRUPT REQUEST ENABLE
$	D20F	53775	SKCTL	SERIAL PORT CONTROL
$	D300	54016	PORTA	READ/WRITE FROM PORT A
$	D301	54017	PORTB	READ/WRITE FROM PORT B
$	D302	54018	PACTL	PORT A CONTROLLER
$	D303	54019	PBCTL	PORT B CONTROLLER
$	D400	54272	DMACTL	DIRECT MEMORY ACCESS CONTROL
$	D401	54273	CHACTL	CHARACTER MODE CONTROL
$	D402	54274	DLISTL/H	DISPLAY LIST POINTER
$	D404	54276	HSCROL	HORIZONTAL SCROLL
$	D405	54277	VSCROL	VERTICAL SCROLL
$	D407	54279	PMBASE	PLAYER/MISSILE BASE ADDRESS
$	D409	54281	CHBASE	CHARACTER BASE ADDRESS
$	D40B	54283	VCOUNT	VERTICAL LINE COUNTER
$	D40C	54284	PENH	LIGHT PEN HORIZONTAL POSTIION
$	D40D	54285	PENV	LIGHT PEN VERTICAL POSITION
$	D40E	54286	NMIEN	NON-MASKABLE INTERRUPT ENABLE
$	D40F	54287	NMIRES	RESETS NMI
$	D800	55296	AFP	ASCII TO FLOATING POINT
$	D8E6	55526	FASC	FP TO ASCII
$	D9AA	55722	IFP	INTEGER TO FP
$	D9D2	55762	FPI	FP TO INTEGER
$	DA60	55904	FSUB	FP SUBTRACTION
$	DA66	55910	FADD	FP ADDITION
$	DADB	56027	FMUL	FP MULTIPLICATION
$	DB28	56104	FDIV	FP DIVISION
$	DD40	56640	PLYEVL	FP POLYNOMIAL EVALUATION

Memory Map Changes in 1200 XL

	ADDRESS		ATARI	BRIEF
	HEX	DEC	LABEL	DESCRIPTION
$	DD89	56713	FLD0R	LOAD FP NUMBER INTO FR0 FROM REGISTER
$	DD8D	56717	FLD0P	LOAD FP NUMBER INTO FR0
$	DD98	56728	FLD1R	LOAD FP NUMBER INTO FR1 FROM REGISTER
$	DD9C	56732	FLD1P	LOAD FP NUMBER INTO FR1
$	DDA7	56743	FST0R	STORE FP NUMBER INTO REGISTER FROM FR0
$	DDAB	56747	FST0P	STORE FP NUMBER INTO REGISTER
$	DDB6	56758	FMOVE	MOVE FP NUMBER FROM FR0 TO FR1
$	DDC0	56768	EXP	FP EXPONENTIATION
$	DDCC	56780	EXP10	FP EXPONENTIATION BASE 10
$	DECD	57037	LOG	FP NATURAL LOG
$	DED1	57041	LOG10	FP BASE 10 LOG
$	E000	57344	CHRORG	CHARACTER SET
$	E400	58368	EDITRV	EDITOR E: DEVICE
$	E410	58384	SCRENV	SCREEN S: DEVICE
$	E420	58400	KEYBDV	KEYBOARD K: DEVICE
$	E430	58416	PRINTV	PRINTER P: DEVICE
$	E440	58432	CASETV	CASSETTE C: DEVICE
$	E450	58448	DISKIV	DISK D: DEVICE
$	E453	58451	DISKINV	DISK INTERFACE
$	E456	58454	CIOV	CENTRAL I/O VECTOR
$	E459	58457	SIOV	SERIAL I/O VECTOR
$	E45C	58460	SETVBV	SET VERTICAL BLANK VECTOR
$	E45F	58463	SYSVBV	IMMEDIATE VBLANK VECTOR
$	E462	58466	XITVBV	EXIT VBLANK VECTOR
$	E465	58469	SIOINV	SERIAL I/O INIT
$	E468	58472	SENDEV	SEND ENABLE ROUTINE
$	E46B	58475	INTINV	INTERRUPT INIT
$	E46E	58478	CIONIV	CENTRAL I/O INIT
$	E471	58481	BLKBDV	BLACKBOARD MODE
$	E474	58484	WARMSV	WARM START
$	E477	58487	COLDSV	COLD START
$	E47A	58490	RBLOKV	CASSETTE READ
$	E47D	58493	CSOPIV	CASSETTE OPEN
$	E480	58496	VCTABL	RAM VECTOR INITIAL VALUE
$	E4A6	58534	CIOORG	CENTRAL I/O HANDLER
$	E6D5	59093	INTORG	INTERUPT HANDLER
$	E944	59716	SIOORG	SERIAL I/O HANDLER
$	EDEA	60906	DSKORG	DISK HANDLER
$	EE78	61048	PRNORG	PRINTER HANDLER
$	EF41	61249	CASORG	CASSETTE HANDLER
$	F0E3	61667	MONORG	MONITOR/POWER UP MODULE
$	F3E4	62436	KBDORG	KEYBOARD/DISPLAY HANDLER

Memory Map Changes in 1200XL

ADDRESS		Atari	BRIEF
DEC	HEX	LABEL	DESCRIPTION
1	1	NGFLAG	POWER-UP SELFTEST
1C	28	ABUFPT	RESERVED
1D	29	ABUFPT	RESERVED
1E	30	ABUFPT	RESERVED
1F	31	ABUFPT	RESERVED
36	54	LTEMP	LOADER TEMPORARY
37	55	LTEMP	LOADER TEMPORARY
4A	74	ZCHAIN	HANDLER LOADER TEMPORARY
4B	75	ZCHAIN	HANDLER LOADER TEMPORARY
60	96	FKDEF	FUNCTION KEY DEF POINTER
61	97	FKDEF	FUNCTION KEY DEF POINTER
62	98	PALNTS	PAL/NTSC FLAG
79	121	KEYDEF	KEY DEF POINTER

ADDRESS		ATARI	BRIEF
HEX	**DEC**	**LABEL**	**DESCRIPTION**
7A	122	KEYDEF	KEY DEF POINTER
233	563	LCOUNT	LOADER TEMPORARY
238	568	RELADR	LOADER
239	569	RELADR	LOADER
245	581	RECLEN	LOADER
247	583	RESERV	$247-26A RESERVED
26B	619	CHSALT	CHARACTER SET POINTER
26C	620	VSFLAG	FINE SCROLL TEMPORARY
26D	621	KEYDIS	KEYBOARD DISABLE
26E	622	FINE	FINE SCROLL FLAG
288	648	HIBYTE	LOADER
28E	654	NEWADR	LOADER
29C	668	CRETRY	FROM $36
2BD	701	DRETRY	FROM $37
2C9	713	RUNADR	LOADER
2CB	715	HIUSED	LOADER
2CD	717	ZHIUSE	LOADER
2CF	719	GBYTEA	LOADER
2D1	721	LOADAD	LOADER
2D3	723	ZLOADA	LOADER
2D5	725	DSCTLN	DISK SECTOR SIZE
2D7	727	ACMISR	TWO BYTES RESERVED
2D9	729	KPRDEL	AUTO KEY DELAY
2DA	730	KEYREP	AUTO KEY RATE
2DB	731	NOCLIK	KEY CLICK DISABLE
2DC	732	HELPFG	HELP KEY FLAG
2DD	733	DMASAV	DMA STATE SAVE
2DE	734	PBPNT	FROM $1D
2DF	735	PBUFSZ	FROM $1E
2E9	745	HNDLOD	HANDLER LOADER FLAG
2F5	757	NEWROW	FROM $60
2F6	758	NEWCOL	FROM $61-$62
2F8	760	ROWINC	FROM $79
2F9	761	COLINC	FROM $7A
30E	782	JMPERS	OPTION JUMPERS
314	788	PTIMOT	FROM $1C
33D	829	PUPBT1	POWER-UP RESET
33E	830	PUPBT2	POWER-UP RESET
33F	831	PUPBT3	POWER-UP RESET
3E8	1000	SUPERF	SCREEN EDITOR
3E9	1001	CKEY	FROM $4A
3EA	1002	CASSBT	FROM $4B
3EB	1003	CARTCK	CARTRIDGE CHECKSUM
3ED	1005	ACMVAR	RESERVED $3ED-$3F8
3F9	1017	MINTLK	RESERVED
3FA	1018	GINTLK	CARTRIDGE INTERLOCK
3FB	1019	CHLINK	HANDLER CHAIN 2 BYTES

Memory Map Explorer A useful program for displaying addresses of key memory locations in your computer.

```
10 REM MEMMAP by Jerry White
20 REM This program will display the
30 REM addresses of key memory
40 REM locations in your computer.
50 REM
60 GRAPHICS 0:POKE 18,0:POKE 19,0:POKE
20,0:REM RESET REAL TIME CLOCK
70 POKE 559,0:REM SHUT OFF ANTIC FOR
FASTER EXECUTION
100 ? "* BASIC MEMORY MAP by Jerry White
* " :PAGE=256
101 POKE 82,2:REM LEFT MARGIN
102 POKE 83,39:REM RIGHT MARGIN
103 POKE 201,10:REM TAB WIDTH
104 POKE 710,0:REM BACKGROUND COLOR
105 DIM LINE$(30),WORDS$(21):? :? ,,"DEC-
IMAL ADDRESS"
```

```
110 WORDS$ ="SCREEN MEMORY":GOSUB
    400:? PEEK(88)+PAGE*PEEK(89)
120 WORDS$ ="O. S. RAMTOP":GOSUB 400:?
    PEEK(106) * PAGE
130 WORDS$ ="BASIC LOMEM":GOSUB 400:?
    PEEK(128)+PAGE * PEEK(129)
140 WORDS$ ="BASIC VARIABLE TABLE":
    GOSUB 400:? PEEK(130)+PAGE * PEEK(131)
150 WORDS$ ="VARIABLE VALUE TABLE":
    GOSUB 400:? PEEK(134)+PAGE * PEEK(135)
160 WORDS$ ="BASIC STATEMENT TABLE":
    GOSUB 400:? PEEK(136)+PAGE * PEEK(137)
170 WORDS$ ="STRING/ARRAY TABLE":
    GOSUB 400:? PEEK(140)+PAGE * PEEK(141)
180 WORDS$ ="RUNTIME STACK":GOSUB
    400:? PEEK(142)+PAGE* PEEK(143)
190 WORDS$ ="MEMTOP END OF PROGRAM":
    GOSUB 400:? PEEK(144)+PAGE*PEEK(145)
200 WORDS$ ="DISPLAY LIST":GOSUB 400:?
    PEEK(560)+PAGE * PEEK(561)
210 WORDS$ ="BASIC MEMTOP":GOSUB
    400:? PEEK(741)+PAGE * PEEK(742)
220 WORDS$ ="BASIC MEMLO":GOSUB 400:?
    PEEK(743)+PAGE * PEEK(744)
230 WORDS$ ="CHARACTER SET":GOSUB
    400:? PEEK(756) * PAGE
240 ? :? "AVAILABLE RAM=";FRE(0); "BYTES."
250 REM FIND RUN TIME AND TURN ANTIC
    BACK ON SO WE CAN SEE THE SCREEN
260 ? "PROGRAM RUNTIME=";PEEK(20);
    "JIFFIES.":POKE 559,34
270 REM ONE JIFFY=1/60 OF A SECOND
280 ? :? "BASIC":? "IS";:END
300 REM INSERT "." SUBROUTINE
400 SOUND 0,PEEK(20),10,8:LINE$ =".":LINE$
    (30) =".":LINE$(2)=LINE$
410 LINE$(1,LEN(WORDS$))=WORDS$:? LINE$-
    ;:SOUND 0,0,0,0:RETURN
```

Memory Map Tutorial* A series of thirty-four short programs that can be used separately or in any order. The tutorials use an interactive approach to show BASIC programmers how to shift operating system memory locations. 32K; disk. Educational Software.

Memory Match* Similar to the card game Concentration, this computer game contains twenty-one pairs of letters, words, or images behind numbered screens. The player, or players, attempt to remember behind which numbers the matching pairs lie. 16K; disk or tape. Atari Program Exchange.

Memory Segment A continuous block of memory addresses, such as 0 to 16K.

Menu A term applied to a screen display which lists a number of possible options and asks the user to select one. Selection may be made by keying an identifying number or letter; keying an identifying number or letter and then pressing RETURN; positioning the cursor beside the desired item (using keystrokes or joystick), and then finalizing the choice (using a keystroke or trigger); changing numbers or expressions with the joystick and finalizing the choice with the trigger; using the console switches (option, select, and start), individually or in combinations.

For the program to perform the selected function, it may have a branch or subroutine call to the code, or the program to carry out the function may be loaded into memory from disk and then executed. See Master Menu.

Menu Driven See Menu.

Message The word "message" is used to designate a statement (printed out or displayed on the screen) for the purpose of giving the user some necessary piece of information about the program. Messages include prompts for input, error messages, and informational messages such as Please Wait, Loading, Game Over, and Copy Complete.

Meteor Storm* Guide your spaceship through a meteor shower to rescue the ten survivors left in a city. When they have been safely returned to the mothership, you must continue your rescue mission in another city. This game quickly picks up speed. Excellent sound effects. 16K cassette or 32K disk. Royal Software.

Metric & Problem Solving* A seven-game package designed for grades two through six. Fundamentals covered include graphing, direction, metric measurements, and conversion. Manual included. 16K; disk. Atari Program Exchange.

Micro Painter* Draw and color your own designs. Three modes are included: fill, draw, and line. Mixed colors, as well as solid, are an additional feature. 48K; disk. Datasoft.

Microcomputing* A monthly general interest computer magazine, geared to the computing novice. Microcomputing Magazine/Wayne Green Inc. See Magazines.

MicroFazer* MicroFazer is an inexpensive universal printer buffer (8K to 64K available) attached directly to the input port of the printers. Available in five versions: parallel-to-parallel, parallel-to-serial, serial-to-serial, serial-to-parallel, and a special parallel-to-parallel model specially designed for the Epson printer. Quadram Corporation.

Microprism* Microprism is a low-cost printer with 75 character/second operation, pin and friction feed, and data printing at 110 characters/second. It contains both RS-232 and parallel interfaces, and features data plot graphics. Integral Data Systems, Inc.

Microsailing* A simulated sailboat race that can be run against an opponent or the computer. There are four levels of difficulty. A demonstration boat goes through the course. Before you start, you have thirty seconds before you start, to position your boat by jibing and tacking. The difficulties of the race include: a strong wind blowing from top to bottom; stormy weather, which forces you to drop anchor; and time penalties for violating some of the North American Yacht Racing Union's rules, such as opposite tack rule, same tack rule, and changing tack rule. A fun game when stormy weather keeps you off the real high seas. 32K. Atari Program Exchange.

Microsoft BASIC* Atari's version of Microsoft BASIC is similar to those used on many other microcomputers. Therefore this 16K+ dialect is most useful for converting programs for use on an Atari computer. Like BASIC A+, Microsoft BASIC provides many more commands than 8K Atari BASIC. Overall, BASIC A+ provides faster executing code and requires less RAM than Atari Microsoft BASIC, but both have their advantages and disadvantages. Anyone in the market for an extended BASIC would do well to have both versions.

Atari Microsoft BASIC Instructions and Functions include:

ABS	AFTER	ASC
AND	ATN	AUTO
CHR$	CLEAR	CLEAR STACK
CLOAD	CLOSE	CLS
COLOR	COMMON	CONT
COS	CSAVE	DATA
DEF	DEL	DIM
DOS	END	EOF
ERL	ERR	ERROR
EXP	FILL	FOR
FRE	GET	GOSUB
GOTO	GRAPHICS	IF
INKEY$	INPUT	INSTR
INT	KILL	LEFT$
LEN	LET	LINE INPUT
LIST	LOAD	LOCK
LOG	MERGE	MID$
MOVE	NAME	NEW
NEXT	NOTE	ON
OPEN	OPTION BASE	OPTION CHR
OPTION PLM	OPTION RESERVE	PLOT
POKE	PRINT	PRINT USING

PUT RANDOMIZE	READ	REM
RENUM	RESTORE	RESUME
RETURN	RIGHT$	RND
RUN	SAVE	SCRN$
SETCOLOR	SGN	SIN
SOUND	SPC	SQR
STACK	STATUS	STEP
STOP	STR$	STRING$
TAB	TAN	TIME
TIME$	TO	TROFF
TRON	UNLOCK	USR
VAL	VARPTP	VERIFY
WAIT		

Microsoft.

Midas Touch, The* After spinning a money wheel, players take turns guessing the hidden word or phrase by guessing the consonants in the puzzle. 32K; disk or cassette. Atari Program Exchange.

Midway Campaign* Based on the famous carrier battle of WWII. The odds are in favor of the Japanese, so you'll need luck to be victorious in this game. System tactical commands are lacking for the true war game enthusiast. 16K; cassette. Avalon Hill.

Miles Payroll System* A good general accounting aid to meet most small business payroll requirements. This system handles the pay categories, such as regular, overtime, commission, etc., makes deductions for withholding and insurance as defined by the user, prints checks, and keeps track of pay periods and cumulative pay information for each employee. It also provides a user definable table feature, so changes in tax rates and laws can be instituted. Can generate thirteen reports. Documentation is good. Disk. Atari 800, 10K, ROM, 32K RAM, two Atari drives, 850 module, and printer required. Miles Computing.

Miner 2049er* Overthrow the deadly mutants, and take over the mine stations. Gather tools as you climb or jump from roof to roof. 16K; cartridge. Big Five Software.

Mini Database/Dialer* For medium-sized jobs, such as personal mailing or telephone lists, auto maintenance records, and home inventory, etc. One major bug can cause the loss of entire records if you're not careful about record lengths during editing. 16K cassette or 32K disk. Santa Cruz Educational Software.

Minotaur* A somewhat limited maze game based on the Greek legend of the Minotaur's labyrinth. The player controls his on-screen counterpart with the joystick, while trying to make him run the maze as quickly as possible without running into the man-eating monster. 24K; disk or cassette. Atari Program Exchange.

Missile In Player/Missile Graphics, each player has an associated missile. Each missile is two pixels wide. These four missiles can optionally be combined to form a fifth player. In this case, none of the players have missiles. See Player/Missile Graphics.

Missile Command* Your reflexes and an arsenal of missiles, are your only hope to protect six cities from the variety of ammunition your enemies possess. As your score increases, so does the speed of the action. 16K; cassette. Atari, Inc.

Mission: Asteroid* Save the earth by destroying the oncoming asteroid. Your moves are limited and timed. The game is easy to play, but not so easy to win. The high-resolution graphics enhance this adventure. 40K; disk. Sierra On-Line.

Mixed Program Lines If, after finishing (and even saving) a program, you immediately start a new program, you will usually wind up with a combination of mixed program lines, some from the old and some from the new program, in the computer's memory. Such mixed lines are completely unusable, and have wasted the time and effort you put into the new program.

To avoid mixed program lines, turn the computer off to completely erase the old program from memory, and then turn it on again for BASIC's READY prompt. Or use the Atari BASIC command NEW to clear the memory. Enter:

NEW

The old program is erased, and you are ready to start on a new one.

But be careful: if the old program is something you want to keep, you must SAVE it before giving the NEW command.

MMG Accounts Payable* This versatile package handles all of your bill paying automatically, either as a self-standing package, or in concert with the MMG General Ledger*. It will even write your checks for you. Lets you know when the bills are due, with all record keeping, reporting, and scheduling managed for you. 40K; disk. MMG Micro Software.

MMG Accounts Receivable* A complete package which stands alone, or coordinates with the MMG General Ledger* for more complete financial control. Generates all standard accounting reports, including aged trial balances, invoices, statements, and delinquent notices. A complete record keeping, scheduling, and reporting package. 40K; disk. MMG Micro Software.

MMG BASIC Debugger* A companion product to BASIC Commander*. This program provides an alphabetized cross-reference listing of all variables, gives search capability for any phrase or command in your BASIC program, and enables full screen up or down scrolling of your program. Split screen mode allows editing of two parts of your BASIC program at once! TRACE through your program line by line. TRACE WHILE, TRACE UNTIL, RUN TO LINE AND TRACE, and many other options, including multiple printing options. 24K; disk. MMG Micro Software.

MMG Data Manager* Leads you step by step through the conversion of any information into a computer-searchable format. Allows up to ten fields per record of up to 255 characters. Machine language searching and sorting enhance this easy-to-use, menu-driven data management tool. 40K; disk. MMG Micro Software.

MMG Form Letter Writer* Interfaces with all of the other MMG Business Packages to allow you to type a letter once, and send personalized copies to all employees, all those who owe you money, your friends, or anyone else you can think of. Automatically centered letterheads, right justification, and the ability to work with any parallel printer makes this one of the most valuable packages you can own. 48K; disk. MMG Micro Software.

MMG General Ledger* A complete, professional package, interfacing with the other MMG Business Packages. Prints complete and accurate assessment of your entire financial position, including balance sheet, trial balance, income statements, and accounts listings. Automatic updates from the other business modules are standard. 40K; disk. MMG Micro Software.

MMG Inventory* Controls a small business's inventory problems, either as a self-standing package, or in concert with the MMG General Ledger*, for more complete financial control. Tells you your costs, value at retail, reorder information, and much more. Completely automates inventory control for the small business. 40K; disk. MMG Micro Software.

MMG Payroll* Stores information on up to forty employees per disk, and can work alone or in concert with the MMG General Ledger*. Generates payroll checks, W2 and 941 information, employee history information, and much more. A complete payroll package for the small business. 40K; disk. MMG Micro Software.

Mnemonic A name or abbreviation which is intended to remind you of what it stands for, such as the file extension .DAT, which refers to a data file.

ModeLine A group of scan lines defined by the specified display mode.

Money Manager* This menu-driven program contains three complementary sub-menus. One presents options for analyzing your investments as sources of income. The second determines the cost of borrowing money. The third option calculates depreciation. The options on the investment menu include nominal and effective interest rates; initial and minimal investments, as well as regular deposits needed to achieve a given goal; an earned interest table; future values of investments, alone and with regular deposits; and withdrawals from investments. The loan menu includes options for total cost and interest on a loan, including annual interest rate; term, payment, and principal of a loan; regular loan payment; final payments; and a loan amortization table. It is worth noting that the method of calculating depreciation used in the third Main Menu option does not produce results valid for income tax reporting. 32K; disk. The Programmer's Workshop.

Money Processor, The* A versatile financial management program for home or business. Allows you to work with seven accounts: cash, employee expense, credit cards, savings accounts, checking accounts, budget items, and tax return items. The package comes with thorough documentation to aid you in solving your fiscal blues. Luck Software.

Money Wizard* A full-scale financial package for the home user. Keeps records of spending, home inventories, income, and more! 32K; disk. Datasoft Inc.

Monkey Math* Designed by Dennis Zander, this program teaches arithmetic using color graphics, multiple skill levels, and sound. The student controls a huge monkey who must knock the correct number off a conveyer belt into a hopper as the equations move by. 16K cassette or 24K disk. Artworx.

Monkey Up a Tree* Help the monkey reach the bananas by solving a series of math problems. For elementary children. 24K; disk or cassette. Atari Program Exchange.

Monkey Wrench* A ROM cartridge that adds to Atari BASIC what should have been built in. Readily accessible utilities are included. 48K; cartridge. Atari 800 only. Eastern House Software.

Monster Maze* An eat the dots maze game with sixteen levels. As the player, you see the corridor your man is in from a 3-dimensional perspective that can be switched to a flat overview of the floor for reorientation within the maze. The object is to collect as many of the gold bars as you can while avoiding the 48 monsters that inhabit the maze. If your man finds and eats one of the 48 vitamin pills in the maze, he becomes temporarily able to consume any monster he can catch. But oh, what heartburn! 16K; cartridge. Automated Simulations.

Moon Patrol* Guard the moon against alien ships with the laser cannon on your patrol Ship. When you've fought off twenty attacks, a launch pad appears and you can take off. Four levels of difficulty. 16K; cassette. Avalon Hill.

Moon Shuttle* An action-packed adventure through meteor-filled space. Maneuver your shuttle out of the way of bombs, rockets, and other dangers, until you meet your enemy—the Prince of Darkness. Your troubles have only begun! 16K; disk or cassette.

Moonbase Io* Three phases are involved in defeating the aliens inhabiting the three moons of Jupiter: guide your ship through a mine field to the opposite side of the moon, battle with the enemy, and confront the mother ship. 32K disk or 16K cassette. Program Design, Inc.

Morloc's Tower* Discover the whereabouts of the insane magician, Morloc, while you travel through dungeons, destroy monsters, and find treasures. You can compete against yourself or others in this game of skill. Good documentation. 32K disk or 16K cassette. Automated Simulations.

Morse Code Tutor* Allows you to learn Morse code at your own pace. Transmission rate can be varied. 16K cassette or 24K disk. Atari Program Exchange.

Morsecode Master* A realistic system for aspiring amateur radio operators to learn Morse code. Uses the sound capabilities of your computer to help you learn and practice symbols, words, and sentences in Morse code. Offers a good simulation of what it's like to communicate in code; you can vary the speed and pitch of the drills as you become more proficient. 24K cassette or 32K disk. Atari BASIC cartridge required. Atari Program Exchange.

Mortgage and Loan Analysis* A straightforward business tool, this program helps you compute monthly payments on a yearly basis for amortized loans. You can calculate several different cases for a

particular loan, varying interest rates, loan amounts, and length of loan to help you decide on the most suitable loan package available. 16K; cassette. Atari 400/800, printer optional. Atari, Inc.

Motherboard The main part of a circuit board in an electronic device. It is usually the largest board and has "slots" for smaller boards to plug into. See Breadboard.

Motocross* Race your cycle against the clock and another cyclist. A fast action game. Safe control of your cycle is not easy. 16K; cassette or disk. Bank, Inc.

Mousekattack* A challanging and well conceived maze game in which your man is a plumber charged with the task of installing pipe in a rat-infested maze. Fortunately, the plumber has a team of cats to run interference for him, eating all but super rat, who eats cats whole. Also on the plumber's side are several traps that will temporarily hold the rats while the plumber beats then into submission with his pipe wrench. Of course, should the plumber be caught alone and unaided...well, the rats are very hungry. 32K; disk. Sierra On-Line Systems.

Move Cursor The cursor with Atari BASIC is a white square. With some programs, a different cursor might be used, such as an X, or an underline. In either case, the cursor is a symbol which is always positioned on the screen in the location where an action, such as typing in a character, deleting, inserting, etc., will next take place. See Cursor, Control Keys.

Move Data A common function among full screen editors and word processing programs is scrolling the screen one full screen (usually twenty-five lines) forward (down) or backward (up). In many instances, the cursor is simultaneously placed at the upper left corner of the new screen. The command for this function is generally a single keystroke with the CTRL key down. Many of the more sophisticated word processors also allow for the movement of designated blocks of text from one position to another within the text.

Movie Maker* An exciting new program created by Interactive Picture Systems that teaches you to compose scenery and shapes, then start them moving in continuous action. You can make a movie without leaving the keyboard. 48K. Reston Software.

MPU Micro Processor Unit. The actual chip containing the processor. A 6502 is used in the Atari.

Mr. Cool* A furnace of fun. Hop around the pyro-pyramid while avoiding menacing hot springs and shooting fireballs. Cartridge. Sierra On-Line.

MSB Most Significant Bit.

Mugwump* Enter numbers into the ten-by-ten grid in your search for hidden mugwumps. 8K cassette or 16K disk. Atari Program Exchange.

Multibase Calculator* A great way to explore the mysteries of computer logic and math. The program converts numbers among hex, decimal, octal, binary, or BCD formats, and will help with writing programs. 32K; disk. Ultraware.

Multiplan* Not requiring much programming skill, electronic spreadsheets can be mastered fairly easily and still provide sophisticated results when applied to the pencil-gnawing repetitiveness of daily bookkeeping and financial planning. Multiplan is one of the most successful spreadsheet programs.

Multiplan's main feature is that it's easy to use. It simplifies the screen to make the spreadsheet easier and more understandable. The screen is divided into a grid of rectangular cells, like most spreadsheets. A row of numbers across the top and another down the side of the screen give the coordinates for each cell. The first cell in the upper left corner is referenced as R1C1, for Row 1 Column 1. This makes an easy-to-remember coordinate system. The command line is composed of two rows of command words at the bottom of the screen. Spelled out on screen, the commands are easy to understand and work with. The Multiplan screen also features the current cursor position, amount of memory remaining, a message line, and the name of the worksheet.

There are seven new commands (including Lock, Sort, and Name) which are not found in VisiCalc (the original spreadsheet program). Multiplan can give individual cells meaningful names. For example, the value in R1C1 can be given the name SALES if the value the cell holds is a sales statistic. This allows you to use the information in specific cells to work out special information, thus simplifying the overall program. 64K; disk. Microsoft Corporation.

Multiple BASIC Statements on One Line You can put a colon (:) at the end of a statement and enter another statement on the same line without giving a new line number. In this way, you can put several statements on one line, so long as the total line length does not exceed one logical line. BASIC will process all such statements in the order in which they appear.

With a REM statement, you can add a comment or REMark to any line. Anything after a REM statement anywhere on a numbered line is ignored by BASIC.

Multiplex Use the same component for several distinct functions, either sequentially or simultaneously. The address lines of an MPU are often used as the data lines at another point in time—an example of multiplexing.

Multi-Tasking Running two or more tasks concurrently on a single computer. The MPU actually works on only one task at a time, but it switches back and forth, so rapidly as to create the impression that all tasks are being processed concurrently.

Music The excellent sound capabilities of the Atari computer have set a high standard for the industry. Programs containing high quality music are available for Atari computers. See Music Software, Sound.

Music Box* This utility package allows you to write music without the encumbrance of Atari's Music Composer, and play it in a BASIC program. Tutorial programs teach you more about Music Composer, and music in general, but the main features are a conversion program that allows you to shape the decay rate of each note, and demonstration programs that show you how you can play your music within your own BASIC programs. You can even play your music while you are writing a program, since the music is played using a Machine language subroutine that runs independently of BASIC, using Vertical Blank Interrupts. The package includes ten songs on disk in Music Composer and Music Box formats. 32K; disk. Program Design, Inc.

Music Composer* Have fun playing music through your computer hardware. The notes you enter at the keyboard are displayed on the screen, using standard musical symbols, and then exit as music through the speaker on your monitor. 16K; cartridge. Atari, Inc.

Music Lessons* Teach yourself to play the piano with help from this package's hundred-page instruction manual. You can even compose your own songs! Excellent sound effects for singing along, or listening to the music. Includes fifteen programs. 16K cassette or 32K disk. Swifty Software, Inc.

Music Major* Teaches anyone the fundamentals of music, individually or in groups. Note recognition, counting, and key signatures are just a few of the areas covered. The package includes a completely documented manual and a utility to create your own tests. 32K; cassette or disk. Educational Software, Inc.

Music Player* Used in conjunction with Music Composer, this program will allow you to use your music in programs. As long as the language permits AUTORUN.SYS files and file opening and closing, you can play your music. Once incorporated into the program, music can be controlled by the program or by the user, and can play during any activity except Input/Output. 16K; disk. Atari Program Exchange.

Music Software See Advanced Music System; Adventures of Proto, The; Colortrack & Soundtrack; Drumesiser, The; Jukebox #1; Keyboard Organ; Music Box; Music Composer; Music Lessons; Music Major; Music Player; Musical Computer—A Music Tutor; Musical Mathematics; Music 1 Terms and Notations; Player Tuner; Player Piano; Sound Editor; Sound & Music.

Music 1 Terms and Notations* A drill program which introduces music theory. Sound and visual effects are good. 16K; disk. Atari Program Exchange.

Musical Computer—A Music Tutor* Teaches the fundamentals of musical notation for musicians, six years old and up. Graphics are not well utilized. 40K; disk. Atari Program Exchange.

Musical Mathematics* A computer math game that uses music to enhance the learning process. Choose from four basic math functions and three levels of difficulty. 32K; disk. Hayden Software.

Mxplus* Gives you easier control of the Epson Printer while using the Atari. It is a small circuit board that fits "piggyback" over the ROM 1B socket in the printer. With a flick of a switch, printer controls can be set without bothering with the control codes in the program. This is very useful with commercial packages when you don't want to be bothered with print controls. Dresselhous Computer Products.

My First Alphabet* An excellent learning device for beginning readers. Pictures illustrate each letter or number. 24K; disk. Atari Program Exchange.

My Spelling Easel* Draw landscapes and practice spelling. There are four levels of difficulty. For children from three to eight. 24K; disk. Atari, Inc.
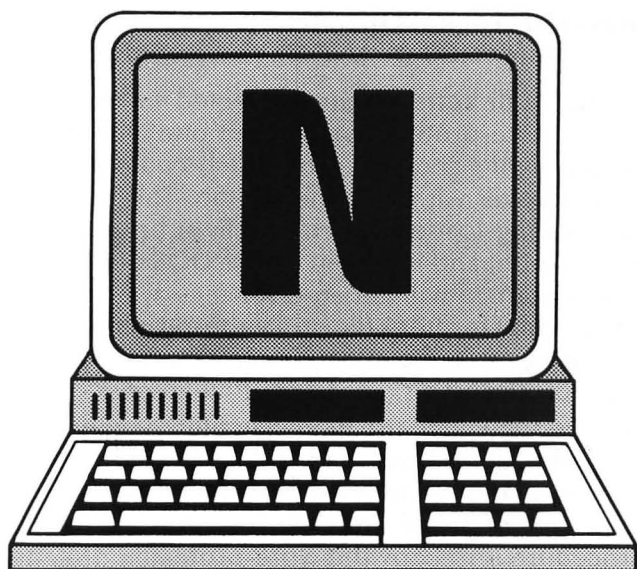
N Codes. ATASCII = 78, HEX = 4E. n—ATASCII = 110, HEX = 6E.

NAK Negative AcKnowledge.

Name That Song* Can you name these well-known songs? Compete against one other player to recognize a tune as the notes are played. There is a fill-in-the-blank mode and a multiple choice mode that are accessed by joystick or keyboard. 24K disk or 16K cassette. Quality Software.

Names, Variable Variables in BASIC:

1) must start with a letter;

2) can have up to 128 characters; and,

3) cannot be a reserved word such as IF, ON, THEN, GOTO, etc., or a reserved word followed by a type declaration character ($,%,?,!,#). See also BASIC—Reserved Words.

NAND Gate Hardware device which implements the NOT-AND logical function.

Native Code Machine language.

Native Compiler Software that compiles programs for the processor on which it runs.

Natural Logorithm BASIC. See LOG.

Nautilus* You command a submarine on a mission to destroy underwater cities and steal their energy cores. Meanwhile, a destroyer (captained by another player or the computer) hunts you down, as its crew tries to rebuild the cities. Split screen gives you two perspectives on the battle. If you are the submarine captain, you may find the game quite difficult—the destroyer captain's job is not so difficult. (Actually, it's dull.) 32K; disk. Synapse.

NBS National Bureau of Standards.

NC No Connection.

NEC 1202 Monitor* The NEC 1202 is a high-resolution color monitor. It comes with a color kit that includes a cable and plug-in modules for intensity control. Jack Strick & Associates.

Necromancer* This game stands out among the original computer games. In the first of its three parts, the player takes the part of a sorcerer who must grow a forest of enchanted trees with which he confronts the evil Necromancer. The number of trees that remain after attacks by ogres and giant spiders determines the difficulty level of the rest of the game. In the second part (which is accompanied by original music), the player struggles against Hands of Fate. The third act features gravestones where Necromancer appears and disappears. You delete the gravestones by stepping over them, and, when they all disappear, you win. Look forward to great animation in this game (particularly the trees, which seem almost lifelike as they move around). 16K. Synapse.

Negative Logic When a normally true-state voltage in the computer system represents a logically false state; and a normally false-state voltage in the system represents a logically true state.

Nested Subroutine A subroutine which is within another subroutine. The nested subroutine is completed before the outer subroutine.

Network Computers can be linked together to form an interconnected system—a network.

NEW Atari BASIC Command. When starting programs, NEW is used to erase all the lines of old programs in memory. It clears all memory and closes all files without turning off the computer. It is generally used when you are finished with a piece of work and are ready to start a new program. To start a new program, enter:

NEW

This completely erases all lines now in BASIC's memory. If it's something you want to keep, SAVE it first. If you don't erase the program in memory before starting on another, you will usually wind up with an unusable combination of lines from your old and new programs.

Newspaper Route Management* A program to help budding newspaper deliverers keep up-to-date on their route. Store name, address, and subscription information for up to 100 customers on twelve streets. This list can be sorted to create bil-

ling lists based on subscription information. Billing status may also be kept. 40K; disk. Atari Program Exchange.

NEXT Atari BASIC Statement. NEXT, the last statement of the FOR...NEXT loop, determines whether the loop continues or terminates, depending on the range of index numbers set up for the loop. See FOR.

Next Step, The* Design your own set of characters with this program. It is menu-driven and controlled solely by the joystick. The shape of letters and other characters can be changed, as well as the colors of the foreground, background, and character display. 32K; disk. Sierra On-Line.

Nibble Half a byte, or four bits.

NMI Non-Maskable Interrupt.

Noise Interference on a system communications line. Random signals of unknown origin.

Nominoes Jigsaw* This is an ideal game for jigsaw puzzle lovers. Players choose from sixty different pieces to fill in the randomly generated puzzle. Six levels of difficulty range from mildly challenging to very difficult. Artworx.

Non-Destructive Read-Out The memory contents are not erased or displaced when other data is read.

Non-Maskable Interrupt NMI. Vertical Blank Interrupts and Display List Interrupts are NMIs which cannot be disabled by the 6502 chip, and are therefore non-maskable.

Non-Text Files Files which cannot be edited by standard editing programs. Non-text files, such as compiled programs, are edited by programs like DEBUG. Non-text editors usually display and modify a byte of storage as either two hexadecimal digits or a three-digit decimal ASCII value.

NOP No OPeration. An instruction which forces a delay of an execution cycle, but does not change the contents of the registers or the status flags.

Normal Size Print To return to normal 10-character/inch print size, you must turn off all non-standard print options. See also Type Format.

NOT Atari BASIC Function. Also a logical operator. NOT reverses the true/false flag for an expression. Example:

$$X = NOT(Y+1)$$

Here a +1 (true) is returned if the expression is false, and a 0 (false) is returned if the expression is true.

NOT-AND Logical Operator A NOT-AND B is a synonym for NOT (A AND B).

Notch A diskette is write-protected if it does not have a write-protect notch about one inch down on the right hand side. The notch could also be covered over with an adhesive tab. This blocks a small spring-loaded switch or a light beam inside the diskette, and is sensed by the DOS disk driver programs. You will get an error message anytime you attempt to alter a file on a write-protected disk by changing it, deleting it, copying it onto the write-protected disk, or formatting the disk.

You are allowed to use files, load files, or copy files from the write-protected disk. The purpose of these limitations is to prevent accidental loss of the only copy of programs or data. In most cases, the procedure is to copy the write-protected diskette onto a notched disk, put away the write-protected disk as a permanent copy, then modify the notched disk.

It is a good practice to put an adhesive tab (supplied with boxes of disks) over the write-protect notch of any important disk you will back up. Then, if you accidentally ask for the backup in the wrong direction (from the old disk to your important disk), you will get a second chance to make the backup, rather than losing your data.

NOTE Atari BASIC Command. Used to locate a byte in a file on disk, and store it for future use. Example:

NOTE #1,S,B

In the example, #1 is the IOCB (Input/Output Control Block. See File Control Block) that was opened for the file in question; S is the variable in which the sector number of the byte wanted is to be stored; B is the variable in which the byte number (within that sector) is to be stored.

NSEC NanoSECond. One nanosecond is equal to one billionth of a second.

Nuclear Bomber* You captain a patrol within dangerous territory and must destroy a Russian city with a one-megaton bomb. Naturally, Russian defense centers challenge you. 16K; cassette. Avalon Hill.

Nukewar* Choose the country you want to lead, then choose your enemy and plot his destruction. A little challenge and a lot of luck are involved in this fairly enjoyable game. 16K; cassette. Avalon Hill.

Null Detector A circuit which registers when current is not flowing, or when voltage is not present.

Null String or File   A string or file with no contents at present.

Number Blast*   Have a blast enhancing your multiplication and addition skills. Compete against a friend, or test yourself. Helpful tables are presented. For children from six to sixteen. 16K cassette or 24K disk. Atari Program Exchange.

Number Crunching   The performance of complex arithmetic operations and computations.

Number of Files on Diskette   DOS Option A displays on the screen or printer a list of all files on a disk. The maximum number of files on an Atari DOS 2.0S disk is 64. See DOS Options.

Numeric Pad   The keypad on the right side of some computer keyboards, upon which numeric operations and numeric data can be entered.

Numeric Value of String   BASIC. See VAL.

Numeric Variable   A quantity whose value may, but does not necessarily have to, change. Atari BASICprocesses numeric variables in floating-point notation. Each variable used in a program is assigned a name which may be up to 120 characters long. The first character must be an alphabetic capital letter, and the other characters in the name may be capital letters or numbers, but nothing else. It is also important not to have the first letters of a variable's name spell out a keyword such as IF, ON, THEN, GOTO, etc. This might lead to misinterpretation by BASIC.

Atari BASIC has a limit of 128 variable names per program. This limit may, however, be avoided, if necessary, by storing numeric variables in the individual elements of an array, instead of using separate variable names. In this regard, it should be remembered that arrays must be dimensioned, whereas numeric variables are not dimensioned.

line means that a device or medium is inside or connected.

A diskette is off-line when it is not in a drive, and on-line when it is in a working disk drive. A printer is on-line if it is attached, powered on, and ready to print. The printer is off-line if it is disconnected, powered off, or switched to its "off-line" state by an on-line/off-line switch. See External Memory.

Offset Address The smaller part of a base register/offset pair. The data to be processed is located at:
<effective address>=<contents of base register> +<offset>.

Omnimon!* A software/hardware utility package consisting of a set of small boards to be inserted in your Atari with resident software. This small device has a resident disassembler, search capabilities, and other debugging tools. It can support either single or double-density disk drives, in linked or sequential modes. CDY Consulting.

ON Atari BASIC Statement. ON is used with GOTO or GOSUB to extend the power of those two branch statements. An arithmetic expression following ON, and before GOTO or GOSUB, determines the number. The arithmetic expression must evaluate to a positive integer not greater than 255. Example:

ON A GOTO 500, 600, 700, 800

In this example, if and when the variable A is 1, the program execution will branch to line number 500; when it is 2, it will go to line number 600; and so on. If A is 0, or over 4 (in this case), control goes to the next statement.

ON...GOSUB and ON...GOTO BASIC Statements. Used to branch to one of several specified line numbers, depending on the value of an expression. The formats are:

ON <n> GOTO <line>[<,line>...]
or
ON <n> GOSUB <line>[<,line>...]

<n> is a numeric expression in the range 0 to 255. <line> is the number of a line you wish to branch to.

The value of <n> determines which line number in the list will be used for branching. If the value is 4, the fourth line number in the list will be the destination of the branch.

In the ON...GOSUB statement, each line number in the list must be the first line number of a subroutine. This means that at some time it will be necessary to have a RETURN statement to bring you back to the line following the ON...GOSUB.

O Codes. ATASCII = 79, HEX = 4F. o—ATASCII = 111, HEX = 6F.

O See DOS Options.

O Stands for Output, or Overflow.

OBJ The extension of the file name for an object or Machine language program. Such a program must be BINARY LOADed and RUN by using the L selection of Atari DOS. Object code files are usually created by an Assembler program or a language such as ACTION!.

Object Code The code produced by a compiler or Assembler program. Can be directly understood by the Atari computer, without using a language, such as BASIC, as a translator.

Object File A file containing the 6502 Machine language version of a program. In most cases, the object file is a translation of a source program stored in a text file. Object files have the file extension .OBJ.

Object Program A program that runs directly on the Atari computer. An object program, created by an Assembler or a language such as ACTION! uses the actual numeric instruction code of the Atari's 6502 microcomputer chip. See Source Program.

Odd Parity A byte in which an odd number of bits are set to 1 is said to have odd parity.

Odin* The ultimate Othello, with fourteen levels of difficulty (beginner to expert-plus). Input is by joystick, paddle, or keyboard. 48K; disk. Odesta.

Off-Line A device or media outside of, or disconnected from, the computer system is off-line. On-

If the value of (n) is zero or greater than the number of items in the list (but less than or equal to 255), BASIC will continue with the next executable statement.

One Line To advance one line on the printer (space up) without using carriage return, enter BASIC statement:

LPRINT CHR$(10)

or use the line feed button (LF) on the printer.

Entering just LPRINT gives a line feed—both space up one line (line feed) and return to the left margin (carriage return).

On-Line A device or media which is inside or connected to the system is on-line. Off-line means a device or medium is outside of or disconnected from the computer system. See Off-Line.

OPEN Atari BASIC Command. This command must be used before a device can be accessed for either input or output of data. Format:

OPEN<#aexp>,<aexp1=aexp2>,<filespec>

<#aexp> can be from (#1 to #7) and specifies which IOCB (Input/Output Control Block, q.v.), of those available, is to be used. When the specified control block is no longer necessary, the CLOSE command should be used, making that block available for another use. The format for the CLOSE command is:

CLOSE <#aexp>

where #aexp is the same as that for the corresponding OPEN command.

<aexp1> is a code number to specify the type of operation to be performed:

4 = input operation
8 = output operation
12 = input and output operation
6 = disk directory input operation
9 = end of file append operation

<aexp2> is reserved for special codes required by certain devices. Usually there is none, and 0 is inserted here.

<filespec> is the specification of the device and (if necessary) the file name being accessed. The format for this parameter is the device code (D1:, C:, P:, etc.), followed by the file name (if necessary).

OPEN For a program to be run, the files with necessary data must be OPENed, so that the data contained is available to the running program.

Operand Operations are performed upon operands. For example, LET A=B+C specifies that the operation of addition be performed on the operands B and C.

Operating System The software which manages the computer's hardware and logical reasoning. Includes file management, scheduling of requested processes, and handling peripheral devices.

Operating Systems See Atari CP/M Module, *Atari's Operating System User's Manual.*

Operation Action of a program, resulting in a defined instruction being executed.

Operation Code Part of the Assembly or Machine language program which specifies what operation is to be performed. See Assembler Op Codes.

Operation Whirlwind* A battle action game that truly tests your ability to command. You move your battalion through a series of combat operations designed to determine whether your strategies are tactically sound. Disk. Broderbund.

Operator User. Also, the person who connects your long distance calls. See AT&T.

Operator Symbols within a program such as * for multiply, - for subtract, or + for add, which specify what operation is to be performed.

Optimization Changing either the software or the hardware of a computer system, so that it operates faster or more efficiently.

Option See Function.

OPTION Key When the OPTION key is pressed, a three is stored in decimal RAM location 53279. If this key is held down during power-up on Atari computers that contain built-in versions of Atari BASIC, the 8K of RAM required by Atari BASIC becomes available. The following BASIC routine shows how to sense the OPTION key:

10 IF PEEK(53279)≠3 THEN GOTO 10:REM Keep Checking
20 PRINT"OPTION KEY PRESSED":GOTO 10

Options Values which determine the operating parameters of a device or program. For example, the screen can be set to forty columns wide or eighty columns wide—the screen width option.

OR Atari BASIC Operator. OR, placed between two expressions, indicates that, if either of the two is true, the entire expression is to be flagged as true by the computer.

O'Riley's Mine* Climb down the dangerous mine shafts in search of treasures. You'll need the luck of the Irish as you battle the strange monsters waiting for you in the dark. 16K; disk or cassette. Datasoft.

OS   Operating System.

OS A+* A disk operating system, distributed along with most O.S.S. disk-based system software. Optimized System Software.

OS REV A   The original Atari Operating System. This version was replaced by OS REV B during 1982.

OS REV B   The Atari Operating System which replaced OS REV A in 1982. The major difference is that some bugs in the original OS were fixed in this version.

Outlaw/Howitzer*   A two-program package involving a cowboy shoot-'em-up in the desert and two-tank warfare across a river. 24K; disk or cassette. Atari Program Exchange.

OV   OVerflow.

Overflow   The result of the arithmetic operation is too large for the register specified. The sign bit is filled from the next lower bit, and a status flag is set.

Overlay   Different routines within a program which occupy the same memory location. They are loaded as needed during the operation of a program. Conflict can occur if two of these routines try to use the same location at the same time.

Over-Run Error   Occurs when the previous character in a register hasn't been completely read before a new character is loaded into the register.

Over-Striking   The printer returns to a position where a previous character was struck, and strikes a new character on top of it, producing a combination character. Sometimes used to make boldface.

Over-Voltage Protection   The computer's circuitry is protected from undesirable increases in the AC power line voltage.
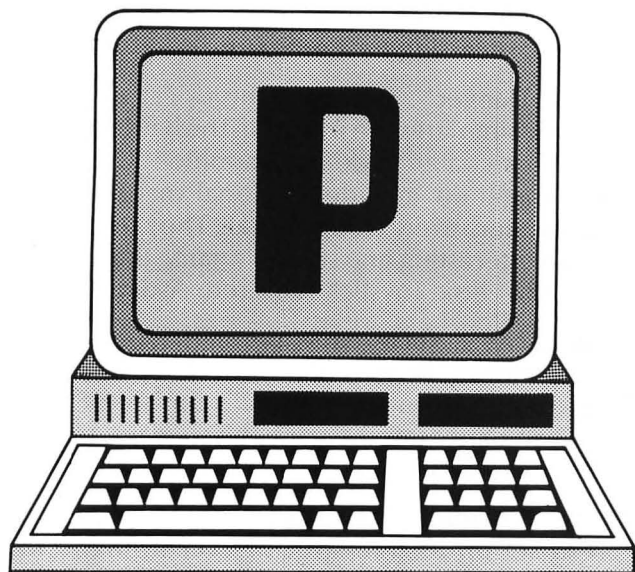
P Codes. ATASCII = 80, HEX = 50; p—ATASCII = 112, HEX = 70.

P DOS 3.0 command to Protect (lock) a file or files.

P Parity.

Pacific Coast Highway* A variation of Frogger— this time you're a little rabbit trying to cross the highway and a pond. Varying skill levels are available. 16K; cassette or disk. Datasoft.

Package, Software A Software package is a group of computer programs, possibly including data files and documentation, which perform a function or group of related functions on the computer. These are called applications software when the programs are operated by the user, such as a word processing package or an accounting package. These programs are called systems software packages when they facilitate the use of the machinery, such as a database management package, a disk operating system, or a program development package.

Packed Decimal Two or more binary coded decimal digits are present in every byte. The ten decimal digits 0 through 9 are stored in a 4-bit representation. 1 is coded as 0001, 9 as 1001, etc.

Packet A short set of data with the length of the data (in bytes) stored at its beginning. The set of data may be transferred between devices in a network.

Pac-Man* A home version of the popular arcade game, featuring dot-gobbling Pac Man and his four ghost enemies. The maze configuration, sounds, and power pills (which make Pac Man momentarily invincible) are all the same in both versions. Play occurs on several, increasingly difficult, levels. Although the personalities of the ghosts are the same, they don't follow the same paths as in the arcade game. 16K; cartridge. Atari, Inc.

Pad The rectangular base where the wire of a computer chip is connected.

Pad To fill a data field with blanks.

PADDLE Atari BASIC function. Gives the status of the paddle whose number (0-7) is placed after it in parentheses. The return is a number from 0 to 228, with the number becoming larger as the controller knob is turned counterclockwise. This number can then be used with further commands to perform other functions. For example:

```
100 FREQUENCY=PADDLE(<0>)
110 SOUND 0,FREQUENCY,10,8
120 PRINT "FREQUENCY=";FREQUENCY
130 GOTO 100
```

In this example, the value of PADDLE(0) is stored in the variable FREQUENCY. This variable is used as the frequency parameter of a SOUND command, then displayed on the screen. Press SYSTEM RESET to exit this otherwise never-ending loop.

Paddles* Used for games and drawing on the screen. The uses include axis positioning for accuracy. These are the only paddles available for the Atari. Atari, Inc.

Page 256 bytes of memory equal one page. For example, page 6 would include decimal locations 1536 thru 1791.

Page Boundary A memory location, divisible by 256 and including location 0. For example, Page 6 begins at location 1536 (1536/256 = 6).

Page Flipping A method of changing screen memory pointers in order to change the current screen display. The common methods of displaying data on the screen involve PRINTing or POKEing data. With page flipping, screen images are stored in various pages of RAM, and then pointers are changed that tell the computer to get its screen data from the desired RAM locations rather than redrawing onto the screen.

Page Flipping* Tricky Tutorial #3. The key to animation technique, and data storage is in using various screens and page flipping. This program teaches you to do this with ease. An understanding of BASIC will help. 16K cassette or 32K disk. *BASIC* cartridge required. Education Software. See Tricky Tutorials.

Page Length To set the page length on an Epson-compatible printer enter BASIC statement:

LPRINT CHR$(27);"C"; CHR$(55)

This example sets the page length to 55 lines. See Type Formats.

Page Six* Twelve Machine language subroutines that are stored on page six in memory. These are utilities you can use in your programs for adding music, reading joysticks, displaying various flag statuses on your screen, using DOS functions in your program, and more. Some of the programs are more useful than others. 24K; disk. Synapse.

Paging On the screen, especially in a word processing program, paging is switching from one full screen of information to another. You can page either backward or forward.

In memory, a page is a logical set of storage used for the management of memory; in a paging system, the memory location is designated by a page number or address, and an address within the page.

Paint* A two-program graphics package with a hundred-page manual. Children and adults will enjoy creating artistic designs through keyboard commands. Four colors and five paint brushes give variety to paintings. 48K; disk. Reston Publishing Co.

P.A.P.I.E. The Professional Atari Programmer's Information Exchange (P.A.P.I.E.) was formed by Jerry White in February of 1982. P.A.P.I.E. is a select group of professional programmers who share information, concepts, utility programs, source codes, and subroutines by mail on a quarterly basis. To qualify for membership, a programmer must have a commercial software product for Atari computers on the market.

Qualified programmers may obtain additional information by writing to Jerry White, 18 Hickory Lane, Levittown, NY 11756. Membership fee is $10.00 per year.

Parallel Simultaneous handling of processes, transmissions, or storage of data. In most microcomputers, parallel I/O conections have eight wires to carry eight bits of a byte simultaneously (or in parallel). Contrast this with a serial interface, where only one data wire is available. The eight bits of a byte are transmitted one after another (or serially). The I/O device must collect all eight bits and reconstruct then into one 8-bit byte.

Parameter A definable variable in a program or system which can be used to send information to and from a subroutine or procedure. A parameter

may take on various values which are used in subsequent processing by a program.

Paris In Danger* Based on historical accounts, this game simulates the events of the battles during the 1815 campaign to defeat Napoleon. The multi-level simulation includes regional maps, armies, supplies, and even troop moral. They add up to quite an interesting and strategic game that lasts for hours. 48K; disk. Joystick required. Avalon Hill.

Parity Error detection technique that uses a one-bit indicator at the end of a word. Odd parity sets the parity bit to make the total number of 1 bits odd. Even parity sets the parity bit to make an even number of 1 bits.

Parser A routine that analyzes a program instruction to set up its tree structure according to the programming language's syntax.

Pascal A structured computer language, descended from ALGOL 60. Added features include "records" (data structure definition) and "sets." It is suitable for a wide variety of chores, from systems to application programming. It is designed so that those other than the original programmer can easily understand the functioning of a program.

It is a structured language; such languages represent a major improvement for programmers who want to predict the behavior of a program more easily. It is much easier to understand the function of an IF...THEN...ELSE structure than to trace GOTOs and statement labels to remote, unpredictable places in a program. Pascal has most of the structures necessary to write a completely structured program without GOTOs. Some dialects of Pascal implement all the necessary structures; all of them allow for more complete structuring than either FORTRAN 77 or the semi-structured dialects of COBOL.

Pascal is strongly typed. The "type" (floating-point, integer, set, record) of a variable is traced even through procedure calls; By contrast, a language like FORTRAN only checks the type through the current local routine. This helps in detecting a major class of programming errors. Pascal, like other recent languages, requires the explicit definition of all variables as a guard against introducing a misspelled variable.

The Pascal standard includes an input/output package. This is important for a language intended to be used in textbooks, but fixes the style of I/O that can be done from Pascal.

Pointers and records give the high-level language programmer access to powerful techniques that

were formerly only available to Assembly language programmers; thus, complicated data structures like linked lists and trees can be handled explicitly in Pascal. In a language like FORTRAN, these structures would have to be "simulated" inside an array with the structure diagrammed either in documentation or inside the programmer's head.

Currently, there are many implementations of Pascal. There are several stand-alone compilers that run under various operating systems. There is also an operating system written primarily in Pascal, called the p-System. The p-System is available on a wide range of computers, so programs written in Pascal are highly portable.

Pass   Make information from one process or program available to another process or program. Similar to a football pass, except that one or more bytes of data replaces the football, and the receiver is a program. The sender may be a program, or a person typing the data onto a command line to be "passed" to a program. The two most common examples are DOS passing parameters from the command line to a program, and a BASIC program passing variables to a subroutine.

Password   Used for identification and security purposes on a computer system. Each user is assigned a specific set of alphanumeric characters used to gain entrance to all or part of the computer system.

Patch   For debugging or alteration of a software program, a section of code is inserted into the program, which changes the program's control functions.

Pathfinder*   The setting is an underground maze strewn with canisters of radioactive waste, and inhabited by such horrible bad guys as Nukes, Phantoms, and Minelayers. Your hero, controlled with the joystick, gets energy by absorbing the canisters of waste, and destroys his enemies with a plasma gun. Hitting a mine with a plasma gun blast will start a fire. It can only be put out with special flame retardent pellets, available from scattered locations throughout the maze and fired from the gun. Earn points by putting out fires, destroying portions of the maze, and doing in the bad guys. Huge scores are possible, regardless of the number of enemies eliminated. 32K; disk. Gebelli.

Pause   To freeze the screen, press CTRL/1. Repeat *this* procedure to continue.

To freeze the screen briefly while the operator using your program reads a message, write a delay loop after you print the message:

```
1000 FOR Y = 1 TO 2000
1010 NEXT Y
```

To freeze the screen until the operator is done with it, put in a dummy input statement and instruct the operator to press RETURN to proceed. The input variable need not be used in your program:

```
1000 PRINT "Press RETURN to continue":
        INPUT A$
```

PC   Program Counter, Printed Circuit, or Personal Computer.

PCS   Personal Computing System.

PE   Parity Error. If the parity status bit goes to 1 in odd parity or 0 in even parity, an error is produced, a flag set, and hopefully, a message displayed.

PEEK   Atari BASIC function. Returns the contents of a given memory address. This must be a whole number between 0 and 65535 in decimal notation. The number returned will be a decimal whole number between 0 and 255. The user can store the number in any RAM or ROM location, and use it for any further purpose he wishes. For example:

Example 1:

IF NOT PEEK(752) THEN PRINT "CURSOR ON"

Example 2:

IF PEEK(752) THEN PRINT "CURSOR OFF"

If the value stored in location 752 is 0 then the cursor is visible. If this value is anything but 0 then the cursor is not visible. The two examples above could also have been written to compare with 0 for an equal or not equal condition, but the true or false method is slightly more efficient.

PerfectData Head Cleaning Kit*   Removes contamination from the recording heads of 8" or 5¼" flexible disk drives. You can safely clean single-or double-sided drives without assistance. You apply the cleaning solution to the lint-free cleaning disk through the cutout in its case, and activate the drive. The cleaning solution loosens head contamination, and the non-abrasive disk gently buffs the head dry. Each kit cleans one drive for up to six months (26 cleanings). Innovative Computer Products.

PerfectData Micro Maintenance Kit*   A general purpose microcomputer care kit with the necessary cleaning supplies for small business or personal computers. It is intended for periodic preventive maintenance and cleaning of flexible disk drives, tape drives, CRT screens, printers, and keyboards. Included in the kit is a flexible disk drive head cleaning disk, and special cleaning solution. It

also contains CRT screen cleaner, cleaning wands, lint-free cloths, a brush, and anti-static spray to protect sensitive circuits from damaging static charge. An instruction book explains the use and benefits of each component, and assists the user in planning an effective preventive maintenance program. Innovative Computer Products.

PerfectData Tech Maintenance Kit* Provides the proper materials to clean read/write heads, guides, capstans, tape paths, and other working components of magnetic peripheral devices. Each kit contains ICP's proprietary cleaning solution, dispenser cap, lint-free cloths, and specially constructed cleaning wands. Innovative Computer Products.

PerfectData Type Element Cleaning Kit* A simple, practical, and low-cost way to clean the printwheels found on the majority of today's information-processing printers. Innovative Computer Products.

PerfectData Video Display Cleaning Kit* Recommended for cleaning terminal screens and keyboards. Includes two 4-ounce bottles of video display cleaning solution, a pump spray dispenser, and fifty cleaning cloths. The solution contains a static neutralizing agent which prevents build-up of electrostatic charges that attract dust and dirt. The cleaning cloths included in the kit are specially designed to eliminate foreign particles and contaminants without scratching plastic surfaces. Innovative Computer Products.

Period (.) File name/Extension Delimiter. In a file name, the colon (:) and period (.) are specified to delimit drive name and extension, respectively.

Peripheral Any external device connected to a computer and controlled by it.

Personal Computer Generally, a single-user computer system which is inexpensive and can fit on a desktop.

Personal Development Software See Astrology; Astro-Quotes; Biorhythm; Compu-World; Factory: Explorations in Problem Solving, The; Personal Fitness Program.

Personal Finance System* This multi-program utility package is useful for personal financial record-keeping and reporting. Features include checkbook balancing, fast Machine language sorting, a colorful monthly bar graph of expenses, printer or screen output, and easy-to-use data manipulation programs. 32K; disk. Dynacomp.

Personal Fitness Program* A fitness program for beginners that requests personal information and

adjusts an exercise cycle to match your abilities. Features eight basic exercises that increase in repetition as you improve your fitness. Also stores and reports specific information on a daily or weekly basis. 24K; disk. Atari Program Exchange.

PG1000 Color Printer* A color printing system using silent ink-jet technology. Precision images in over 125 shades of color can be produced on standard computer paper. The specially formulated ink is contained in a snap-in, disposable cartridge. The PG1000 package includes printer interface hardware, cables, software drivers, 500 sheets of paper, and ink cartridges. Printacolor, Inc.

Pharaoh's Curse* You must locate sixteen treasures that are protected by boobytraps, ghosts, mummies, and the Winged Avenger. As you find each treasure, you give the password and exit into the next level of difficulty. Demands jumping, climbing, and quick shooting to survive. 32K; disk or cassette. Synapse.

Pharoh's Pyramid* Match wits with the ancient Egyptian gods, take advantage of beautiful gifts, and fight off deadly plagues as you help build one of the great wonders of the world. A challenging, fast-paced game with wonderful graphics. 16K cassette or 48K disk. Master Control Software Inc.

Phase Measured in degrees, phase is the difference between the 0 crossing point of a reference waveform and that of the measured waveform.

Phase Locked Oscillator PLO. A circuit which is phase locked to recover data in a floppy disk drive controller. The PLO steadies the separate data and clock bits.

Phobos* A sequel to the successful Caverns of Mars*. To reach the enemy, you must go through sixteen levels of defenses. Your ship is armed with lasers, which are a real asset, but it has a fuel supply problem. Several levels of difficulty are offered, and this game has enough challenges to make it interesting. 16K. APX.

Phoenix Lair* This multiple board action arcade game will keep you involved for a long time. Solve one board, and there's another for you to master— over and over. Between boards, joust with the computer for bonus points. Written in Machine language for speed and playability. Color, challenge, action, music, and sound effects combine for an absolute winner. 40K; disk. MMG Micro Software.

Piano Tuner* Use the sound effects of your computer to learn piano tuning. This program guides

you step-by-step through the tuning procedures, with illustrations, then it gives the tones to tune by. You use a joystick to sound the tones, and you can practice sharpening your tone identification skills with a special included module. 16K cassette or 24K disk. Atari BASIC cartridge, joystick tuning hammer, and damping wedges or felt required. Atari Program Exchange.

PIC Priority Interrupt Controller. A chip which manages interrupts and gives vectored interrupt capability to an MPU which does not have this feature built in.

Picnic Paranoia* Don't let the spiders, wasps, and ants ruin your picnic. Your joystick controls George's fly swatter—if you let him get stung by the wasps, he is paralyzed for five seconds (giving the ants time to steal the food from the table). Good graphics and fun to play. 16K; cassette or disk. Synapse Software.

Picture This—Programming Your Atari Computer* Become an artist on the screen while using the PILOT language. Turtle graphics are discussed. Addison-Wesley.

Pilot* A basic flight simulator for straight-on plane landings. It takes a lot of practice to make safe landings. 16K cassette or 32K disk. Artworx.

PILOT* Programmed Inquiry, Learning, Or Teaching. Atari's version of LOGO, a programming language with turtle graphics. The full capabilities of the Atari computer (full screen editing, upper and lower case characters, graphics, color, and sound) are used. There are two versions of PILOT for the home, 8K, and for educators, 16K. Atari, Inc.

Pinball Construction Kit* Construct a custom pinball machine from forty-two parts. Paintbrushes are included to give it an artistic touch. One to four players can compete. 48K; disk. Electronic Arts.

Pin-Compatible Computer systems whose circuits have leads or pins with identical functions.

Pinhead* Pop the falling balloons as you maneuver the clown on his uni-cycle. There are three levels of play, and it's joystick controlled. 16K; cassette or disk. Utopia Software.

Pipelining Occurs when a computer gets the next program instruction before finishing the last, thereby increasing the speed of the processor.

Piracy In the computer industry, piracy is the illegal distribution of hardware or software. Copying copyrighted software for purposes other than personal backup is illegal. Giving away or selling a copyrighted product is piracy, which is punishable by fine or imprisonment or both. Because this problem is especially widespread among Atari users, many software companies are no longer developing programs for Atari computers. The law of supply and demand will not apply when there is no profit for the supplier. If the consumer doesn't support the industry, then the industry cannot support the consumer. Please remember that giving or selling copyrighted products that you have copied is stealing. Accepting an illegal copy of a copyrighted product is also illegal.

Pirate This term is given to a person who illegally trades, buys, or sells copyrighted merchandise. In the computer industry, this usually involves stealing software through copying cassettes or disks.

Pirate Adventure Saga #2* A high-resolution graphics adventure game. Find the treasures using your adventuring skills and the Hint Sheet that's provided. This is a good beginner's game to draw all ages into the timeless world of adventure. 24K; disk. Adventure International.

PIXEL The smallest addressable unit in a video graphics display.

Planet Miners* Successfully orbiting a planet in one of your five spaceships grants you mining rights somewhere in the solar system. Just like the "gold-rush days, anything goes—claim-jumping, sabotage, etc. The forty-move limit may be too long to hold your interest. 16K; cassette. Avalon Hill.

Plan-Power for VisiCalc or SuperCalc* With this system, the user can create, modify, manipulate, save, retrieve, label, and print financial planning data as needed, arranging and calculating complex mathematical information. The system includes a disk and User's Handbook. American Training International, Inc.

Plato's Cave* A science game for all ages in which you explore caves, searching for the relationship between illusion and reality. Offers a variety of difficulty levels. 48K. Krell Software Corp.

Plattermania* You must help the clown keep platters spinning on top of twelve poles. The joystick moves the clown, and the button either spins the platter or puts out a new platter. Too much or too little spin causes disaster. Although simple, it's fun to play. 16K; cartridge. Epyx.

Player One of up to five objects available on the Atari for display on the screen using Player Missile Graphics.

Player Generator* A utility to help you design your own players or shapes to appear on the screen. A grid of pixels or points is used while the joystick controls the cursor for defining the filled points. Color and movement simulation is also included. 24K cassette or 32K disk. Joystick required. Atari Program Exchange.

Player Missile Editor* Create your own player shapes and player-missile graphics. This could be useful for inclusion into the user's BASIC programs. A grid and the use of the joystick helps define the detail of the shape. An advantage of this utility is that the data is stored as strings for faster movement during the eventual running of the designed program. Color definition is also included. 16K; disk or cassette, joystick. Artworx.

Player Missile Graphics* This Tricky Tutorial is a great way to create your own graphics and shapes for games you write. There are literally hundreds of shapes, people, rockets, monsters, etc. that you can draw on the screen. Disk. Educational Software. See Tricky Tutorials.

Player/Missile Graphics This is Atari's method of creating an image that appears two-dimensional on the screen, but is one-dimensional in RAM. For a demonstration of Player Missile Graphics, see the PMLOGO program under Graphics Tutorial. See Missile.

Player Piano* Displays a picture of a piano with the keys labeled with the corresponding notes. Plays in two modes, a standard piano mode and a play/save mode. 24K cassette or 40K disk. Atari Program Exchange.

Playfield Refers to the area that overlays the background display on your screen.

PLO See Phase Locked Oscillator.

PLOT Atari BASIC command. Displays a given point in the graphics window, using data as defined by a previous COLOR command.
Example:

COLOR 1:PLOT 7,5

In this example, data will appear at the screen position defined by the horizontal coordinate of 7 and the vertical coordinate of 5. The origin of coordinates (0,0) is at the upper left hand corner of the *screen*. The coordinates increase positively to the right and downward.

Plotter A computer-controlled mechanical device which draws images on a screen or printer.

Plug-Compatible Devices or components which use the same plugs and therefore can be used interchangeably, without modification, within the computer system.

Pluperfect* A disk utility program for those who use the Letter Perfect* word processor. Pluperfect performs a number of useful functions from a menu-driven format. The features include edit the directory, fix the allocation map, recover lost files, display a file map, examine a file, fix a file map, format a disk, and adjust sector saver. Disk. BJ Smartware.

pm Animator* Direct your own animated classics on the screen of your Atari. With the help of the Grafix Editor (q.v.) you can set up the shapes of the player/missle graphics, and the pm Animator will let you sequence differing movement shapes to get the desired effect. 32K; disk. Don't Ask Software.

Pogoman* Shoot out street lights as you hop down the road on your pogostick. Keep an eye out for feisty dogs, fire hydrants, and more! Good visual graphics. 16K; disk or cassette. Datamost.

POINT Atari BASIC Command. Used to read a specific byte from a file on a disk into RAM.
Example:

POINT #3,S,B

In the example, #3 is the IOCB (Input Output Control Block, q.v.) that has been opened to the file wanted;

S is the variable that will hold the sector number of the byte wanted;

B is the byte number (within that sector) of the byte wanted.

Pointer A data item whose contents is the address of another data item.

Pointmaster* A low-cost, pistol-grip joystick that has helped many gamers improve their scores. The fire button is positioned on the top, and the stick responds very well. Durability over the long run may be questionable. Discwasher.

POKE Atari BASIC Command. Places a number in a given RAM memory location. If there is a number already at that location, it will be replaced by the new one.
Example:

POKE 82,5

Since memory location 82 is the address for the left margin on the screen, and the default value is 2, this example will change the left margin to 5, thus moving it 3 spaces to the right of its default location.

Some useful 1200XL PEEK/POKE locations:

POKE 621,0	Enable Keyboard
POKE 621,255	Disable Keyboard
POKE 622,255	Then GR.0 for fine scroll
POKE 622,0	Then GR.0 for coarse scroll
POKE 729,X	Where X=Jiffies of key repeat delay
POKE 730,X	Where X=Key repeat rate delay
POKE 731,0	Enable key click
POKE 731,255	Disable key click
POKE 732,0	Clear HELP key
PEEK(732)=17	HELP key pressed
PEEK(732)=81	SHIFT+HELP keys pressed
PEEK(732)=145	CTRL+HELP keys pressed
POKE 756,204	International character set
PEEK(65527)=221	and
PEEK(65528)=87	400/800 Rev.A O.S.
PEEK(65527)=243	and
PEEK(65528)=230	400/800 Rev.B O.S.
PEEK(65521)=1	1200XL O.S.

See Sound Tutorial.

Poker Tourney* Play draw poker—your one hand against the computer's six. While you are psyching out your opponent's playing strategies, the computer is trying to discover yours, without cheating of course. The computer adjusts its game according to what it discovers about your poker habit. If the cassette program is run on a machine with less than 32K, the cards are viewed as text, rather than the exceptionally high-resolution graphics of the disk version. 32K; disk or cassette. Artworx.

Pokersam* SAM stands for Software Automatic Mouth. SAM is also your opponent in this five-card stud poker game. Since speech modules are built into the program, SAM talks. He narrates the play of the game as cards appear on the screen. The author has given SAM a personality that ranges from cranky to cocky, depending upon who is winning and by how much. Arcade gamers may complain about the simple graphics, and perfectionists may complain about the blanking of the screen during speech, but the computer's commentary makes this relatively simple game just plain fun. 32K; disk. Don't Ask Software.

Pokey This digital I/O chip handles the serial I/O bus, keyboard scan, random number generation, and sound. It also digitizes resistive paddle inputs, and controls maskable interrupt requests.

Pokey Timer A hardware timer with Pokey, which is clocked by frequencies that may be set by the programmer.

Polling A technique where the status of each device is ascertained according to a schedule.

Polycalc* Helps compute complex calculus and algebra equations, for people who are knowledgeable in these areas. Allows fractions and negative powers of variables, instead of numeric values. 24K cassette or 32K disk. APX.

Pool* Two game selections for one or two players. A joystick points the cursor to direct the shots. Good graphics and ease of play make this an enjoyable pastime. 16K; cassette. Thorn, EMI.

Pool 1.5* A realistic computer version of the game of pool. All of the laws of motion seem to have been considered by the programmer. The outstanding graphics are also effective on a black and white screen. 48K; disk. Innovative Design Software.

Pool 400* A cartridge version of Pool 1.5. Several games are available for up to four players. Excellent graphics and game simulation will satisfy most pool enthusiasts. 16K; cartridge. Innovative Designs Software.

Pooyan* You must save yourself and the piglets, so take careful aim at the balloons descending with the hungry, evil wolves. Things can get really hairy if your arrows miss and the wolves land safely! 32K; disk or cassette. Datasoft.

POP Atari BASIC statement. The stack is a series of numbers in the computer's memory, the top number of which determines whether a FOR...NEXT loop continues or terminates. It is also the target number for the RETURN statement of a GOSUB. There may be confusion, especially if a subroutine is not terminated by a RETURN. In this case it is necessary to clear the data from the top of the stack to prepare the stack for a new GOSUB. The POP command does just that.

Port A physical Input/Output connection. An address providing a connection between the computer's internal processor and an external device. Ports are used to attach input and output devices.

POSITION Atari BASIC command. Locates the cursor at a given position on the screen. It can be used in all graphics modes, and is effective for the next I/O command which affects the graphics screen.

Example:

POSITION 4,2

This example places the cursor at the point on the screen four spaces to the right of the upper left corner, and two spaces down.

Position the Cursor   See Move The Cursor.

Positive Logic   The voltage level most positive in the computer system is the true level; the false level is the voltage level closest to zero.

Postfix   Notation system where the operator follows the manipulation symbols used in the program.

Power Down   The steps a computer takes to preserve the state of the processor and to prevent damage to it and connected peripherals when the power fails or is shut off.

Power On   Turn the power switch to the ON position, or otherwise supply electric current to a device.

Power-fail Restart   A device which detects a drop in the voltage and signals the processor. The processor still has several milliseconds to preserve the registers in a battery backup memory, allowing automatic resumption of processing when the power is restored.

Prefixes*   An excellent way to teach the uses of prefixes to children in second through sixth grades. Visual and sound effects help them review the material. 16K; disk. APX.

Preppie*   Help Wadsworth avoid speeding golf carts and nasty, lawn-mowing groundskeepers, watch out for the giant frog, and maneuver across the river in your timed quest to gather lost golf balls. You'll enjoy this game, which is similar to Frogger. 16K; cassette or disk. Datasoft.

Preppie II*   A continuation of Preppie*, which almost did in Wadsworth. Here, he wanders through three mazes painting the floor pink. The first maze has revolving doors that turn when touched, revealing huge, hostile frogs. The second level features golf carts and lawnmowers that he must artfully dodge. Wadsworth is equipped with a cloak of invisibility, but it will run out of power if he overuses it. Good sound, and okay graphics are featured. 32K disk or 16K cassette. Adventure International.

Preschool Games*   A series of eight games that have simple concepts, offer little in the form of graphics, and are recommended for three-to six-year-old children. Includes Touch-Me, Battleship, Tic-Tac-Toe, and Musical Chairs. 16K; disk. Atari Program Exchange.

Preschool Library, The*   An educational game for children ages three to six. Helps develop listening skills, improves hand-eye coordination, and teaches shape, letter, and number recognition, all in an entertaining way. 16K cassette or 24K disk. Program Design, Inc.

Presidents of the U.S.*   A quiz with several levels to familiarize students with presidents. The student is given clues, and is asked to identify the president. At lower levels, choices are given. The program is unprotected; therefore, a programmer can enter or change the clues. 24K cassette or 32K disk. Atari Program Exchange.

Princess and the Frog*   In this game, which is similar to Frogger, you journey with your frog past many obstacles to the lips of the princess (the keys to the kingdom?)—then you are turned into a prince (and the game really begins). 8K; cartridge. Romox, Inc.

PRINT   Atari BASIC Command. The PRINT command causes arithmetic expressions, string expressions, and data between quotation marks to be printed serially as listed. The expressions and/or data must be separated by a comma or semicolon. If two expressions to be printed are separated by a comma, the second starts at the next tab stop after the end of the first; if they are separated by a semicolon, there is no space between the two when printed. If one or any other specific number of spaces are wanted, they must be inserted in string expressions, or at the beginning or the end of expressions within quotes. If no specific device (printer, graphics screen, etc.) is specified, the printing will default to the text screen. The device to which to print is specified by the IOCB Input/ Output Control Block (#1-#7) which has been opened for it. The GRAPHICS statement automatically opens IOCB #6 for output to the graphics window.

Example 1:

PRINT R, S, T, N$

Example 2:

PRINT#2;"MY NAME IS ";N$

In example #1, the values of the numeric variables R, S, and T, and then the data stored in N$, will be printed along the first vacant line of the screen, in the order given, each starting at a tab stop. In example 2, MY NAME IS, and then a single space followed by the name stored in <N$>, will be printed on the printer, assuming that IOCB #2 has previously been opened for output to the printer. See also LIST.

Print   An LPRINT statement with no other specifications will print a blank line (that is, feed the paper up one line and return to the left margin) so you can space your printout format neatly. See LPRINT.

Print—BASIC See LPRINT.

Print, Compressed To print small type (132 characters/8-inch line) an Epson-compatible printer enter the BASIC statement:

LPRINT CHR$(15)

This may be done either in immediate or deferred mode. To turn compressed print off, enter:

LPRINT CHR$(18)

For the Atari 825 printer, turn on compressed print with:

LPRINT CHR$(27);CHR$(20)

and return to normal printing with:

LPRINT CHR$(27);CHR$(19)

Print, Double Width For large type (40 characters/8-inch line) on an Epson-compatible printer enter the BASIC statement:

LPRINT CHR$(14)

This command is good for one line only, and must be repeated for the next line if it is desired. To turn double width off before the end of the line, enter:

LPRINT CHR$(20)

Double width may also be used in conjunction with compressed print. In this case, it will give 66 characters/8-inch line.

For the Atari 825 printer, start double width (or "extended/character") printing with:

LPRINT CHR$(27);CHR$(14)

and stop it with:

LPRINT CHR$(27);CHR$(15)

See also Type Formats, Atari 825 Printer.

Print, Normal To return to normal width printing (80 characters per 8-inch line) it is necessary to turn off all non-standard print width options currently turned on.

Print Lines To get one or more spaces between fields printed by your BASIC programs, use a literal of spaces like: " ". To get several spaces between the printed values of A$ and B$ use BASIC statement:

LPRINT A$;"   ";B$

See also Print Zones.

Print Zone To leave space on the print line between items, put an extra comma (,,) in the print listing. Enter BASIC statement:

LPRINT A,,B

This would print A in print zone one, nothing in print zone two, and put B in print zone three, (col 21).

See also Print Zones.

Print Zones Each group of 14 spaces across the print line is called a print zone. A comma (,) in an LPRINT list of items to be printed means "start printing the following item at the start of the next print zone." The semi-colon (;) means the next item is to be printed immediately after this one, without even a single space between. The print zones begin in columns 1, 11, 21, 31, 41, 51, 61 and 71. See also Print Lines.

PRINT # BASIC statement. PRINT # is used to write data sequentially to a file.

PRINT #<filenum>,<list of expressions>

<filenum> is the number used when the file was opened for output.

<list of expressions> is a list of the numeric and/or string expressions that will be copied to the file.

PRINT # writes data to the file just as it would appear on the screen with no compression. For this reason, your data should be edited carefully for file input, exactly the way you want it to appear on the screen. Numeric expressions should be delimited by semicolons. If commas are used as delimiters, the extra blanks that are inserted between print fields are also written to the file. String expressions must be separated by semicolons in the list. To format the string expressions correctly on the file, use explicit delimiters on the <list of expressions>.

Printer—Lines Per Inch To set lines per inch on the Epson-compatible printer, enter BASIC statement:

LPRINT CHR$ (27); "0"

To print at 8 lines/inch.

LPRINT CHR$ (27); "2"

To print at 6 lines/inch.

LPRINT CHR$ (27); "1"

To print at 72/7 lines/inch.

See also Type Formats, Atari 825 Printer.

Printer—Page Length To set the page length on an Epson-compatible printer, enter BASIC statement:

LPRINT CHR$(27);"C"; CHR$(55)

This example will set the page length at 55 lines.

Printer—Top of Page Pressing the Form Feed (FF) button on your printer advances the paper to the top of the next page. If you are writing a program in BASIC, and you want the printer paper at the top of the next page, enter the statement:

LPRINT CHR$(12)

In this instance it may be necessary to adjust the paper in the printer so it actually is at the top of the

page, as defined by the perforations. In your program you may want to provide instructions to the operator and a pause (q.v.) to allow for the adjustment of the paper.

Printer—Type Formats Many type formats are available on your printer. To select the one you want, follow the instructions in your printer's manual for the proper BASIC statements. See also Type Formats, Atari 825 Printer.

Printout Basket* This inexpensive basket will accomodate both bottom-feed and rear-feed printers. Helps prevent cords and cables from interfering with the paper. 12" or 14" basket. SEE, Inc.

Priority Refers to the method of setting Player Missile and Playfield displays so that objects appear to be in front of or behind other objects. See the sample PMDEMO2 program in Graphics Tutorial.

Pro Bowling* Up to four players can roll curve balls with joystick control. 16K cassette or 24K disk. APX.

Pro Golf* A nine-hole course for one to four players. Game simulation is not very realistic, and aiming control is not very finely tuned. 16K; cassette or disk. Dynacomp.

Probe An electrical device which, when touching a circuit point, will allow a test meter to check the circuit's connection and power.

Procedure A part of a program which helps the program's structure, readability, or reliability. The procedure is a separate function of the program, and could be incorporated into a subroutine.

Processor-bound The speed of the processor limits the processing speed of the program.

Program A sequence of instructions which specify a process for manipulating data. Programs can be written in many languages of different "levels;" the level reflects how much additional work the processor must do before the program can be executed. BASIC is a high-level language, which requires that all programs be run through a compiler or interpreter. Assembly language is mid-range. That is, it is closer to the binary code of the computer, but still needs some processing through an assembler before execution. The lowest level is programs written in binary or hexadecimal code which are directly executable by the microprocessor. Before Assembly language programs were developed, all programs were written in binary code—a tedious and time-consuming task.

Program—Version or Release Programs and software packages are changed from time to time to correct errors or add new capabilities. To keep programs from being in a constant state of flux, and to simplify distributing modified programs to users, a number of changes are made, tested, and packaged as a new version or release of the program.

Program, LOAD A BASIC program that was SAVEd on diskette or cassette can be called back into the Atari memory to be modified or run.

For a program named "SAMPLE," if it is on the default diskette enter:

LOAD "D:SAMPLE"

If SAMPLE is on drive 2 enter:

LOAD "D2:SAMPLE"

If SAMPLE is on cassette, rewind the cassette, press PLAY and enter:

CLOAD

All LOAD instructions erase any program lines you have in memory before the LOAD.

Program, Object The Machine language instructions which result from translation of a source program by a compiler or assembler. See Object Program, OBJ.

Program, SAVE A BASIC program can be SAVEd to disk or cassette for use later.

To SAVE it to disk (the default drive) type:

SAVE "D:SAMPLE"

On disk (drive 2):

SAVE "D:SAMPLE"

For cassette, first rewind the cassette, press PLAY and RECORD together, then enter:

CSAVE

To run the program at a later time, use the LOAD command to copy it from the disk (cassette) you saved it on, back into the Atari memory. See LOAD. The SAVE instruction does not alter your program in memory. It is important to be aware that if you write a BASIC program, it will be lost (erased) unless you SAVE it before you either turn off the computer, go to DOS (System Command), or use the NEW command.

Program, Source A source program is a file which, although it may be RUN as is, will eventually be processed by a language processor or interpreter, such as a compiler or assembler. It is the source program for the interpreter. The name "source program," then, is a matter of function rather than content. See OBJ, Object Program.

Program, Starting The Programs, depending on their type, are started in several ways. Autoboot

programs (programs with an AUTORUN.SYS file pointing to them), whether Machine language compiled object or BASIC programs, are executed automatically by DOS when the Atari computer is turned on or rebooted. Machine language or object programs, if not started by an AUTORUN.-SYS, are executed by using the L option from Atari DOS. In BASIC, you LOAD the desired program to memory and RUN to execute. If the program is on disk use:

RUN "D:FILENAME"

to LOAD and RUN the program with one command.

Program Concatenation and Data Concatenation Adding an item on at the end of the others to produce one longer data or program item.

Program Counter A register which holds the memory address of the next instruction to be executed. The counter is incremented each time an instruction is executed. The counter can be modified through subroutines or calls, so that the instruction next executed is different from that which directly follows in the program.

Program Development Aids Programs to aid the programmer are called utilities. Such software is commonly used for routine tasks. Utilities are designed to facilitate or aid in the operation and use of the computer for a number of different applications. Examples of utilities are editors, sorters, debuggers, file handlers, compilers, assemblers, languages, etc. See Utilities.

Program Development Aids—Software See ABC; Assembler Editor; Asteroid Miners Tutorial; Atari BASIC Rev A; Atari BASIC Rev B; Atari BASIC Routines; Atari BASIC Quick Reference Card; BASIC Commander; BASIC Compiler; BASIC Crossreference Utility; BASIC Program Compressor; BASIC Renumber Utility; BASIC Utility Disk; BASIC X/A (Extended BASIC); Basics of Animations, BASM; Blis; Character Graphics Tutorial; Datasm/65; Dsembler; DISASM; Developer's Diskette; Edit 6502; Extended WSFN; Graphics Generator; Graphics Machine; Happy Warp Drive Software; Happy 810 Enhancement; Instedit, Rev.2.; Load'n Go; MAC 65; Machine Language Monitor; Macro-Assembler; MAE; Magic Dump; Mantis Boot Tape Development System; Memory Map Tutorial; MMG Basic Debugger; Monkey Wrench; Multibase Calculator; Next Step, The; Page Six; P.A.P.I.E.; Player Generator; Player Missile Editor; Quick Reference Card—Atari BASIC; SAM; Softeach for UCSD Pascal; Sound Editor; Ultimate Renumber Utility; Util-

ity Diskette II; Variable Changer; 3-D Supergraphics & Color Game Development System; 6502 Disassembler.

Program Disk A disk used for the permanent storage of programs. Data disks are used primarily to store data. To save space, a data disk will usually not have any DOS written on it. A system disk is one used principally for storing DOS commands and related utility type programs. It is entirely feasible to have any two or all three of these types of information stored on one disk.

Program File A program file contains some type of program instructions specifying how data is to be processed. If you write a program in BASIC, and then RUN it from BASIC, it is a program file. However, if you then use your BASIC program as the source program for a BASIC compiler in order to produce an object program, your original BASIC program has been used as input for the compiler, or as a data file. Thus, how a file is used determines whether it is a program file, a data file, or, as in the case of a source program, sometimes one and sometimes the other.

Program Integrity Ensuring that programs (or data) cannot be altered improperly. For example, in a payroll system, steps must be taken to ensure that employees cannot improperly alter their pay rates or hours worked. Data security consists of guaranteeing both data integrity and data secrecy or privacy.

Programming Language A set of rules specifying a language that can be translated into Machine language and cause the computer to carry out functions. See FORTH, Pascal, Assembler, COBOL, RPG, LISP, ACTION!.

Programming Languages See ACTION! Assembler Editor; Atari Microsoft BASIC; Atari Microsoft BASIC II; Atari BASIC Rev A; Atari BASIC Rev B; BASIC A+; Datasm/65; Extended fig-FORTH; Extended WSFN; MAC 65; Macro-Assembler; MAE; Microsoft BASIC; PILOT; QS FORTH; Synassembler.

Programming Your Atari Computer* The subjects covered in this book by Mark Thompson include number systems and codes, microcomputer basics, computer arithmetic, boolean operations, introduction to programming, introduction to the Atari 800 keyboard, optional peripherals and software, input/output operations, mathematical and other functions, programming techniques to save memory, graphics and sound, and programming in Machine language. TAB Books.

PROM Programmable Read-Only Memory. A ROM which can be modified by the user.

PROM Programmer An external device or module for writing user-modified ROMs. The programmer may input data through a new keyboard, binary paper tape, or directly, through the microprocessing unit.

Prompt A visual signal from a program to "prompt" the operator to do something. The prompt should give some clue as to what the program requires (or allows) the operator to do in response to the prompt.

READY

is a prompt from BASIC indicating that you can now enter a BASIC command or statement.

?

is the prompt from a program written in the BASIC language that tells you the program is running but is on standby for you to answer a question. When you answer the question and press RETURN, the program will continue. In this case it is a good idea to include a descriptive prompt in the program that will tell the user exactly what is wanted in response to the ? prompt. Here is an example of how this is done:

100 PRINT "ENTER YOUR NAME"
200 INPUT NAME$

Propagate To go from one component in the computer system to another.

Propagation Delay The time the processor takes to pass a signal through one device on the system to another.

Property Management Program 2000* A VisiCalc template which helps apartment building managers. This four-disk system can handle up to 100 rental units. One useful feature keeps background data on each tenant. Can also keep expenses and bank statements, produce printed late-rent notices, and use customized titles. Backup copies of these disks can be made. 48K. Printer and VisiCalc required. T & F Software Company.

Proportional Spacing The printer allocates horizontal space according to a character's width, rather than using the same width space for all characters. Proportional spacing is more readable than fixed-width type and appears to be typeset. Not to be confused with justified type, where spacing is manipulated to produce a flush (even) right margin.

Prostick* A joystick that works well with games. There isn't too much tension on the side positions, and it returns to neutral position easily. The base

fits in the palm of the hand and contains the fire button. GAMES.

Protected Diskette A disk is write-protected if it does not have a write-protect notch about one inch down on the right hand side. The notch could be covered over with an adhesive tab. If there is no notch, a small spring-loaded switch, or a light beam inside the disk drive, is blocked. This is sensed by the disk driver program. You will get an error message ("Attempted write-protect violation") anytime you attempt to alter a file on a write-protected disk by changing it, deleting it, copying a file onto the write-protected diskette, or formatting the diskette.

You are allowed to use files, load them, or copy from the write-protected diskette. The purpose of these limitations is to prevent accidental loss of the only copy of programs or data. In most cases, the procedure is to copy the write-protected disk onto a notched diskette, put away the write-protected disk as a permanent copy, then modify the notched disk.

It is a good practice to put an adhesive tab (supplied with boxes of disks) over the write-protect notch of any important disk you will backup. Then if you accidentally ask for the backup in the wrong direction (from the old disk to your important disk), you will get a second chance to make the backup rather than lose your data.

Protected Field Some data entry screens have areas that are reserved and cannot be modified by the user with keyboard entry.

Protected Files The files on a disk may be protected from accidental changing of content, renaming, or erasure. To protect (lock) a file use the F option on the DOS menu. A file that is locked shows a star in front of its file name on the disk directory.

If you want to change, rename, or erase a protected or locked file, use option G from the DOS menu. This will open the file, the star will be removed from in front of the file name on the disk directory, and you can edit the file, rename it, or erase it. See DOS Options.

Protector* The strong point in this game is the graphic depiction of an alien world with sputtering volcanoes, lava, meteors, and laser bases. Your goal is to save the people of this planet from the clutches of an alien ship. Although the game is unexciting and has a somewhat weak story, the upper levels are challenging. This game uses almost all the available Atari graphic features and is a very good example of Machine language programming. Sound

and music are good too. 32K; disk. Synapse Software.

Protector II* An improved version of Protector* that is both more playable, and more interesting. The object of this game is the same as in Protector. Many of the land barriers that made high speed flying scary have been removed. Some of the graphics have been sacrificed for this, but this new version should hold your interest longer than the original. 32K. Synapse.

Pseudo-Operation Pseudo-Op. An operation code recognized by an Assembler, but not corresponding to any Machine language instruction. Examples are ORG, which specifies where a program will reside in memory, and SKIP, which specifies a new page in the listing of the program.

PSW Program Status Word. Contains the zero flag, carry flag, and other information relevant to the processor.

PTRIG Atari BASIC function. PTRIG, followed (in parentheses) by a number (0-7), depending on the port into which the paddle is connected, will return the status of the trigger of that paddle. If the trigger is in its normal condition, a 1 is returned; if the trigger is pressed, a 0 is returned.

Public Domain Programs There are hundreds of available public domain programs. The programs are not copyrighted—you can freely copy them and share them with your friends. In most cases these programs have been simply placed into the public domain, sometimes anonymously, sometimes with the author's name attached. In some cases, the author requests that anyone who finds the program useful send him a "donation" to help pay the costs of development and to finance development of new or improved software. With public domain software, you get a change to try out the programs extensively without making a commitment to buy. The prices tend to be much lower than commercial software. We urge you to help keep the idea of donation-supported software alive. If you find such a program useful, please send the suggested contribution to the authors. And urge your friends to do the same.

Some of the public domain programs have extensive and excellent documentation. The source code is provided for many of the programs, so you can customize them to suit your needs or preferences. You may encounter a bug in one of the public domain programs. If it is donation-supported, contact the author. Otherwise, you're on your own. Most public domain programs are offered "as is"— if you encounter bugs, it's up to you to fix them.

Pulse A square or gaussian-shaped voltage or current lasting a short period of time.

Pulser A circuit which for test purposes delivers a high current signal of short duration.

Punctuation Put-On* Designed for students age eight to fourteen, this program teaches the correct and effective use of punctuation in various writing modes including poetry, narrative, and dialog. There is a special section for young children, and different skill levels are provided. It's an enjoyable and interesting way to learn very useful information. 32K; disk. Atari Program Exchange.

Pushdown List Another name for a stack.

Pushover* A game of will power involving the interpretation of symbols in a test of coordination and fast reactions. Two adversaries battle on top of a cliff, attempting to push each other off the edge. Levels of difficulty can be selected. You can also choose to play against the computer. A unique game. 32K. Atari Program Exchange.

PUT Atari BASIC command. Outputs a single byte to the screen at the cursor location. FORMAT:

PUT #aexp,aexp$

Here #aexp is usually #6 for the graphics screen, and aexp is the ATASCII code number for the character to be output.

Q Codes. ATASCII = 81, HEX = 51. q—ATASCII = 113, HEX = 71.

Q Register used as an accumulator extension for efficient multiply-divide operations. Usually not found in earlier 8-bit CPUs, which have combined A register/Q register. Newer 8-bit and 16-bit CPUs usually have a larger set of general purpose registers. Also, the half-width of power spectrum of bandpass filter response in hertz, divided into the center frequency in hertz.

Q Bus The internal system bus of the DEC LSI-11 computer.

QA Quality Assurance.

QC Quality Control.

Qix* Hand-eye coordination and strategy are a must in this abstract Atari arcade game. You must capture seventy-five percent of the screen, boxing in the Qix with your joystick-controlled marker. Sparx are your enemies, and they multiply if you don't beat the time limit. Qix is a unique and challenging game. 16K; cartridge. Atari, Inc.

QPL Qualified Products List. A catalog of military-qualified products for high-reliability applications.

QS FORTH* An excellent implementation of FORTH for the Atari. The package includes documentation, with a complete list of QS FORTH words, and many programming examples. The editor with this package is much easier to use than those in other FORTH packages, and relies on the *Atari* screen editor for many functions. The package adds CASE and BEGIN...AGAIN control structures to the normal fig-FORTH kernel—powerful additions for structured programming. 24K; disk. Quality Software.

QS Reversi* Atari's answer to Othello, offering twelve levels of play, allows you to back up several moves to test strategies, and has a tournament entry mode. Reversi is a major rival to Hayden's Reversal. 40K; disk. Quality Software.

Quad Involving four entities, or a multiple of four.

Quad-Density Disk Quad-density stores four times the amount of information per disk as single-density.

Quarxon* Compete against the computer or a friend as you blast at droids hiding behind a brick wall. Shots must be fired through holes in the wall, or they will ricochet back at you. 32K; disk. Atari Program Exchange.

Queue A data structure which contains data or tasks waiting to be processed.

Quiz Master* Allows you to create quizzes (true-false and multiple choice). It also can produce vocabulary reviews. There is no way to record student scores on tape, disk, or printout, but the program is a good study aid for students. 32K; disk. Atari Program Exchange.

Qwerty The traditional typewriter keyboard layout, named after the first six letters in the top letter row.
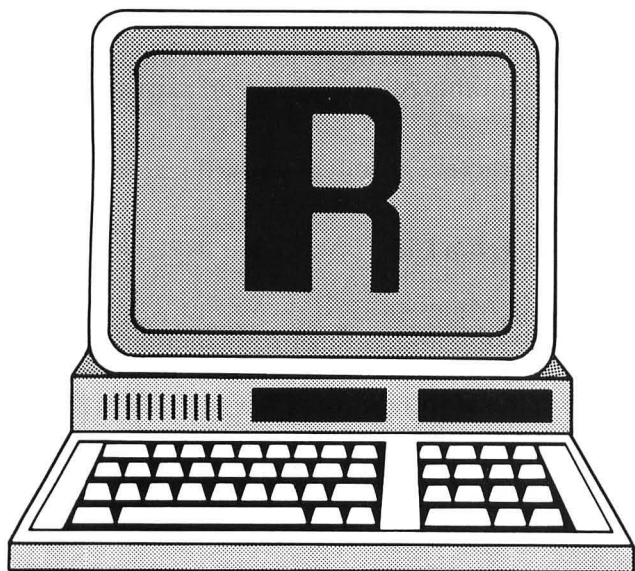
R Codes. ATASCII = 82, HEX = 52. r—ATASCII = 114, HEX = 72.

R Reset. Also Register, Request, Ring indicator.

R DOS 3.0 command to Rename a file or files. See DOS Options.

Rabbotz* The goal is to destroy hungry, multiplying rabbits. Your joystick controls movement, and the button lays mines. As the difficulty levels increase, you have fewer mines, and there are more rabbits to destroy. 16K cassette or 24K disk. Atari Program Exchange.

Race in Space* Race your opponent through the asteroid field (from the bottom to the top of the screen). You can knock out your opponent with space boomerangs—if you have time while dodging asteroids. Varying levels of difficulty. Graphics and sound are good. 16K; cassette or disk. Analog Software.

Rack Mountable Packaged for installation in a metal cabinet, or a rack.

RAD Atari BASIC Statement. Converts the value of a trigonometric function to radians from degrees.

Radiation Hardening A quality assurance process used in the production of Integrated Circuits (ICs), to select circuits which are better able to withstand radiation.

Ragged Margin Not justified. See Justify.

Rainy Day Book of Activities for the Atari, The* By Electronic Playground and Widget Company Inc. A collection of short programs written in Atari BASIC. Reston Publishing Company.

Rally Speedway* An exciting drag race game that lets you create your own track, or speed along the existing roadway. Push yourself in the time trials or go neck and neck to the finish. Cartridge. Adventure International.

RALU Register-equipped ALU. A bit-slice ancestor (National Semiconductor).

RAM Random Access Memory. This is the general purpose, erasable and reusable memory located inside the Atari computer. The word memory, used by itself, is usually a reference to RAM. See Memory.

RAM Disk A block of RAM memory used by a program to simulate a disk drive. The program must modify or intercept all Input/Output to the "fictitious" drive, and redirect it to the RAM memory. The RAM disk will have its own drive letter and appear in every way like a real disk, except that it is much faster.

RAM Memory Card A card containing RAM memory to expand the computer's main memory.

RAM Pack A package containing expansion RAM, to mount external to the computer. If mounted inside the computer housing, it would be called a RAM card.

RAM Test II* Problems with the RAM chips in your Atari are very difficult to trace. This is the fastest and most complete memory-testing program available for the Atari. Since it is all Machine language, it can test even the top 8K of a 48K machine, and it tests the memory addressing system, as well. Use the memory-testing program the board manufacturers use! 16K; cassette or disk. MMG Micro Software.

RAM Vector An alterable system vector that contains a 2-byte address to various operating system routines.

RAMCRAM Plus 48K* A new, easy-to-install module that expands the memory of the Atari 400 to 48K. Axlon, Inc.

Random Access An access method where each data item can be retrieved directly by an address computed from the data.

Random Number BASIC. See RND.

Rapid Reader* Learn to read faster and understand more through this system of words and phrases flashing on the screen. Set the speed from a range of 50 to 2200 words per minute. 24K; disk. Silicon Valley Systems.

RAS Row Address Strobe. A signal used in dynamic RAMs to reduce the pin count by multiplexing the address. A group of pins is used at one point in time for one point of the address, then reused with a different RAS carrying a different point of address.

Raster Blaster* Have fun with this super recreation of a real pin-ball machine. The rubber bands on the bumpers jump, and the action of the spinners and claw mechanism is similar to the action of the original electromechanical parts. The ball acts like the real thing, too. Aiming the shot is a little more difficult than with a pinball machine, and anticipating its strength is really difficult. Graphics are wonderful, but the sound effects are a little weak. 32K; disk. Budge Co.

Raster Scan—CRT Display The most common technique of TV display: an image is built from aggregates of dots of varying brightness.

Rat Race* The chef in this grungy fast food restaurant throws the food wherever he finds space, and it's your job to move it to the appropriate slot for the counter folks to pick it up. Many obstacles lie between you and success, however. There are multiple levels of difficulty, progressively more complex boards, music, and sound. All in Machine language—everything you want in an arcade game. 40K; disk. MMG Micro Software.

RATFOR RATional FORtran. A structured dialect of FORTRAN which is compiled into standard FORTRAN by a preprocessor.

R-C Resistor-Capacitor. A circuit connected to an oscillator to define its oscillating frequency. For stable frequencies, a crystal is required.

RD Received Data (RS-232C standard).

RDY ReaDY. A control signal used with slow memory or devices to indicate that valid data is available.

READ Atari BASIC Command. The READ command is always used in conjunction with the DATA (q.v.) command. READ is most often used to transfer values from DATA statements into specific RAM locations, strings, or numeric variables.

READ—Input Data Into Memory Data in internal RAM (Random Access Memory) is immediately available to programs for processing. Data in external memory must be copied into internal memory (READ or INPUT), processed, then copied back out to external memory (WRITE or OUTPUT).
If data has been created in internal RAM, it can be

written out to external memory without a READ first. And, if data read in from external memory has not been modified, there is no need to write it back out since the original copy is still there.

Read Character From Keyboard BASIC. See INPUT.

Read Data From File BASIC. See INPUT.

Read-Only Memory ROM. Memory which can be written only once. Read-only memory can be used only as input to the Atari computer. No output from the computer can be written to it. ROM, as opposed to RAM (Random Access Memory), cannot be erased and reused. ROM contains fixed data, such as the Atari 10K Operating System, the Atari BASIC language cartridge, etc. See Memory.

Reading Flight* A collection of adventures for children ages ten through twelve. Includes Space Adventure, Traitor Among the Trolls, and Curious Undersea Species. 16K; cassette. Roklan Corporation.

Read/Write Describes the direction of data flow in an operation.

Real Time CLOcK RTCLOK. A 3-byte system timer that may be used to keep track of time. This clock occupies decimal locations 18 through 20 in RAM. See Memory Map.

Real-Time An action, or system capable of action, at a speed that keeps pace with the occurrence of an actual process.

Real-Time Operating System An operating system capable of real-time task management, including event scheduling, interrupt management, and real-time event counters.

Rear Guard* Your duty as a patrol ship commander is to shoot down the enemy with energy darts. Level of difficulty increases with score. 16K cassette or 32K disk. Adventure International.

Reasonableness Test A test of the value of a variable to see if it falls within a range defined as reasonable. It is used to detect and filter noisy inputs or erroneous outputs.

Reboot To reset the system. Rebooting clears the computer's memory and restarts the application (if it is on an autoboot disk) at the beginning of the program, menu, or whatever the AUTORUN.SYS is pointing to. If there is no AUTORUN.SYS on the disk, and the BASIC cartridge is not inserted in its slot, DOS will be loaded into memory. If BASIC is on-line, the screen will show the READY prompt.

To reboot with a cold start, turn the computer's power switch off and then on again.

To reboot with a warm start, press SYSTEM RESET. (Note: The warm start function of the SYSTEM RESET button may be different, depending on the particular application you are running.)

Record A unit of information, either read, written, or stored, such as a punched card, a disk sector, or a line of characters.

Recursive Refers to a function, routine, or procedure which calls itself.

Redundancy The use of more than one of the same item to increase reliability or performance.

Reentrant Programs or routines written in reentrant code. This code can be used by several tasks concurrently.

Reentrant Code A single segment of code and data which is not modified during execution, so that it may be called by multiple programs.

Refresh Circuitry Electronic circuitry which periodically reads and rewrites the contents of dynamic memory, to prevent loss of data.

Refresh Logic The logic necessary to periodically rewrite the contents of the dynamic RAM, typically once per millisecond (ms).

Register One word of memory, usually implemented in fast flip-flops, directly accessible to a processor. Most CPUs include a set of internal registers which can be accessed much faster than the main memory.

Register Select One or more lines used to select one register out of a given number within a device. Register select pins are normally connected to the address bus.

Relative Addressing A method of memory addressing in which the information desired is located by adding a displacement to a pointer. Addresses are expressed relative to some base address or pointer.

Release To make a program, application, or software of any kind available to the public. When any software is released with a change or update from a previous version of the same application, it is said to be a new release or version and is renumbered accordingly. See Program, Version or Release.

Reload To reboot a program or DOS. See Reboot.

Relocatable Describes the load module or object form of a program (or routine) which does not contain fixed addresses, or which is structured so that it can be executed anywhere in the memory.

REM Atari BASIC Command. This command, and anything after it on the same numbered line, is ignored by the computer in the execution of a program. The purpose of REM is to supply information about the function of routines or variables within a BASIC program. The user gets this information by LISTing the program. The REMarks appear in the LISTing even though they are ignored when the program is RUN. REM statements have only a slight effect on the execution speed of an Atari BASIC program, but they will slow down the program and consume RAM. It is a good idea to keep one version of your program that contains REM statements for future reference, and one version with all REMs removed for faster loading and execution.

Removable Media for Recording Information Physical methods of storing information, such as programs and data files, are called media. The main medium for Atari is disk, but cassette, hard disk, RAM, ROM, and other devices are also used. Media are often classified:

a) removable media, such as disks, cassettes, and some hard disks, or

b) fixed media, such as most hard disks.

Fixed media cannot be removed from the device that drives them, so backup copies or additional copy cannot be stored off-line (outside the computing system) for insertion when needed. See also Memory.

REN or RENAME Rename a file. See DOS.

Rent Wars* Pits two landlords against each other in a race to obtain a choice apartment building. The objective is to fill apartments with furnishings and paying tenants. At the end of a year, the landlord with the most points can claim a majority interest in the building and win that penthouse for himself. Disk, cassette, or cartridge. First Star Software.

Repeat Program Lines BASIC. See FOR.

RES RESet signal.

Rescue at Rigel* You must save humans held captive on a distant planet. Use all your weapons to combat the monsters and robots standing guard over their prisoners. The graphics are poor, but an interesting game anyway. Part of the Starquest Series. 32K; disk or cassette. Automated Simulations.

Rescue at 94K* Race against the clock, as you dig buried countrymen out from under the surface of another planet. Keep a constant check on your oxygen supply, as deadly clouds will burn it up. Your mission is not over until all survivors are aboard your ship. 32K; disk. Business Data Center.

Reserved Words Words in Atari BASIC that are used for commands, statements, and functions. These words have particular meanings in BASIC and cannot be used as variable names, nor in some other ways. If you accidentally use one of the reserved words, you may see an error message or have strange results when you execute the program. Some of these words are IF, THEN, FOR, NEXT, GOTO, GOSUB, LET, etc. See also BASIC Reserved Words.

Reset To return a program to some arbitrarily selected beginning point. See Reboot.

Reside Be recorded in. A program may reside on a disk or in memory (RAM or ROM).

Resident Software A program which resides in the main memory of the Atari computer. When Atari DOS is called up, for example, it remains resident in the computer's memory while it is in use. Many applications, such as word processors, data managers, etc., are resident programs during operation. Others are not resident. They are read from disk into memory each time they are needed. Some applications keep certain parts resident while they leave some non-resident parts to be called from disk only when specifically needed.

Restart After Pause When any long bit of information, such as a LISTing, disk directory, etc., is being scrolled forward on the screen, the scrolling can be paused by typing CTRL/1. To restart the scrolling, the same command is used. CTRL/1 toggles the scrolling off and on. See also Control Keys.

RESTORE Atari BASIC Statement. This statement makes possible the repeated use of all or any of the DATA statements in a program.
Format:

RESTORE aexp

When this RESTORE command is used, the DATA pointer is reset to the first DATA item in the line number indicated as aexp. The default is the first DATA item in the program.

Resume a Program After a Pause See Restart After Pause.

Retirement Planning* Develops savings strategies for meeting your projected expenses. You provide the computer with detailed information about assets, income, expenses, anticipated expenses, and anticipated inflation rate. The computer uses this information to generate a table of required savings for reaching the set goal by the target date. 32K; disk. Advanced Financial Planning.

Retrofit To improve or change software or hardware by making additions.

RETURN Atari BASIC Statement. RETURN must be the last statement of a subroutine started by a GOSUB (q.v.) command. The RETURN statement will bring you back from a subroutine. It is used in conjunction with the GOSUB statement. See also GOSUB.

RETURN <line> allows non-local returns from event trapping routines, to a fixed line number while still eliminating the GOSUB entry the trap created. Be careful when using this non-local RETURN, since any other GOSUBs, WHILEs, or FORs that were active at the time of the trap will still be active.

Reversal* This program won the First Man-Machine Othello Tournament. It's a simple game, but difficult to master—trap your opponent's pieces between yours. Advanced levels are particularly challenging. 16K; disk. Hayden.

Reverse Video Sometimes called inverse video, this function displays dark characters on a light background instead of the normal light characters on a dark background. This function is turned on and off by striking the Atari logo key.

Reversi II* A computerized version of the game Othello. Surround your opponent's pieces to capture them. You can play against the computer or another person. Moves are made with the joystick and finalized with the fire button. 16K; cassette or disk. APX.

RF Modulator A device which changes a composite video signal, required for most monitors, into a radio frequency signal for display on a standard television set.

RFI Radio-Frequency Interference.

RFP Request For Proposals.

RFQ Request For Quotes.

Rhymes and Riddles* Educational games, recommended for children five to nine years old. The programs use color and sound to challenge the student to solve riddles and identify famous stories. 48K; disk. Spinnaker Software.

Ricochet* A game of strategy and skill somewhat resembling bumper pool, played on a grid surface. 32K; disk. Automated Simulations.

Right Arrow (→) Pressing CTRL and the right arrow will move the cursor right one character. This function is common in text and command entry. See Control Keys.

Right Cursor BASIC. Cursor right moves the cursor one space to the right, with the character remaining in BASIC. See also Control Keys.

Right Justify See Justify.

Ring Indicator In telephone-based applications, such as telecommunications via modem, Ring Indicator is the signal on-line which causes the bell to ring.

Ripple-Carry An addition technique where the carry coming out of an adder is propagated to the next adder. Carry look-ahead is a faster method.

Rise Time The time required to complete the low-to-high transition of a pulse.

RND Atari BASIC Function. In the format RND-(<aexp>), this command returns a random number from 0 up to, but not including, 1. The aexp is a dummy. It has no effect on the number returned, but it must be used. A (0) is generally placed after the RND. Example:

```
200 R=RND(0)
210 X=INT(500*R)
220 PRINT X
```

Every time this routine is RUN a random number between 0 and 499 will be printed on the screen. You can also get a random number of 0 to 255 by PEEKing into RAM location 53770.

Robby the Robot Catcher* An arcade game similar to Avalanche(tm) and Kaboom(tm). The player controls Robby with a joystick and tries to catch falling child-robots. The faster they fall, the harder the game gets. If you miss more than nine, the game is over. 32K; disk. Sublogic.

Robin's Halloween* An educational interactive storybook package with voice track narration. Grade school children will be fascinated by the human voice, excellent sound effects, and colorful graphics, while they play and learn to identify words. Robin is an animated little girl who is dressed up as a robot on Halloween night. As the adventure unfolds, the child uses a joystick to light up key words that allow the story to continue. The package includes a spelling game and work book. The disk version provides a bonus data creation utility program, so that parents or teachers can insert the words of their choice into the spelling game. Cassette or disk. Program Design, Inc.

Rollover Depressing two or more keys on a keyboard simultaneously. A good keyboard controller includes debouncing and multiple-key rollover protection.

ROM Read-Only Memory. Memory which can be written only once. ROM can be used only as input to the Atari computer. No output from the computer can be written to ROM. ROM, as opposed to RAM (Random Access Memory q.v.), cannot be erased and reused. ROM contains fixed data, such as the Atari 10K Operating System, and the Atari BASIC language cartridge. See Memory.

ROM Vector An unalterable system vector that contains a 2-byte address to various Operating System routines.

ROMable Code which will execute properly when placed in ROM. Segments of ROMable code have no temporary storage areas and do not accept instruction modification.

ROTATE An instruction which shifts the contents of a register or word to the left or right. The bit coming in one end of the rotating word is generally the one falling off the other end; sometimes it is the old value of the carry bit (9-bit rotation).

Round-Robin A scheduling technique in which each task on a list cycles some necessary time-repeating sequence. In round-robin scheduling, each process or device corresponding to a task is guaranteed periodic service, whatever the actual task traffic may be.

Routine A section of code written to perform an action, such as an input character routine, or a disk-write routine.

Row Scanning A technique used in decoding which key of a keyboard is pressed. Each row is scanned in turn. The output on the columns is examined, resulting in identification of the key.

RPG Report Program Generator. A business-oriented programming language which uses a highly structured system of preformatted commands.

RPM Rotations Per Minute.

RPN Reverse Polish Notation. See Postfix Notation.

RPN Calculator Simulator* Turns your Atari into a Reverse Polish calculator. This avoids having to write programs to utilize the mathematical power of your computer. Disadvantages are that you must enter several key strokes per function and it does not simulate a programmable calculator. 16K cassette or 24K disk. Atari Program Exchange.

RPROM ReProgrammable Read Only Memory. Similar to PROM, except that it can be repro-

grammed any number of times. See PROM, EPROM.

RS   Register Select. A control signal determining which of several eligible registers will be used in an MPU operation.

RS-232C*   A widely used standard for connecting computer system components, especially for serial communication of control and data between computers and serial input/output peripheral devices. Standard for connecting data terminal equipment, such as modems or network data concentrators. It allows substantial variation as to what signals are passed. See EIA RS-232C.

RTOS   Real Time Operating System. An operating system in which data input and computer response proceed at the same rate.

RTS   Ready To Send (RS-232C standard signal).

RUN   Atari BASIC command. Followed by the file specification of a tokenized program, this command tells the computer to execute that program. RUN alone will cause the execution of the RAM-resident program. Either way, this command may be used in direct or deferred mode. All variables and dimensions are set to zero, files are closed, and sounds are turned off. To RUN the program from a line other than the first, type GOTO followed by the desired starting line number, and then press RETURN before using the RUN command.

R/W   Read/Write (q.v.).

RZ   Return to Zero. A recording technique often used on continuous magnetic media, especially tape.
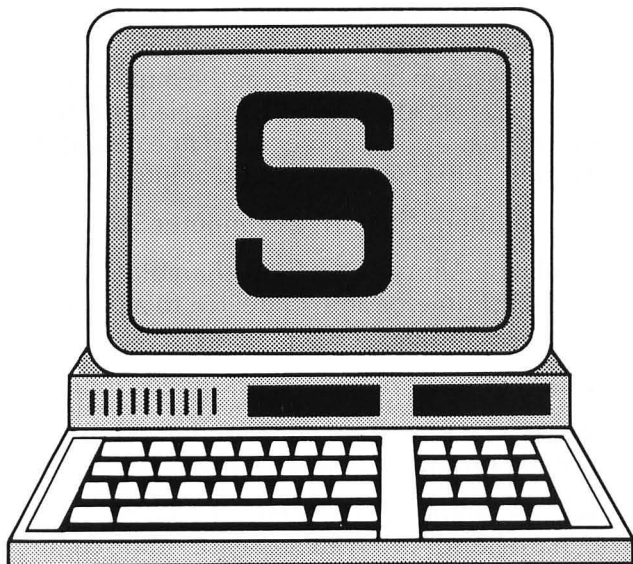
S Codes. ATASCII = 83, HEX = 53. s—ATASCII = 115, HEX = 73.

S Select. Also, Strobe.

S DOS 3.0 command to Save (binary save) RAM as a disk file.

Safetyline* Combine fun with safety as Max the Cat gives you lessons in how to take care of yourself and use common sense. Features face animation, original music, full-color graphics, and optional joystick control. 48K; disk or cassette. Maximus, Inc.

S.A.G.E.* Scott Adams Graphics Editor. A game programmer's editor developed for the highly acclaimed Scott Adams SAGA series. Your drawings can use over fifty colors for vibrant game graphics. They can be stored in much less memory, sometimes up to one-tenth the space required by normal screen graphics. 48K cassette or disk. Adventure International.

Saigon: The Final Days* You can relive the final days of American involvement in South Vietnam in this text adventure game. Find a way out of Saigon when it seems there is no possibility of escape. 16K; cassette. Adventure International

Salmon Run* Guide a salmon upstream to his spawning ground, past a jagged shoreline and up a swift river with a lot of waterfalls. Watch out for those fishermen, seagulls and bears who would love to have salmon for dinner. Earn points for each foot of the river you travel, and ten points for each waterfall you climb. The reward for reaching the spawning ground is a baby salmon! The longer you play the game, the more difficult it becomes. The

sound effects, simulating water, bears and sea gulls, are wonderful. The smoothly scrolling graphics are especially charming. Captivating for children. 16K cassette or 24K disk. Atari Program Exchange.

SAM* Tricky Tutorial 12. SAM stands for Software Automatic Mouth. This aid will show you how to use the S.A.M. program distributed by Don't Ask Computer Software. It is a speech synthesizer on disk which gives the computer the ability to sound out words. The program will also display graphic patterns on the screen while speaking to you. 16K cassette or 32K disk. Educational Software, Inc.

S.A.M.* Software Automatic Mouth. This program has revolutionized computer speech synthesis. Unlike all the others, SAM requires no special hardware. That's right, SAM provides the highest quality computerized speech currently available for Atari computers and does it with inexpensive software.

The SAM software on diskette includes demonstration programs and a well-written, 38-page manual.

Combined with its companion program RECITER, SAM will pronounce nearly 90% of the English language properly. Using RECITER, creating speech with BASIC is as easy as placing your text into a string called SAM$, and issuing the command A=USR(8199).

If you don't use the RECITER program, you save 6K of RAM, and you can make SAM pronounce all words properly using the phonetics system. You can tell SAM to use any of eight different stress factors on each syllable. No more monotone monotony. You are in control of the pitch of SAM's voice, as well as the rate of speed at which he speaks.

Of course, it takes a bit more work to master the phonetic system, but the manual provides about 1500 example words in normal and phonetic spellings. If you're having any problems, the manufacturer's support is only a telephone call away.

Adventure type games, card games, and educational software are obvious applications for computer speech. Software with SAM built in is also available. The first two packages on the market are Pokersam* (a five card stud Poker game) and Chatterbee* (an educational spelling game).

In Pokersam, the speech is used to simulate a wise-cracking opponent. SAM also narrates the game play. In Chatterbee, SAM makes an extensive spelling-bee-type game possible by asking the player to spell words. (Adapted from an article in ANTIC—The Atari Resource). 32K; disk. Don't Ask Computer Software.

Sammy the Sea Serpent* A fantasy story comes to life as young children help Sammy make his way back to the sea. Sound effects and visual graphics are enchanting. 16K; disk or cassette. Joystick required. Program Design, Inc.

Sample and Hold An analog circuit to capture and retain a signal so that it may be converted by an analog-to-digital converter.

Sampling Measuring an input value at intervals.

Sands of Egypt* A vocabulary list of one hundred words helps you battle for survival against the perils of the desert. Each word draws part of the picture, and only the right combination will let you tell your tale of adventure. 16K cassette or 48K disk. Datasoft, Inc.

Sargon II* One of the best chess games for the Atari. Six levels of play, good board display, and a move suggestions mode make this game worth considering. 32K; cassette or disk. Hayden.

Satellite Processor A computer subordinate to another computer, possibly communicating over large distances, which performs specialized processing related to the master computer. The satellite may also be contained in the same device as the main processor, creating a multi-processor machine.

SAVE Atari BASIC command. SAVE, followed by the file specification, will output the program in the computer's memory in tokenized form to a disk. The file will carry the designated FILE NAME and .EXT. The format is:

SAVE "D[<n>]:<file name.ext>"

An example is:

SAVE "D2:FILEA.TWD"

In this example the program in RAM will be saved to the disk in drive #2 under the name FILEA.TWD. The number <n> after D defaults to 1, so that users with only one drive need not enter any number.

On cassette, first rewind the cassette, press PLAY and RECORD together, then enter:

CSAVE

To RUN the program at a later time, use the LOAD command to copy it from the disk or cassette you saved it on, back into the Atari memory. See LOAD. The SAVE instruction does not alter your program in memory. It is important to be aware that, when you write a BASIC program, it will be lost (erased), unless you SAVE it before turning off the Atari, go to DOS (DOS Command), or use the NEW command.

SBC Single Board Computer. A line of board-level products built to Intel specifications and using a common system bus known as the multibus. This bus is standardized as the IEEE 796. National Semiconductor has a compatible board line designated by the letters BLC (Board-Level-Computer).

SCCS Southern California Computer Society.

Scheduling Allocating a non-sharable resource such as CPU time or an I/O device to a particular task for a period of time.

Schottky A technology of high-speed circuits.

Scope The scope of a variable or definition is that part of the program in which it may be accessed.

Scotch A brand of magnetic recording media. Also, hard liquor often essential for home computer users.

Scott Adams' Adventure Series* A series of twelve Assembly language puzzle games, each with its own environment. Features all-text display states, two-word instructions, a save game command, and fast humorous program responses. The games, grouped into four packages, include Adventure Land, Pirate's Cove, and Mission Impossible; Voodoo Castle, The Count, and Strange Odyssey; Mystery Fun House, Pyramid of Doom, and Ghost Town; Savage Island Part I, Savage Island Part II, and Golden Voyage. 32K; disk. Adventure International.

SCR Silicon Controlled Rectifier.

Scram* You run a nuclear power plant in this detailed and informative simulation. Pumps, reactor rods, and valves respond to joystick control. Once you have mastered the operation of the plant you can test your response and repair abilities in a variety of disaster situations. 16K; cassette. Atari, Inc.

Scraper Caper* Help the legendary mountie, Bounty Bob, in his new job as a city fireman. He has many adventures in store, including a towering inferno. Cartridge. Big 5.

Scratchpad A group of general purpose registers, without specific function, that serves as a high speed workspace for some operations. Usually, it is an internal RAM faster than the main system RAM.

Screen The surface of a monitor or TV set on which characters are displayed.

Screen Generator A program which aids in the definition of CRT screen forms. CRT screen forms are a particular pattern of symbols on a CRT screen

used for data entry and display. Screen forms are often displayed in protected fields, and consist of prompts to guide the data entry operator.

Screen Maker* This program will help you increase your graphics abilities while programming in BASIC. The program generates BASIC subroutines that, when appended to a BASIC program, will allow you to combine up to fifteen graphics modes on the screen at one time. This can add immeasurable complexity to your games, or any other program. ICON Software.

Screen, Freeze The See PAUSE.

Screen, Print The There are many programs available in books, magazines, and in utility software packages, that print the contents of the screen on the line printer. These are called screen dumps.

Screen Printer Interface* Allows printing both text and graphics screens to any of four graphics printers without an 850 interface. Print graphics screens while the host program is running. A versatile piece of software. Disk. Printer required. Macrotronics, Inc.

Screen Size A measure of the amount of information that a CRT screen can display. Screens may be measured diagonally, as TV sets, or by the number of vertical and horizontal dot or character positions.

Script Wizard* An advanced word procesor. Includes formatter, editor, help menu, automatic index creation, print preview, and much more! Disk or cartridge. Datasoft Inc.

Scrolling Moving data horizontally or vertically across the screen. This enables the viewing of more area than is available on the screen. When LISTing a program or displaying a disk directory, the Atari computer will automatically scroll forward if there is more data to display when the screen is full. Screen editors and word processors enable the scrolling of data forward or backward one page at a time. Smaller movements, or microscrolling, is performed one dot at a time. See Move Data.

SE Sign Extend. A technique used during a multiply or divide operation and during some shift operations, to ensure that negative numbers remain negative when shifted right. The convention is that bits shifted into the high end of the register will be identical to the bit that was in the high order position when the shift began. Also, Systems Engineer—a software technician usually employed by a computer manufacturer.

Sea Bandit* You are on the ocean floor looking for treasures. If you run out of time you'll find out who Davey Jones really is. However, if you avoid drowning, predators, and the floating mines, you could be very rich when you come up for air. 16K; cassette or disk. Gentry Software.

Sea Dragon* Guide the submarine Sea Dragon through mine fields and undersea tunnels. Avoid depth-charges as you try to destroy the Master Mine before your air supply runs out. You control the Sea Dragon with a joystick. Six segments and more than thirty screens. Graphics are good and the game is challenging. 16K; disk. Adventure International.

Sea Fox* Destroy merchant ships with torpedoes fired by your submarine, but be careful not to hit Red Cross ships by mistake. Keep an eye out for the frequently-needed supply ship, and the dolphin who transports the supplies to you. 48K; disk. Broderbund.

Second Source The manufacturer of a product, but not the original developer.

Secrets of Atari I/O* This book contains application programs for input/output to disk, screen, cassette, and RS232 serial port. Companion software is available on disk. The programs contained on the disk are Super Menu, Screen Dump BASIC AutoRUN, Binary Loader, String Search, Disk Copier and Cassette Copier. IJG, Inc.

Sector A continuous section of a disk track. A block of data on a disk is addressed by its track and sector numbers. Typical disk sector sizes are 128, 256, or 512 bytes of data. Atari drives use 128 bytes per sector. Consecutively numbered sectors may or may not be physically adjacent within a track.

Sector, Bad A sector on the disk which will not read/write data correctly, usually due to a minor physical flaw in the disk. One or two bad sectors will not seriously effect the use of the disk; DOS will mark them as bad and avoid using them. More then a few bad sectors indicates the disk should be used as a frisbee rather than to hold your valuable data.

Sector Index On each diskette, DOS maintains an index or directory of all files. It is the available space in the directory which limits the number of files on a diskette. Each diskette has 40 tracks with 18 sectors, for a total of 720 sectors per diskette.

Seek Time The time needed to position the read/-write head in a drive over the specified track of the disk.

Segment A continuous block of memory addresses, such as 0 to 64K.

SELECT Key When the SELECT key is pressed, a five is stored in decimal RAM location 53279. This key has no other function unless one is specified by the program in control. The following BASIC routine shows how to sense the SELECT key:

```
10 IF PEEK(53279)≠5 THEN GOTO 10:REM
Keep Checking
20 PRINT"SELECT KEY PRESSED":GOTO 10
```

Semi-colon (;). Use in LPRINT for Printer Line. Each group of 10 spaces across the print line is called a print zone. A semi-colon (;) in an LPRINT list means the next item is to print immediately after this one, without even a single space between. The print zones begin in columns 1, 11, 21, 31, 41, 51, 61, and 71. See also Print Line.

Sending Program Line Upon pressing the RETURN key the displayed line is sent to the requesting program for processing.

Sensor A device which translates a physical stimulus into an electronic signal which may be input into a computer.

Sentinel One* Protect both of your cities against alien spacecraft by flying erratic patterns in the skies above. 16K cassette or 24K disk. In-Home Software.

Sequencer In a bit-slice system, the module in charge of providing the next microprogram address to the microprogram memory. It is essentially a complex multiplexer, but may include stack facilities and a loop counter.

Sequential Access An access method in which items may be accessed only in a fixed order. The standard example of a sequentially-accessed medium is magnetic tape. Here, in order to access a particular record, all records before it must be scanned first.

Sequential File A file whose elements may only be accessed in ascending order. In order to read an element of a sequential file, all of the preceding elements must be accessed first.

Serial Sequential handling of processes, transmissions or storage of data. In most microcomputers, parallel I/O connections have eight wires to carry eight bits of a byte simultaneously (or in parallel). Contrast this with a serial interface, where only one data wire is available. The eight bits of a byte are transmitted one after another (or serially). The I/O device must collect all eight bits back into one 8-bit byte.

Serial Data Data transmitted sequentially, one bit at a time.

Serial Port An I/O port through which data is transmitted and received serially. Serial ports are often used for communicating with terminals or other computers.

Series Circuit elements connected so that the output of one is the input of the next.

Serpentine* Two teams of snakes chase each other through a maze. There are three computer-controlled snakes which you must nibble on until you reduce them to conquerable size. Your snakes are nourished by eating frogs that hop around the maze—each time you eat a frog, your snake grows. Once you have eaten three of the computer's snakes, more can hatch and the game goes to the next level of difficulty. 32K; disk. Broderbund Software, Inc.

Servo Short form of servo-mechanism (q.v.).

Servo-Mechanism A device which converts electrical signals to mechanical or physical actions. Servo-mechanisms range from simple relays to robots.

SETCOLOR BASIC Statement. Use SETCOLOR to assign a color and luminance value to the specified color register.
Format:
SETCOLOR register#,color,luminance
Example 1:
SETCOLOR 2,3,0
Example 2:
SETCOLOR 4,2,14
In example 1, the SETCOLOR Register #2 is changed to hold the value 3 (red) with a luminance value of 0 (darkest). In example 2, the SETCOLOR Register #4 is changed to hold the value 2 (orange) with a luminance of 14 (brightest).

Setup Time The time required before a signal can be changed from its prior state. Also, the time required to set up the preliminary conditions for a program to run—mounting required disks and tapes, changing printer forms, etc.

Seven Card Stud* This card game pits you against five opponents, each with his own special poker playing traits. The computer deals the cards, three face down, four face up, and also collects and counts the bets. You can look at the other hands, but, fortunately, the computer doesn't look at yours. 24K; cassette or disk. Atari Program Exchange.

SGN Atari BASIC arithmetic function. SGN, followed by an arithmetic expression in parentheses, returns a +1 if the expression is positive, 0 if the expression equals zero, and -1 for a negative expression.

S/H Sample and Hold.

Shamus* This game combines the mystery and multiple levels of an adventure game with the fast action of a shoot-'em-up. There are thirty-two rooms on each of four increasingly difficult levels; all are populated by an assortment of dangerous enemies, and a few pleasant suprises. The object of the game is to survive long enough to locate and defeat the Shadow, master of the lair. 16K; disk or cassette. Synapse Software.

Shattered Alliance* A tactical war game in which the major objective is to break the opponent's unity and morale, rather than destroy his forces. Knowledge of the keyboard is essential and total concentration on tactics and strategy is demanded. The game is rather difficult to learn, but once you have it under control, it may be one of the fastest-moving war games you'll encounter. 48K; disk. Strategic Simulations, Inc.

Shell The name for the command interpreter running under the Unix operating system.

Shift Moving the contents of a register left or right by one bit or more. The bit falling out goes into the carry bit of the status register or is lost. The bit coming in is usually a 0, except in some special circumstances, such as Sign-Extend.

Shift Register A register whose contents can be moved left or right by one or more bit positions.

Shifter Hardware device which implements the shift instruction. It moves all bits in a register left or right one bit.

Shooting Arcade* Intended for young children, this visual game presents shooting gallery animals marching across the screen. Bonus points are given for killing the bear. 16K; disk or cassette. Datasoft.

Shopping List* A simple, inexpensive, and useful little program that reminds you of what you need when you go shopping. You enter items and prices, and generate your shopping list on your screen or printer. The program will total the prices of the items you wish to purchase to let you know how much money you'll need. Dynacomp.

Side Effect An unintentional change in the value of a global variable by a function, procedure, or subroutine. Structured programming languages discourage side effects by limiting the scope of global variables.

Sign Plus or minus. In two's complement notation, the sign can be determined by examining bit 7, the most significant bit (MSB).

Sign Extend A shift where the sign bit is copied to the right, rather than shifting in a zero or the carry bit on the right.

Sign Language Fun* A program for people with some experience in dactylology. It can be used to increase your sign recognition and interpretation speed. An on-screen friend is willing and eager to sign for you, and will even play word games if you desire. 32K; cassette or disk. D & D Computer Products.

Sign Magnitude A binary representation for integers where the most significant bit (MSB) acts as the sign (0 for +, 1 for -) and the rest of the bits contain the magnitude, or absolute value, of the number.

Signed Binary A binary representation of signed integer numbers which sets aside one bit, usually the high-order or leftmost bit, to indicate the sign of the number.

Silicon Valley The area around Sunnyvale, California (in the Santa Clara Valley, south of San Francisco), where many semiconductor manufacturers are located. More generally, it contains the greatest concentration of electronics industries in the U.S. It is also called Silicon Gulch but, please, never Silicone Valley.

Silicon-Gate The MOS technology using silicon for the gate of the transistor. An alternative is aluminum-gate.

Simplex Data transferred in only one direction.

Simulator A program which models a device or process by having the same input/output behavior as the device simulated. A CPU is easily simulated, but, Input/Output cannot be precisely simulated because of imprecise timing, so only the logic of a program can be tested with a simulator. Simulators are also used to model scientific experiments, business, situations, etc.

SIN Atari BASIC Function. SIN, followed by an arithmetic expression in parentheses, will return the sine of the value of the expression. The argument is assumed to be expressed in radians unless a DEG statement was executed. See DEG, RAD.

Single Precision Arithmetic Regular *Arithmetic*, i.e., arithmetic on single-word integers, in contrast to double or multi-precision arithmetic.

Single-Board Computer A complete computer on one printed circuit board: CPU, ROM, RAM, and interfaces. Single-board computers are often used for industrial control applications.

Single-Sided A method of disk storage using only one side of the disk. Also, a printed-circuit board with printed-circuit wiring on only one side.

Single-Sided Disk Drive A drive designed to READ or WRITE on one side of a disk at a time.

Sink Current A logic family's current drive capability. Sink current is 1.6 millamperes for one standard TTL gate.

SIP Single In-line Package. A package for a chip which has a single row of pins, usually very few in number (2-8). Contrast with Dual-In-line Package (DIP, q.v.), where up to 100 pins are often used.

Size, Print The size of the type produced by your printer can be controlled by commands from your Atari computer. See Type Formats.

Size of Files The use of Option A from the Atari DOS menu displays a list of the files on a disk. Each file name displayed will have the size of the file in sectors after it. See also List Disk Directory.

Skip Print Zones To leave space on the print line between items, put an extra comma (,,) in the print list. Enter BASIC statement:

LPRINT A,,B

This prints A in print zone 1, nothing in print zone 2, and B in print zone 3 (col 29). See also Print Zones and PRINT Lines.

Skip to Top of Page To go to the top of the next page on your printer use the Form Feed (FF) button on your printer or enter the BASIC statement:

LPRINT CHR$(12)

Sky Blazer* A five-level, scrolling arcade game wherein the challenge is to destroy ground targets with aerial bombs. The setting is a dry oil field covered with cactus and oil derricks. The feature that sets this game apart from others is the excellent detail: bomb doors open, and dropping bombs hit trees or cacti and get caught in branches. There is a ground-to-air, heat-seeking missile that misses the tail end of your bomber as you maneuver out of the way, but does a 180 degree turn and attacks from the front as you try to shoot it down with your pulse *cannon*. Developing a technique for destroying the targets is the key element to winning. Bombing the enemy radar is pretty easy, except that the radar is always located under a tree or oil tower. The joystick control is very sensitive and, if held in one position for too long, will move your ship too rapidly. Even though the scrolling isn't smooth, the playability is excellent. 32K. Broderbund.

Slave Any device under control of another device, or imitating its operation.

Sleazy Adventure* A basic adventure game to whet the appetite of the new adventurer. Hints are provided as you sail from Thailand to San Francisco smuggling an increasingly valuable cargo as you progress. In San Francisco, wealth and success await you. This is a beginner's level game, but could lead the way to bigger and better challenges. 24K; disk. Atari 800 only. Atari Program Exchange.

Slew Rate A fast signal response measured in volts per second. Used in operational amplifier specifications.

Slice See Bit-Slice.

Slime* An original game, in Machine language featuring good graphics. The challenge is initially interesting, but wears thin after a while. An enemy ship seeds the clouds with slime capsules. When they mature they fall into the ocean below. You must channel these capsules into drains on either side of the screen. If you don't do this, the ocean will rise. You have to survive fifty slime storms to win the game. Beware of the lightning and fireballs, which might wreck your deflector wedges and saucers. 16K. Synapse Software.

SLSI Super Large Scale Integration. A technology which enables one chip to hold up to 100,000 transistors.

Small Scale Integration The technology which holds up to ten gates per device.

Small Type To turn on small type on your printer, use the statement:

LPRINT CHR$(15)

To turn it off, enter:

LPRINT CHR$(18)

For the Atari 825 printer, start compressed print with:

LPRINT CHR$(27);CHR$(20)

and end it with:

LPRINT CHR$(27);CHR$(19)

See Print, Compressed, Atari 825 Printer.

Smalltalk A language and software system developed by the Learning Research Group at the Xerox Palo Alto Research Center (PARC) between 1971 and 1980. Smalltalk is organized around two fundamental concepts: objects and messages. Small-

talk systems are characterized by a high degree of pictorial interaction.

Smasher* You have the Smasher, but the enemy ships are still gaining on you! Their ultimate weapon is the Mystery Ship, but before its deadly powers are revealed to you, you must do something about the swarms of smaller ships. Be careful—many carry high-powered explosives. It's an exciting action game. 24K; disk or cassette. Joysticks required. Atari Program Exchange.

SMI Static Memory Interface.

Smoke Test Turning on the equipment for the first time to see if it will operate.

SMS Scientific Micro Systems, a manufacturer.

Snake Byte* An uncomplicated, yet enjoyable game where the object is to make a snake eat as many apples as he can. The more apples he consumes, the longer he grows, so that he has trouble moving without running over his tail. If he can eat all the apples, you can move to the next level. The upper levels have barriers and internal walls. 48K; disk. Sirius Software.

Snapper, The* Gobble up the dots to gain points but beware of the Whirlers who steal them away from you. They are as deadly to touch as the Gamma-Field, so plot your moves carefully. 16K; disk. Silicon Valley Systems.

Snark Hunt* An exercise in logical deduction. By observing the way a light beam passes through a box, you must determine the locations of the hidden snarks. From four to nine snarks can be hidden by your opponent or the computer. 16K cassette or 24K disk. Atari Program Exchange.

Sneakers* Shoot at and dodge a variety of enemies who are out to take over your gun base. The level of difficulty increases as you wipe out each category of characters. 48K; disk. Sirius Software.

SNOBOL StriNg-Oriented symBOLic language. A character-string-manipulation programming language.

Snokie* Fighting his way through blizzards, ice lazers and other dangers, the snowbird needs your help to find his girlfriend. Disk or cassette. Funsoft.

Snooper Troops #1* An educational adventure series for players of all ages. Sharpen your deductive reasoning and mapmaking skills while you have fun meeting the challenges of these varied adventures. Games include: The Granite Pass Ghost, where you are the detective called in to help solve

the mystery of the ghost-like happenings in the mansion; Mystery Fun House, a cleverly constructed, entertaining search of the carnival Fun House, to find secret plans to foil the spies; and several more puzzles to spark the interest of even the most expert adventure aficionados. 40K; disk. Spinnaker Software.

SNR Signal to Noise Ratio.

SO Shift-Out bit.

SOB Start-Of-block.

Soccer* Up to four players can play on a huge field, displayed on a scrolling screen. Watch out if you choose the computer as your opponent—it almost always wins! The computer manipulates more than one player at a time, and you don't. 16K; cartridge. Thorn, EMI.

Socket A mechanical electrical connector. The socket is also known as the female connector.

Soft Sectored A disk format in which magnetic marks signal the beginning of every sector. This is in contrast to hard sectoring, where each sector's start is marked by a physical hole. The Atari disk drives use soft sectored diskettes.

SofTeach for UCSD Pascal* This computer-aided instruction package assists the novice in learning to use and understand UCSD Pascal. It is accompanied by *The UCSD Pascal Handbook,* which provides a complete description of the concepts of structured programming embodied in UCSD Pascal. SofTech Microsystems,Inc.

Soft-Fail Techniques which preserve a degree of system operation despite some failures.

Software Computer programs of all kinds are called software. Usually software is contrasted to hardware, the actual chips, wires, boards, etc., which make up the computer. A special case is Read-Only Memory (ROM) (q.v.), which is hardware that contains a permanent copy of software. Shorthand terminology here could be confusing, such as "A BASIC ROM," which means a ROM (hardware) containing a copy of a BASIC interpreter program (software). Such ROMs are often called firmware to distinguish them from non-program hardware and from software in changeable media (RAM, diskette, cassette, etc).

Software, Applications A software package is a group of computer programs, possibly including data files and documentation, to perform a function or group of related functions on the computer. These are called applications software when the

programs are devoted to a user task. Examples would be a word processing package, an accounting package, etc. These programs are called systems software packages when they facilitate the use of the machinery, such as a database management package, a disk operating system, or a program development package.

Software Package A pre-written group of commercially available programs designed to serve a specific need, such as word processing, inventory control, database management, etc.

Software-Compatible Describes CPUs which execute the same instructions (i.e., have the same Machine language).

Solitaire* Solitaire on the computer, including betting. The computer deals the cards and maintains win and loss records. 16K; disk or cassette. APX.

Some Common BASIC Programs: Atari Edition* Written by Lon Poole, Mary Borches and Steven Cook. This book contains a collection of seventy-six financial, statistical, and mathematical programs. Osborne-McGraw Hill.

Sort To arrange items according to defined criteria, such as alphabetical or numerical order.

SORT/65 with MAIL/65* SORT/65 not only sorts almost any file, but also can handle fixed-length or line-oriented records. It can create indexed tag/-key files. MAIL/65 may be customized to fulfill your personal mailing specifications. Optimized Systems Software, Inc.

SOS Silicon-On-Sapphire. Integrated circuit technology in which a sapphire substrate is used. Yields high operation speeds.

SOUND Atari BASIC command. This command requires four arithmetic expressions that define VOICE (0-3), FREQUENCY (0-255), DISTORTION (0-14 even numbers only), and VOLUME (0-15). The SOUND command generates music and sound effects. For extensive information and examples that demonstrate the use of this command, see Tricky Tutorials, Sound Effects, Sound & Music, De Re Atari.

Sound & Music* This entry in the Tricky Tutorial series explains many of the mysteries about how to generate sounds from your Atari. Beginning with simple SOUND statements and progressing all the way to complex four-part compositions, this package can teach you about programming sound and and music on your computer. You'll soon be com-

posing your own music. 16K cassette or 24K disk. Educational Software.

Sound Editor* This utility program allows you to create and store various sounds of short duration. You can specify frequency, loudness, and the level of distortion. Also includes a short program which will allow you to use sounds in BASIC. The documentation is not always helpful. 16K cassette or 24K disk. Atari Program Exchange.

Sound Effects* Tricky Tutorial 10. Turn your Atari into a sound effects processor. There are many different effects that can be produced—from creaking doors to storms. This easy-to-use program comes with full documentation. 16K cassette or 24K disk. Educational Software.

Sound Tutorial The following program will play the 1812 Overture by Tchaikovsky. It will teach you a great deal about Atari sound using POKEs. The REM statements will give you a lot of guidance, but the real learning comes from keying in and running the program yourself and seeing what happens.

```
100 REM POKESOUN BY JERRY WHITE
110 REM
120 TRAP 530:SOUND 0,0,0,0:GOSUB 570
130 REM
140 REM TRAP 530 WILL FORCE BASIC
150 REM TO GO TO LINE 530 WHEN WE
160 REM RUN OUT OF DATA.
170 REM
180 REM * MAIN PROGRAM LOOP *
190 REM
200 READ PITCH,DURATION:POKE 53761,172:
POKE 53760,PITCH:POKE 540,DURATION: POKE
712,PITCH
210 DURATION=PEEK(540):IF DURATION>15
THEN DURATION=15
220 IF PITCH THEN POKE 709,DURATION
230 IF DURATION THEN 210
240 POKE 53760,0:POKE 709,0:POKE 710,0:GOTO
200
250 REM
260 REM DATA FORMAT=2 BYTES PER NOTE
270 REM BYTE 1=FREQUENCY
280 REM BYTE 2=DURATION
290 REM
300 DATA 162,2,162,2,162,4,121,8,108,896,8,108,
8,121,8,108,8,96,8,0,8,121,8,0,8,121,32,0,16
310 DATA 162,2,162,2,162,4,121,8,108,96,8,108,
8,121,8,108,8,96,8,0,8,121,8,0,8,121,32,0,16
320 DATA 162,2,162,2,162,4,108,8,96,8,108,8,128,
8,162,8,128,8,108,8,128,8,162,8,128,8,108,32,0,16
330 DATA 162,2,162,2,162,4,121,8,108,8,121,8,
```

```
162,8,193,8,162,8,121,8,162,8,193,8,162,8,121,32,
0,16
340 DATA 81,2,81,2,81,4,60,8,53,8,47,8,53,8,60,8,
53,8,47,8,0,8,60,8,0,8,60,32,0,16
350 DATA 81,2,81,2,81,4,60,8,53,8,47,8,53,8,60,8,
53,8,47,8,0,8,60,8,0,8,60,32,0,16
360 DATA 81,2,81,2,81,4,53,8,47,8,53,8,64,8,81,8,
64,8,53,8,64,8,81,8,64,8,53,32,0,16
370 DATA 81,2,81,2,81,4,60,8,53,8,60,8,81,8,96,8,
81,8,60,8,81,8,96,8,81,8,60,32,0,16
380 DATA 72,4,72,4,72,4,60,12,0,8,72,16,0,16,81,
4,81,4,81,4,64,12,0,8,81,16,0,16
390 DATA 81,4,81,4,81,8,68,16,72,16,60,16,64,16,
47,16,53,16
400 DATA 40,16,42,16,45,16,47,16,50,16,53,16,57,
16,60,16,64,16,68,16,72,16,76,16
410 DATA 81,32,0,16,76,32,0,16,72,32,0,16,64,32,
0,16,60,16
420 DATA 81,4,81,4,81,8,53,16,0,4,64,16,0,4,60,
16,0,4
430 DATA 81,4,81,4,81,8,53,16,0,4,64,16,0,4,60,
16,0,4
440 DATA 64,16,0,4,60,16,0,4,64,16,0,4,60,16,0,4
450 DATA 64,16,0,4,60,16,0,4,64,16,0,4,60,16,0,4
460 DATA 47,16,0,4,35,16,0,4,47,16,0,4,35,16,0,4
470 DATA 47,16,0,4,35,16,0,4,47,16,0,4,60,16,0,4
480 DATA 162,2,162,2,162,4,121,8,108,8,96,8,108,
8,121,8,108,8,96,8,0,8
490 DATA 193,8,162,8,121,8,162,8,193,8,162,8,
243,32,0,16
500 REM
510 REM END ROUTINE
520 REM
530 SOUND 0,0,0,0:POKE 764,255:GRAPHICS
0:LIST :? "BASIC":? "IS";:END
540 REM
550 REM DISPLAY SUBROUTINE
560 REM
570 GRAPHICS 0:POKE 710,0:POKE 709,0:POKE
752,1:POKE 201,9
580 ? :? :? :? ,"THE 1812 OVERTURE"
590 POKE 201,10:? :? ,"BY TCHAIKOVSKY"
600 ? :? :? :? "AN Atari BASIC DEMONSTRA-
TION"
610 ? :? "OF MUSIC USING POKE INSTEAD
OF SOUND"
620 ? :? ," by Jerry White":RETURN
630 REM
640 REM *RAM LOCATION POKED
650 REM *
660 REM *201 PRINT TAB WIDTH (,)
670 REM *540 COUNTDOWN TIMER
680 REM *709 TEXT LUMINENCE
690 REM *710 BACKGROUND COLOR
700 REM *712 BORDER COLOR
710 REM *752 CURSOR DISPLAY
720 REM * 53760 VOICE 0 FREQUENCY
730 REM * 53761 VOICE 1 VOLUME/DIST
```

Source   The emitter of a transistor.

Source, The*   A timesharing system that gives you access to a broad range of services and reference information. Available services include mailgrams and electronic mail, a public bulletin board, and voicegrams. Information services available include catalog shopping, a business database, access to news publications, education and career information, and more. Users are encouraged to participate in the dissemination of information, with an allowance for non-original documents to be shared, and a royalty credited to the original publisher from the reader's fee. 32K, modem. Source Telecomputing Corporation.

Source Code   A synonym for source program.

Source Drive   The diskette drive that information/data is coming from. Target drive is the diskette drive that information/data is going to.

Source Language   The original language used by the programmer, on which a translator program operates to produce a version in Machine language.

Source Program   A file containing data to be processed by a language processor or interpreter. See Object Program.

SP   Stack Pointer.

Space   Binary 0 (zero). In the RS-232C standard, negative voltage; in a current loop, no circuit flow; and in modems, the lower frequency of the pair.

Space   An LPRINT statement with no other specifications will print a blank line (that is, feed the paper up one line and return to the left margin).

Space Ace*   While being bombarded by asteroids and Silurian ships, you must guide your spaceship through a mine field. Destroy the Silurian warship by a direct hit on its atomic center. 16K; disk or cassette. London Software.

Space Chase*   A one-player space game that tests your strategy. You must conquer all the planets of the Galactic Federation while battling the Clone Robot Ships. Your actions must be well thought out or you'll never get past "start." 16K cassette or 32K disk. Atari Program Exchange.

Space Eggs*   As the eggs break, monsters crawl out to attack your spacecraft. The further you advance, the more horrible the creatures become. 48K; disk. Sirius Software.

Space Invaders* Fight off the aliens with your laser guns before they destroy you from above, or touch down on your base, or return to Kansas. 16K; cassette. Atari, Inc.

Space Shuttle—Module One* A three part simulation of the launch, descent and runway approach of our latest space vehicle. You can choose to fly a complete mission, or do flight training on one of the mission's three parts. One challenge is centering the *Attitiude Direction Indicator* that is represented by moving bars that form a cross. The screen displays the cockpit during launch and final approach. At launchtime, you see the exterior view of the ship and at descent, you see the runway, 100 miles away. Although the cockpit display and graphics are very good, the flight simulation is too mechanical and unrealistic to be educational. This is the first of a series of modules that are planned for the space shuttle. Look forward to constructing a space station and fighting the enemy with lasers. 32K; disk. Swifty Software.

Space Up One Line To space up one line on the printer, without the carriage returning to the left margin, enter BASIC statement:

LPRINT CHR$(10)

or use the line feed (LF) button on printer. To space up one line with a carriage return, just enter:

LPRINT

Spaces You can use two methods to leave spaces on printed lines of BASIC. To leave space on the print line between items, put an extra comma (,,) in the print list. Enter BASIC statement:

LPRINT A,,B

This prints A in print zone 1, nothing in print zone 2, and B in print zone 3 (col 29).

To leave one or more spaces between fields, use a literal of spaces like: " ". To get several spaces between the printed values of A$ and B$ enter BASIC statement:

LPRINT A$;"";B$

See also Print Zones, Print Lines.

Spare Change* You own a video arcade, and your partners are irresponsible Zerks who are driving you to bankruptcy. Many color graphic routines are available. 48K; disk. Broderbund Software.

SPDT Single Pole Double Throw. A type of switch.

Special Characters See BASIC Special Characters.

Speed Reader* Five reading programs that improve perception and eye span, teach correct eye movement, and measure speed and comprehen-sion. Provides thirty-four interesting reading selections, and quizzes to check comprehension. It is a ten-lesson course to build and maintain reading skills. Speed Reader was designed by a reading specialist and has undergone thousands of hours of testing. Davidson & Associates.

Speed-O-Disk* Incorrect disk drive speed could cost you both data and money. This utility shows you the drive's speed (RPM) and tells you how to correct it if its not correct so you won't have to pay for a service call. 16K; disk. Atari Program Exchange.

Speedread+* Improve your reading and comprehension skills while reading three classic short stories: "The Outcasts of Poker Flat", "The Legend of Sleepy Hollow," and "Rip Van Winkle." Additional text materials may be inserted for use in the classroom. 16K; disk. Optimized System Software.

Speedreading* Begin by letting the program determine your reading speed and acquaint you with using the system and joystick controls. A progress graph is set up and updated as you continue. This is a comprehensive course that includes Warm-up Exercises, Phrase-reading Exercises, Paced and Timed Reading, New Techniques, Flexible Reading exercises, and a section on evaluating your progress chart. Comments throughout are encouraging and documentation is excellent. 16K; cassette. Atari BASIC cartridge, Atari 410 or 1010 Recorder, joystick required. Atari, Inc.

Speedway Blast* Speed around the streets destroying the asphalt-eating monsters and their eggs. Control of the speeding car (and it is fast) is a bit difficult. Graphics are good. 16K; cartridge. Innovative Design Software.

Spell Perfect* A spelling program that can be used with Letter Perfect* to check your work against an expandable dictionary. Also gives "sounds like" suggestions, counts words, adds words, lists technical terms, and fills in states and towns. LJK Inc.

Spell Wizard* A word processing tool which flags misspelled words for immediate correction. The program starts out with a 33,000+ word base and you can add more whenever necessary to increase your word file. Compatible with Text Wizard*, Word Wizard* and AtariWriter*. A real time-saver!! Datasoft, Inc.

Spider Invasion* As you traverse this maze, two screens high by two screens wide, you must try to eliminate the spiders that dwell within by shooting baby spiders, eggs, and ultimately the nest itself.

Take extra care when you meet the mother spider, as she is not so easily defeated. 16K; cassette or disk. Cosmi.

Spikes Sharp, temporary increases in a signal or voltage.

Spinwriter A line of thimble printers manufactured by Nippon Electric Corporation (NEC).

Split Screen Division of a CRT screen into two or more separate areas, or windows, in which distinct information is displayed.

Spool Simultaneous Peripheral Operating On-Line. A method of increasing system throughput by allowing programs using slow output devices to complete execution rapidly. Program output data is placed in queues on high speed mass storage devices or in a part of main memory dedicated to spooling for low-speed transmission concurrent with normal system operation.

SPST Single Pole Single Throw. A type of switch.

Spy's Demise* Guide your secret agent to the twelfth story of a building using elevators which are constantly going up and down, and avoiding the guards. Can be played with joystick, paddle, or the keyboard. When your agent reaches the top of each building, he is given part of a coded message. When he collects all of the messages you can solve the cryptogram and win a free T-shirt. 32K; disk. Penguin Software.

SQR Atari BASIC function. Returns the square root of the number specified by an arithmetic expression in parentheses following the SQR. The expression must be, or evaluate to, a positive number.

Square Root BASIC. See SQR.

SR Status Register. A register holding bits that indicate the type of results that were obtained by the last operation, such as positive or negative error or overflow situations.

SS Solid State.

SSDA Synchronous Serial Data Adaptor. A synchronous serial interface.

SSI Small Scale Integration. A technology holding a few gates per element.

SSR Solid State Relay.

Stack A last-in-first-out (LIFO) structure which preserves the chronological order of information, and is necessary for subroutines and interrupt management. A stack is manipulated by the BASIC instruction POP.

Stack Pointer The register in the CPU which contains the address of the top of the stack in memory.

Stand-Alone A device which will operate by itself, requiring no other equipment.

Star Island* An Atari version of the arcade game, Star Castle. You must attack an enemy starbase which is protected by three regenerating energy rings. Meanwhile you must avoid magnetic mines which the starbase launches against you. Win and proceed to the next level of difficulty. 32K; disk. Binary Computer Software.

Star Raiders* Fight off the insidious Zylons as you single-handedly protect the galaxy. Good visual and sound effects make this fast paced game a real thriller. Four levels of difficulty. 16K; cassette. Atari, Inc.

Star Sentry* On the planet Thule, aliens are trying to change the atmosphere. As the ammonia mountains on which you are situated melt, your job is to stop the eruption of a high pressure geyser with your ship. Then you'd better deal with the aliens. An average shoot-'em-up game on all counts. 24K. Analog Software.

Starbase Hyperion* A single-player spacewar game. You must defend your starbase against invasion for fifteen days (turns) while your reinforcements are on the way. There are six skill levels, and a random feature. This is not an easy game. 24K; cassette or disk. Quality Software.

Starbowl Football* A realistically designed, arcade-style game of strategy. Probably the best football game for the Atari 400/800. There are some shortcomings, but overall Starball is a well-presented action game you should enjoy. 16K cassette, 32K disk. Gamestar, Inc.

Starcross* An all-text science fiction adventure that offers an imaginative and fascinating story, along with challenging puzzles and life-or-death encounters with various aliens. Your mission is to explore the uncharted alien entity and, through logic and your innate curiosity, discover the secrets of its existence and why you are there. 16K; cassette; or 24K; disk. Infocom, Inc.

Starplex Controller* A set of buttons for game action similar to the Asteroids arcade game. Various controls are assigned to the buttons, which are responsive to the touch. A rapid fire option is included. Starplex Electronics.

StarQuest/StarWarrior* In this game you participate in a plot to assassinate the governor of a

neighboring planet. You can move about to locate enemy units, installations, and strategic weapons. Good documentation and high-resolution graphics. 32K; disk or cassette. Automated Simulations.

START Key When the START key is pressed, a six is stored in decimal RAM location 53279. If the START key is held down during power-up, the computer will assume that a boot-tape is to be binary loaded. The following BASIC routine shows how to sense the START key:

```
10 IF PEEK(53279)≠6 THEN GOTO 10:REM
Keep Checking
20 PRINT"START KEY PRESSED":GOTO 10
```

Start or Execute To cause a program or batch file to start functioning, or to "run."

Start-Bit A bit indicating the beginning of asynchronous serial transmission. See Stop-bit.

Starting A New Program To start a new program enter:

NEW

This completely erases all lines now in BASIC's memory. If it's something you want to keep and haven't already got on disk, SAVE it first. If you don't erase the program in memory before you start on another, you will probably wind up with an unusable combination of lines from your old and new programs.

Staring a Program after a Pause Press CTRL/1 to continue a paused program. See Control Keys.

Starware* Learn about Astronomy and constellations. Test yourself on the knowledge you gain. 40K; disk. APX.

Stat Plus* A statistics program with a wide variety of formulas. You can do calculations for mean, variance, and standard deviation, Mann-Whitney U test, Chi Square, sample space, and linear regressions with one to twelve variables. This is a powerful package which can perform almost any kind of statistical calculation. 24K; disk. The Programmers Workshop.

State Table A list of the outputs of a logic circuit, based on the inputs and the previous outputs. Such a circuit has memory and cannot be described by a simple truth table. Also called state-transition table.

Statement A string of characters which is a syntactically complete instruction with respect to a high-level language translator.

States and Capitals* States are highlighted one at a time on the map of the United States. The student must first identify the state, and then the corresponding capital. 16K; cassette. Atari, Inc.

Static Memory MOS memory which uses a flip-flop as a storage element. It does not need to be refreshed and does not require a clock. It does not lose its contents as long as power is supplied.

Static RAM RAM memory circuits which retain their contents as long as power is supplied. They do not require refreshing.

Statistics I* An introduction to the fundamentals of statistics. Covers areas such as mean, mode, standard deviation, and skew. 16K cassette or 24K disk. Atari, Inc.

STATUS Atari BASIC Command. This command uses the format:

STATUS #<aexp>,<avar>

It calls the STATUS routine for the device specified as #<aexp>, and stores it in the variable named as <avar>.

Status The present condition of a device, usually indicated by flag flip-flops in special registers. See Flag.

Status Bit Handshaking The delegation of certain bits of a parallel I/O port to coordinate information transfer with a peripheral device. Status bits are used to indicate device read, buffer full, printer out of paper, etc.

Status Register A register used to hold status information inside a functional unit. A typical status register provides: carry, overflow, sign (negative), zero, and interrupt. It can also include parity, enable, and mask.

STD STanDard.

Stellar Shuttle* You are a shuttle commander piloting your craft from th mother ship through an asteroid belt, to rescue people stranded at two different bases on a planet. On the way down you can slow your descent to avoid asteroids but on the way up you must rely on your quick reflexes with the blasters to remove obstacles from your path. 16K; disk or cassette. Broderbund.

STEP Atari BASIC statement. STEP is the third part of the FOR statement. It determines how many index numbers are counted for each turn around the loop. See FOR.

Stepper Motor A mechanical device which rotates by a fixed amount each time it is pulsed. Often used in disk drives.

Stereo 3-D Graphics* This graphics package of six programs allows you to draw and view line drawings of three dimensional objects. Viewing programs are Mono3D and Stereo3D, with choices of medium- and high-resolution, field of view, and location of view. The viewing in mono is considerably more flexible than stereo, allowing variations in yaw, bank, and pitch, while stereo viewing automatically points you toward the object. Viewing stereo images also requires using 3D glasses (paper frames supplied without colored filters) or photographing screen images for viewing with a stereoscope, a somewhat cumbersome procedure. 32K; disk. Atari Program Exchange.

STICK Atari BASIC function. STICK, followed by the number of the port into which the joystick is connected (0-3 from left to right) in parentheses, will return the code number for the current position of that joystick. The code number for the normal central position of the stick is 15. There are eight other positions corresponding to the eight compass points. The code numbers for these positions, starting with north and moving clockwise, are 14, 6, 7, 5, 13, 9, 11, and 10. Diagram:

```
            NORTH(UP)
              14 106
LEFT(WEST) 11 15 7 RIGHT(EAST)
               9 5
                13
            SOUTH(DOWN)
```

Stimulating Simulations* A group of twelve games that incorporate simulation. They are in BASIC and have complete documentation, including flowcharts. Hayden.

Stock Analysis* A program for stock portfolio evaluation. Calculate your rate of return on stock investments, and the intrinsic value of a particular stock. This is a package for knowledgeable, seasoned investors who are familiar with financial modeling. 24K; disk. Atari, Inc.

Stock Charting* Chart the performance of any stock with this program that will generate a well-organized graph from your input on earnings, dividends, daily volume and closing highs and lows. In addition, you can obtain a 10-day moving average, and the overall high and low for the charted period. 24K, Atari 800; disk. Atari, Inc.

Stock Charting* Obtain a visual history of a stock's price and performance with this stock investment analysis tool. Four charts are generated on each stock to give you information on high and low closings, volume, moving averages, and more. 24K. Atari, Inc.

Stock Management* Store and update stock-related information. This program will handle transaction and price records, buy and sell dates, broker's fees, dividends, and splits. You can list, update, and correct existing records and use them as data for profit and loss calculations. Sample data is included to demonstrate its use. 32K; disk. Atari Program Exchange.

Stocks and Bonds* Four players begin the game with $50,000 each. What happens during the next ten investment sessions depends on the shrewdness of the players. They speculate while buying and selling shares in ten investment options. Data is entered by joystick and may be input simultaneously by all players. The colorful grapic effects include charts, and a running listing of current quotations. 40K; disk. Avalon Hill Game Co.

Stone of Sisyphus* The magic Stone of Sisyphus transports you to an underground dungeon full of dazzling treasure and horrendous monsters. Your intellect will help you outwit the guardians, so you can satisfy your greed. 40K; disk. Adventure International.

STOP Atari BASIC Command. The STOP command at any point in a program, causes it to halt at that point and revert to direct mode. A message is displayed on the screen telling the number of the line at which the program was stopped. The program may be resumed from that point, at any time while it is still in memory, by using the CONT command. STOP is most often used as a program debugging tool.

Stop and Terminate Current Function To end, terminate, or break current function, in any program, at any time, press BREAK. See Control Keys.

Stop BASIC Program See STOP, END.

Stop the Screen Press CTRL/1 to pause in any program at any time. Press it again to continue. See Control Keys.

Stop-Bit A bit indicating the end of asynchronous serial transmission. See Start-Bit.

Stopping System Operation This can sometimes be accomplished by pressing the BREAK key. To continue operation, enter the BASIC statement:

CONT

followed by RETURN. It is also sometimes possible to stop system operation by pressing the SYSTEM RESET button. Naturally, you can always stop your computer by turning it off.

Storage Synonym for Memory (q.v.).

Story Machine* Watch your story acted out as you write the text. Intended for young children. Visual and sound effects teach sentence structure. 48K; disk. Spinnaker.

Storyline* The perfect child's bedtime companion. Clover the Clown helps you tell two well-known fairytales: "The Ugly Duckling" and "Rumpelstiltskin." Features facial animation, original music, full-color graphics, and optional joystick control. 48K; disk or cassette. Maximus, Inc.

**STR$** Atari BASIC Function. This function, whose format is STR$<aexp>, returns the number to which the arithmetic expression evaluates, but in string form. Example:

```
100 DIM N$(10)
110 N$=STR$(60+9)
120 PRINT N$
```

Running this sample routine would display the number 69 on the screen.

Strain Gauge A sensor which produces a voltage or resistance change when a force is applied.

Strategic Financial Ratio Analysis* Analyze a company's strengths and weaknesses using financial information, and base management strategies on the results. You can also do projections or "what if" analysis, or compare two separate companies. This program comes with a helpful user's manual and could be used for educational as well as investment purposes. 32K; disk. Atari BASIC cartridge. Atari Program Exchange.

Stratos* As defender of a shielded future city, you control the defense laser against waves of invaders. Their bombs slowly break down the sheild, and could destroy its power supply and your weapon. There is a repair ship, but it is in danger of being destroyed too. 16K cassette or 32K disk. Adventure International.

Streets of the City/Trucker* Two text games about transportation. In the first you play an independent trucker hauling your choice of freight, mail, or oranges over three transcontinental highway routes. Each option or combination thereof has its own unique hazzards. The second game casts you as the controller of the public transportation works, facing some very modern day dilemas, such as decaying streets, aging buses, workers' salaries, and safety problems. Every decision you make has an interactive effect on other issues. All in all, an educational experience for even the most irate customer of public transit. 16K; cassette or disk. Creative Computer Software.

STRIG Atari BASIC Function. The function STRIG, followed in parentheses by the number of the port into which the joystick is connected (0-3 from left to right), will return the status of the trigger of that joystick. If the trigger is not pressed, a 1 is returned. If the trigger is pressed, a 0 is returned.

String An ordered sequence of data items, such as characters. For example, the word "string" is a string of six characters. See also Character String.

String, Numeric Value of BASIC. See VAL.

String Handling The ability of a programming language to operate on strings of characters.

String, Length of BASIC. See LEN.

Strip Poker* Five Card Draw is the game, and once the money is gone articles of clothing become the stakes. The computer partners are Suzi and Melissa, who, by the last of three high-resolution screens, reveal all. There are other modules available that offer both male and female computer players. The game has excellent graphics and is fun to play. 40K; disk. Artworx.

Strobe A selection signal that is active when data is correct on a bus.

Structured Language A computer language designed to aid or enforce structured programming. Modular program structure is facilitated by control structures such as IF...THEN...ELSE, DO WHILE, CASE and REPEAT UNTIL; logically separate program modules such as procedures; and a limited scope for variables. Unconditional control transfer statements (GOTOs) are often left unimplemented. Popular structured languages are Pascal, ALGOL, C, and ACTION!.

Structured Programming A set of techniques designed to increase the reliability and comprehensibility of programs by increasing programmer discipline. Structured programming involves precise problem specification, top-down or stepwise program design, and block-structured or modular programs.

STTL Standard Transistor-Transistor Logic.

Study Quiz Files* Teachers can use this program to design quizzes. The format is multiple choice only. BASIC; disk. Compu-tations.

Stun Trap* A shoot-'em-up game requiring some strategy. The object of the game is to trap your adversary with hyperspike barriers. This game has been criticized as boring. 32K. Affine Software, Inc.

STX Start of TeXt.

Sub-Harmonic A fractional multiple of the fundamental sound frequency.

Submarine Commander* Captain your own submarine on a search and destroy mission in the Mediterranean. If your fuel, power, torpedoes, and air hold out, you may earn a transfer to shore duty. Control your sub with the joystick and some keyboard commands. Graphics are good. Timing and strategy are essential for victory. 16K; cartridge. Thorn EMI Video, Inc.

Subroutine A program segment identified by name and often bracketed by "subroutine" and "return" statements. Execution is transferred to a subroutine when a subroutine call occurs. Subroutines improve program modularity and save memory space.

Subroutine BASIC. See GOSUB.

Subroutine—Passing Parameters Makes information from one process or program available to another process or program. Similar to a football pass, except that one or more bytes of data replaces the football. Also, the receiver is a program. The sender may be a program or a person typing the data onto a command line to be "passed" to a program. The two most common examples would be DOS passing parameters from the command line to a program and a BASIC program passing variables to a subroutine.

Sultan's Palace* Rescue the beautiful princess from the evil Sultan in this text adventure game. The clues and obstacles are humorous and risque. The game is only moderately difficult to play. But think of the gratuitous sex and violence. 32K; Disk. Atari Program Exchange.

Sunday Golf* This simulated golf game graphically generates a nine-hole golf course on your screen. Players select a club and angle for each stroke. Also features long or short courses and automatic score keeping. For one to four players. Adventure International.

Super Breakout* An advanced version of Breakout. This version gives you four variations of the original. With four sets of paddles, up to eight players can play. 16K; cassette or disk. Atari, Inc.

Super Cartridge* A term used by Optimized System Software to indicate a Bank Select 16K Cartridge that uses only 8K of RAM. Super Cartridges include BASIC XL*, Integer BASIC XL*, MAC65*, and ACTION!*. O.S.S.

Super Cubes and Slip* Two game programs strictly for entertainment. The first presents a scrambled Rubick's cube. You can vary the level of difficulty by specifying three or four rows per side of the cube. The second game, Slip, simulates a board with maze-like dividers and shallow holes capable of trapping objects as they "roll" with the tilt of the board. 16K; cassette. Thorn EMI.

SuperCalc* One of the original spreadsheet programs designed for microcomputers, it is a versatile program that has proven its worth overtime. It differs from the original spreadsheet, VisiCalc, mainly in its command mnemonics. They both have limited ability to output or retrieve data from other programs and databases.

SuperCalc is organized in a matrix of rows and columns addressed by letters and numbers. You can enter a formula, text, or command into the cells.

Data commands available are /Blank, /Edit, /Copy, /Replicate, /Protect, and /Unprotect. The worksheet commands are /Delete, /Insert and /Move. The file and printer commands are /Load, /Save, /Delete, /Output and /X(execute). The help facility is very good, making it possible to run the program without a user's manual. SuperCalc is a pleasant tool for finance, engineering, science, and any other endeavor which requires manipulation of large amounts of numerical data. See VisiCalc.

Supersort* A fast, flexible sort routine which can be incorporated in your BASIC programs. It autoloads, is transparent to your BASIC programs, can sort 1000 30-character fields in about four seconds, and can handle up to 10,000 records. A very useful program if you need to sort a lot of data. 16K; disk. Atari Program Exchange.

Support Chips All the microchips beyond the CPU which are required for complete system operation.

Survival* An elapsed time text game set in the mountains. Food is scarce, and wild animals are sometimes very brave. You must locate treasure to survive hazards and constantly changing weather conditions. The game can be saved at any point for play later. 40K; disk. United Software of America.

Survivor* A shoot-'em-up game for one or two sets of partners. The setting is four space forts. Your objective is to destroy them by eliminating their guns. Enemy trackers, kamikaze fighters, and careening asteroids all distract you from your goal. Features a scrolling space battlefield that is activated to keep your ship on the center of the screen. 32K. Synapse Software.

Suspended* Frozen in the underground complex of a forbidden planet, you control a force of robots. (Clarence Birdseye never had it so good.) Your game can be saved. 32K; disk. Infocom.

SUT Socket Under Test.

SW Status Word.

Swamp Chomp* This Frogger look-alike is about a Gorx instead of a frog. Gorx not only must survive ensuing dangers to reach his dinner but he has a chance to destroy his swamp enemies. Thirteen levels of difficulty offer more challenge than Frogger. 16K cassette or 32K disk. Program Designs, Inc.

Swifty Datalink* A terminal communications package with an excellent, sophisticated menu. This may perform uploading and downloading in either full-duplex or simplex modes. The additional feature of saving commercial time by automatically off-loading data to disk upon completion makes this a very useful and economical device. Disk. Written by Tony Dobre. Swifty Software.

Switching Regulator A power supply design which regulates by commuting the input voltage into a filter circuit.

SYBEX A leading publisher of computer books.

Symbol Table A table constructed by an assembler or compiler to associate symbolic names with actual addresses or values.

Symbolic The use of characters or character strings in a defined syntax to stand for machine-related entities, such as instructions or data.

Synassembler* A co-resident assembler for beginners. Features a line-oriented editor; Atari screen editor support; TAB key next line number entry; and support for search and replace, copying and moving lines, and renumbering. The assembler is located in high memory, is very fast, and is one of the few fully integrated assemblers for the Atari system. Synapse.

SYNC SYNChronous, or SYNChronizing.

Synchronous Operation controlled by a mutually sensed clock pulse.

Synchronous System A system in which all events are synchronized with a common clock pulse.

Syntax The rules governing proper construction of statements in a language. For programs, the rules include spelling and placement of keywords, spelling and type of data names, and number, type, and order of arguments. Punctuation rules are also usually part of syntax.

Syntax Check A check, performed by a program or person, to ensure that one or more statements in a programming language complies with all syntax rules of the language. A program may pass all syntax checks and still give an error message or erroneous results due to logic, data, or program flow problems.

System Any aggregate of two or more interconnected electronic components. Also used for "computer system." See Computer System.

System Refers to a group of programs which accomplishes some function (example: Database Management System), or group of interconnected devices (example: the computer system), or both taken together (example: a dedicated word processing system).

System Disk Used to contain DOS commands and other system software or utility-type programs. Actually, such programs need reside only on one disk. For convenience, however, most disks will contain at least the file DOS.SYS. A system disk may also store user programs and/or data.

SYSTEM RESET Pressing SYSTEM RESET will reset various key system locations. Depending on the situation, SYSTEM RESET will cause a program to halt, restart, or cause what is known as a coldstart. If RAM location 580 is not equal to a zero when SYSTEM RESET is pressed, a coldstart will follow and your computer will act as if it were turned off, then turned on again.

Systems Software A software package is a group of computer programs, possibly including data files and documentation which perform a function or group of related functions on the computer. These are called applications software when they perform tasks not directly serving the functioning of the computer. Examples would be a word processing package, an accounting package, etc. Systems software packages, on the other hand, facilitate the use of the machine; these include disk operating systems and program development packages.

```
80 FOR TAB=1 TO 3:? CHR$(159);BLANK$;:NEXT
   TAB:? CHR$(155)
90 POSITION 5,5:REM POSITION CURSOR
   FOR DISPLAY DEMONSTRATION
100 FOR LINE=1 TO 3
200 FOR X=1 TO 3:READ BLANK$:? BLANK$;-
    CHR$(127);:GOSUB 330:NEXT X
300 ? :? :NEXT LINE
310 POKE 82,2:? :REM RESET LEFT MARGIN
    AT 2 THEN EXIT
320 ? :? "BASIC":? "IS";:END
325 REM SOUND AND COLOR SUBROUTINE
330 FOR VOLUME=8 TO 0 STEP -1
340 SOUND 0,X*VOLUME*LINE,10,VOLUME
350 SOUND 1,X*VOLUME*LINE+1,10,VOLUME
360 SOUND 2,X*VOLUME*LINE+2,10,VOLUME
370 SOUND 3,X*VOLUME*LINE+3,10,VOLUME
380 SETCOLOR 4,VOLUME,VOLUME
390 NEXT VOLUME:RETURN
400 DATA TABS,NOW,SET,EACH,10,POSITIONS,-
    X=5,X=15,X=25
450 REM NOTE THAT SYSTEM RESET AND
    GRAPHICS COMMANDS RESET TABS
```

Tabbing A method of moving a CRT cursor or printer head to a predefined column on the screen or paper, called a tab stop.

Tab, Adhesive A disk is not write-protected if it has a writeprotect notch about one inch down on the right side. However, the notch can be covered with an adhesive tab. This blocks a small spring-loaded switch or a light beam inside the disk drive, and is sensed by DOS disk driver programs. You will get an error message any time you try to alter a write-protected disk by changing or deleting files, copying a file onto it, or formatting it.

You can use files, load them, or copy from the write-protected disk. The purpose of these limitations is to prevent accidental loss of the only copy of programs or data. In most cases, the procedure is to copy the write-protected disk onto a notched disk, put away the write-protected disk as a permanent copy, then modify the notched disk.

It is a good practice to put an adhesive tab (supplied with boxes of diskettes) over the write-protect notch of any important disk you will backup. Then, if you accidentally ask for the backup in the wrong direction (from the scratch disk to your important disk), you will get a second chance to make the backup, rather than lose your data.

Table Look-Up Method of converting one variable to a corresponding value, or verifying its accuracy, by searching a list or table of entries for the known keyword or value. The corresponding values

T Codes. ATASCII = 84; HEX = 54. t—ATASCII = 116, HEX = 74.

T DOS 3.0 command to leave DOS and turn over control to the cartridge.

T An electrical network shaped like the letter "T". It has one input, one output, and one ground lead. Resistors are used as attenuators and capacitors. Inductors are used as filters. Also: True—a logical 1.

Tab Forward Pressing TAB will move the cursor forward in the text a number of characters set by the user or applications program. In BASIC and DOS, the tab forward is eight spaces. This function is common in entering text. Although this is a recommended value, this key may be defined differently.

Tab Stop Tutorial The following program will teach you a little about Atari TAB stops. The REM statements will give you guidance, but the real learning comes from keying and running the program, and seeing what happens.

```
0 REM SETTING TAB STOPS BY JERRY WHITE
10 GRAPHICS 0:POKE 82,0:POKE 83,39:? :REM
   SET TEXT MODE, MARGINS, THEN PRINT
20 DIM BLANK$(10):BLANK$="":REM BLANK$
   =10 SPACES
30 REM CLEAR OUT STANDARD TAB STOPS
40 FOR X=0 TO 39 STEP 8:POSITION X,0:?
   CHR$(127);CHR$(158):NEXT X
50 REM SET LEFT MARGIN AT 5, PRINT, THEN
   POSITION CURSOR
60 POKE 82,5:? :POSITION 5,0:SETCOLOR
   2,0,0
70 REM SET TAB STOPS AT X POSITIONS 5, 10,
   & 25, THEN RETURN CHARACTER
```

may then be extracted from corresponding positions in the table. Looking up a name in the phone book to find the corresponding number is a similar activity.

Tach-Master* A utility for testing and adjusting the speed of your disk drive. 24K; disk. Swifty Software.

Tact Trek* The starship Enterprise is under your command. Anti-matter weapons, phasers, and photon torpedoes are your defense against three enemy ships. Firing your weapons requires a somewhat awkward three-step process. Skill is not a requirement, but pointed ears can help. 32K; disk drive and joystick. Atari Program Exchange.

Talk To Me* A demonstration of the Votrax "Type 'n Talk" voice synthesizer. It is really no better than the sample program which comes with the Votrax synthesizer. 850 Interface, Votrax required. Dynacomp.

TAN BASIC Function. TAN gives the trigonometric tangent of <x>. The format is:

$$<v> = TAN(<x>)$$

<x> is the angle in radians, or degrees if a DEG statement has been executed (see DEG and RAD). TAN is calculated in single precision.

Tape, Magnetic A mass storage medium which requires sequential access but is inexpensive. It is convenient for large files or archival storage. Often the only external storage on very low priced systems, and used as a backup for disk on larger systems.

Tape Program Recorder The Atari 410 or 1010 program recorders are used for the external storage of files and data. Cassette storage is much slower and less convenient than disk, but, because it is considerably less expensive, it is still widely used. Atari, Inc.

Target Disk See Target Drive.

Target Drive The disk drive to which information/data is headed, as opposed to the source drive, from which information/data is coming.

Task A particular execution of a program. In a multi-user system, several terminals may use the same program, so that one program is being used for several tasks.

Tax Advantage, The* Help, at last, with preparing your taxes. This program is designed to handle form 1040A versions A-E, G, SE, and the depreciation schedule, form 4562. Line numbers on the

nine screens that constitute the workspace for the 1040A match the line numbers on the form itself; each screen contains a list of the program functions that apply to the form. Numbered 1040 lines that require prior itemization or calculations direct the user to the appropriate schedule and then return him to the form with the total. Of course, the cost of the program is tax-deductible if you file schedule A. Continental Software.

Tax Dodge* A cleverly conceived maze game in which you try to accumulate as many dollars as you can, while avoiding the roving taxers. The game span is one taxable "year," during which you must get a certain amount of money and return to your starting place on the screen. The maze is two screens wide and two deep, and scrolls just as you are about to move out of the old screen. Special areas on screen, "deductions" and "accountant," will save you money if you cross them, or others, such as "inflation" and "red tape," cost money or slow you down. Likewise, the doors between corridors are "loopholes" through which the player can go, but the Taxer can't follow. 32K; disk. Island Graphics.

TCAM TeleCommunications Access Method (IBM mainframe telecommunications term).

TD Transmitted Data (RS232C standard).

TDM Time-Division Multiplexing. A networking, timesharing technique used for regulating signal flow between terminals.

Teacher's Aid* A review of the fundamental arithmetic processes: addition, subtraction, multiplication, and division. It ranges from single-digit to five-digit problems. Review is made of the problems missed during the drill. 24K; cassette or disk. Dynacomp.

Telelink I* Link with another computer or communications network through the use of an Atari 830 Acoustic Modem. While the hookup through standard telephone lines is simple, the functions of the program are limited. Essentially the only uses are printing data as it's received because the buffer is only 1.5K. It is not set up to transfer data to disk or cassette. 16K; cartridge. Cassette required. Atari, Inc.

Tele-Talk* An excellent telecommunications program. Thoroughly documented and user friendly. The default values in the program will allow you to access most bulletin boards. However, each parameter, such as baud rate, parity check, duplex type, and so on, can be individually set to suit your needs. You can save new parameters and install

them as default values. The program includes indication of remaining buffer space, elapsed time, and connect charges. Will not translate ATASCII from one Atari to another. Binary Atari programs must be uploaded and downloaded. 32K; disk. Datasoft.

TeleTari* A telecommunications program that helps you to use an Atari 850 interface hook up any peripheral device compatible with the RS-232. There is a 20K buffer for immediate holding of input or output data. The data received can be directed to a printer or storage device for later use. The menu-driven program is easy to use 32K (48K recommended); disk. Don't Ask Software.

Teletype One of the oldest, slowest peripherals for communication with a computer. (10 characters per second or 110 baud).

Temple of Apshai* Use intelligence, strength, and willpower to overcome the monsters guarding the Temple. Venture into dungeons in search of treasure, which can be used to pay your helpers and buy more weapons. Includes a complete story that explains this game and fantasy-role playing games in general. 32K; disk or cassette. Automated Simulations (EPYX.)

Terminal Emulator A program that allows a microcomputer to function as a terminal to a mainframe's time-sharing network.

Terminal Mode A mode of operation of a general purpose computer such that its CRT and/or printer can be used as a terminal for another computer. Also called terminal emulation.

Terminate Current Function BREAK. To end, terminate, or break current function, in any program, at any time, press the BREAK key. See Control Keys.

Terry* A conversational program with a limited selection of responses. Developed for younger children, it doesn't offer as much as other intelligence programs. 32K; disk or cassette. Atari Program Exchange.

Test Data A programmer must insure that a program will correctly process all of the types of data for which it is intended. Samples of the data are prepared (test data), and the program is executed using this data (a test run). The program's outputs (reports, screen displays, files, etc.) are then verified to be as specified. An error in the processing logic of a program is called a "bug," hence the terms "debug" and "bug free." Atari BASIC includes debugging aids for BASIC programs. More sophisticated software for debugging programs is available.

Test Site See Alpha Test Site vs. Beta Test Site.

Text Editor A specialized program for writing and editing text files. A text editor for the Atari manipulates ATASCII characters, such as letters, numbers, punctuation marks, and other symbols in the ATASCII set. The Atari BASIC editor and the highly sophisticated word processors available today are all text editors. Their basic function is to create and change text data such as letters, reports, programs, and even books.

Text File A file containing character data: letters, numbers, or special characters. These files may have any file extension. By contrast, an object or an executable file, such as the .OBJ file, may contain data which is not displayable as characters. Most data and programs that you write will be in text files. See Data File.

Text Wizard* A word processing package with some useful special features. This is not a menu-driven program, so you have faster access to specific parts of the program, but some inconvenience in selection. It is comprehensive and relatively easy to use, and includes an editor that lets you move blocks of text and perform search and replace functions. Documents can be easily formatted and printed. The system comes with complete documentation, a step-by-step tutorial, and a reference card summarizing options and commands. 32K; disk. Printer required. Datasoft.

THEN Atari BASIC Statement. THEN is the closing portion of the IF/THEN statement. See IF.

Thimble Printer Prints fully-formed characters with a "thimble." The thimble is like a daisy wheel type element with the type petals bent up 90 degrees to form a cup or thimble shape.

Three R Math Classroom Kit* Included in this kit are Three R Math System, Three R Math Practice Worksheets, and Three R Math Gradebook. The first two programs aid the student in enhancing mathematical skills. The latter aids the teacher in keeping track of grades and progress of individual students. 40K; disk and printer. Atari Program Exchange.

Three R Math Home System* Designed for children, ages five through thirteen, this program to complement classroom learning and enhance basic skills. Lively and stimulating exercises are provided at many different skill levels. Worksheets and summaries of results are included. Comes *with a* good user manual, suggestions for effective use of the program, and guides to the various levels of difficulty. Requires Atari BASIC cartridge. 40K; disk. Atari Program Exchange.

Three R Math System* Over one hundred levels of difficulty are available for creating your own tests on basic arithmetic. Teachers may use this in preparing exams for students from kindergarten to eighth grade. 48K; disk. Atari Program Exchange.

Threshold* This action-filled game involves warfare against twenty-four types of attacking aliens. They attack your armed spaceship independently or in groups. The level of difficulty increases. 48K; disk. Sierra On-Line.

Thunder Island* A maze is randomly generated and displayed, for fifteen seconds. Henceforth, it is visible only when illuminated by flashes of lightning. The object of the game is to get through the maze as quickly as possible. 16K; disk or cassette. Analog Software.

Tigers in the Snow* A simulation of the Battle of the Bulge. The computer may play one or both sides, and one or two players may play. Weather, supplies, and fuel are variables that affect what you can do and how you do it. 48K; disk. Strategic Simulations, Inc.

Timber* Lumberjacking in the north woods could be fun, if the bears, snakes, and other nasties would just leave you alone. (Take off, you hosers!) Three levels of difficulty, great music, sound effects, and graphics will make this all Machine language arcade-style game a favorite. 40K; disk drive. MMG Micro Software.

Time Runner* Fight the droids as you conquer new land (Ho-hum). Disk or cassette. Funsoft.

Time Trials* A road race in which you race the clock while practicing math skills. Recommended for children from five to ten years old. Cartridge. CBS.

tiny-c* A subset of the C language. Customization is available through the FULL source for this useful programming language. Complete with user guide and reference manual. Optimized Systems Software, Inc.

TO Atari BASIC Statement. The second part of the FOR...NEXT loop. It designates the limiting index number for the loop. See FOR.

Touch Typing* A self-paced series which takes you from beginning through advanced typing levels. You are guided through finger drills and are told of your errors and speed. Repeating an exercise is only possible by rebooting the disk, making it a bit awkward when you want to drill in a problem area. 16K; cassette. Atari, Inc.

Track Attack* Attack a train and make off with its cargo of gold, but watch out for the night watchman. This is a unique game with excellent graphics, but the awkward controls make it frustrating at times. 32K; disk. Broderbund Software.

Transistor An electronic device which can use one electrical signal to influence another. The two main uses of transistors are as amplifiers and switches. Used as an amplifier, a transistor uses the changes in a small signal to make large changes in a large signal. Used as a switch, the transistor opens or closes a circuit, depending on the state of a controlling signal.

TRAP Atari BASIC Command. When an error is detected during the running of a program, the program stops and an error message is displayed on the screen. To prevent this, use the TRAP statement, followed by a number in parentheses. The program will not stop, but will branch and continue execution at the target line number, which is the number after the TRAP statement.

Treasure Quest* It's the 18th century. You are the captain of the good ship Zombie, in search of sunken or buried treasure—you're not particular. However, you are sailing the dangerous Blood Straits, it's hurricane season, your crew is not entirely trustworthy, and the always annoyingly upright British Navy thinks you are a pirate. What could possibly go wrong? 16K; cassette. Adventure International.

Tree Structure A collection of data organized so that each item is linked to one or more other items, creating a spreading network of linkages analogous to the branches of a tree. Genealogical data provide the classical model—each person has exactly one mother, but may have zero or more daughters. An example of data organized in this way might be the parts list of an airplane. The main entry is for the entire airplane. It is linked to the major components, such as wings, fuselage, and tail. Wings, in turn, are linked to their smaller components, such as flaps, engine supports, engines, etc. Each of these is further linked to smaller and smaller sub-assemblies, until individual parts such as nuts and bolts are charted.

Triad* A fast-paced game that pits you and your partner against against nine horrible foes. Control your moves with joystick and keyboard, and play on ten different levels. Keep score on a tic-tac-toe board. 48K; disk. Adventure International.

Tricky Tutorials* Fifteen tutorial packages, consisting of many programs to help the user under-

stand the inner workings of your Atari, particularly sound and graphics. The programs are: 1) Display Lists; 2) Horizontal/Vertical Scrolling; 3) Page Flipping; 4) Basics of Animation; 5) Player-Missile Graphics; 6) Sound & Music; 7) Disk Utilities; 8) Character Graphics; 9) GTIA Graphics 9 to 11; 10) Sound Effects; 11) Memory Map Tutorial; 12) SAM; 13) BASIC Programming Tools; 14) Advanced BASIC Programming Tools; and 15) Fancy Fonts. The programs include examples and program subroutines that can be used by the beginner. 16K cassette or 24K disk. Educational Software, Inc.

Trion* This fast-action, 3-D game consists of three screens. As you explore the surface of a newly discovered planet, your scout ship must avoid walls, destroy bombs, blow up ships, and more! 32K; disk. London Software.

Trivia Trek* A series of multiple choice trivia quizzes containing ten questions per subject area. Fifty different subjects are available, including baseball, movie stars, inventors, and phobias. After answering the packaged questions, you can create your own and save them to a DOS-compatible data disk. 32K; disk. Swifty Software.

Truth Table A table showing the logical value (true or false) of a compound logical expression, based on the logical value of the simple components of the expression. Example:

A	B	A or B
T	T	T
T	F	T
F	T	T
F	F	F

This table reflects the definition of Or: A or B is true if and only if either A or B or both are true.

Tumblebugs* A maze game populated by good and bad dot-eating creatures. Your character responds to joystick or keyboard control as it travels a maze which is so detailed that the inhabited portion appears in a magnified screen window. As you travel along, you eat the dots and leave a trail of digested by-products. If your pursuer crosses your trail it immediately follows, consuming your trail as it goes. If you can consume all the dots without being eaten, you win. But look out, in this game, as in life, you only live once. (Unless, of course, you're James Bond.) 24K; disk. Datasoft.

Turmoil* A shoot-'em-up game in which you try to defeat enemy fighters attacking you along seven horizontal lanes. The enemy rams your ship instead of shooting back. A simple game, it lacks depth and is repetitive in the faster levels. Requires fast reflexes but little thought. 8K. Sirius Software.

Tutti Frutti* An arcade-style game in the eat-the-dots genre. Eat as many objects as possible inside a jungle clearing that is surrounded by trees. You are pursued by relentless, deadly bugs. Sacred Vanilla Ice Cream Cones, Rooti Frooti Lollipops, and the Buggsy Wuggsy Birthday Cake are some of the special food items you can encounter in this game. Several levels of play. 32K. Adventure International.

Two-Pass See Pass.

Tycoon* This game can make or break your fortune. You play to gain wealth in the form of gold, stocks, real estate, and inheritances. Unfortunately, the game board also contains doom, income tax, and other pitfalls of the rich. It takes savvy, and just a little luck, to beat your competition, particularly if the computer takes you on. 16K cassette or 24K disk. The Programmers Workshop.

Type—Set Lines Per Inch To set lines per inch on an Epson-compatible printer, enter BASIC statement:

LPRINT CHR$(27);"2"

This sets the printer at 6 LPI.

LPRINT CHR$(27);"1"

Sets the printer at 72/7LPI.

LPRINT CHR$(27);"0"

Sets the printer at 8LPI.

Type Formats Many formats are available on your dot matrix printer. There are four type widths: compressed (132 characters/8 inch line), normal (80 CPL), compressed double-width (66 CPL), and normal double-width (40 CPL). There are also four strike methods, each producing a different type density: single-strike, double-strike, emphasized, and emphasized with double-strike. Vertical spacing can be varied, with 6 lines/inch, 8 LPI, or 10 LPI, and variations of these which are double or triple. There is also superscripting, subscripting, and italics.

To select type formats, follow the instructions in your printer's manual for the proper BASIC statements to enter on your Atari computer. If you use a word processor or data management software, the formatting is done for you by the program, at your direction. See also Atari 825 Printer and entries under specific printer functions such as Compressed Print, Double-Width Print, etc.

Type 'n Talk* A speech synthesizer that gives your computer some life in the form of sound and words. Type 'n Talk interfaces easily with the RS-232

port of the 850 Expansion Interface Module. It contains volume and frequency control, and a small amplifier that powers a small speaker. A voice returns the spoken equivalent of words typed on the keyboard. Some words must be spelled phonetically to overcome the idiosyncracies of the English language. For example, "kuntry" is the phonetic spelling of country. The user's manual will help you with harder words, as well as answer other questions. Vortex.

Type Size—Compressed Print.   To enter this mode, enter BASIC statement:

LPRINT CHR$(18)

either in a program, with line numbers at the point where you want to start printing in the small type, or directly without a line number. This gives 132 characters on the 8 inch line, or about 16 characters per inch. To return to normal type, enter:

LPRINT CHR$(146)

Types of Variable Declaration Characters   Variables, in Atari BASIC, are of two kinds: numeric variables or string variables. To distinguish between the two, a type declaration character is used at the end of any string variable. This character is the dollar sign ($). Numeric variables have only the variable name (nothing after it). Otherwise the rules for naming variables are the same for both types. See Names, Variable.

Types of Variable Names   Variables in BASIC:

a) must start with a letter,

b) can have up to 120 characters, and

c) cannot be a reserved word, such as IF,ON, THEN, GOTO, etc., or a reserved word followed by a type declaration character ($). See BASIC Reserved Words for a complete list.

String variables can be from 0 to 255 characters, using letters, numbers, punctuation marks, and other characters, followed by a $.

The default value for the type of variable is numeric, so any variable name not ending in $ is a numeric variable.

Typo Attack!*   Stop the Typos from infiltrating your reports and papers. Increase your typing accuracy, while having fun with this game. 8K cassette or 16K disk. Atari Program Exchange.
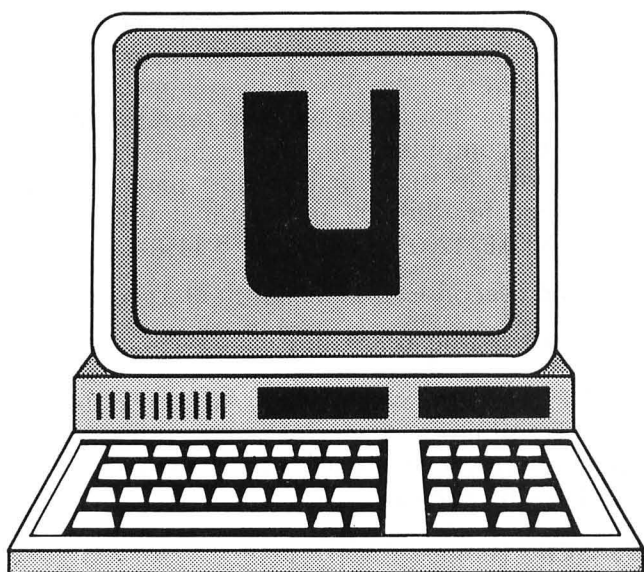
U Codes. ATASCII = 85, HEX = 55. u—ATASCII = 117, HEX = 75.

U Underflow. Also: A lower case u is sometimes used to represent the Greek letter mu meaning micro.

U DOS 3.0 command to Unprotect (unlock) a file or files.

UART Universal Asynchronous Receiver/Transmitter. A serial-to-parallel and parallel-to-serial converter. Usually a particular kind of integrated circuit used to interface a byte-parallel port to a bit-serial communications network or processor bus.

UCSD p-System This is an integrated program development system, created by Kenneth Bowles at the University of California at San Diego. It includes an operating system, a full-screen text editor, and compilers for Pascal, FORTRAN, and BASIC. Although originally developed to teach programming, it has been enhanced to provide the tools necessary for large-scale programming projects.

The p-System is a virtual machine, a machine made up entirely of software. It can be run on many computers. The "p" refers to "pseudo" computer. The system compilers produce p-code, which is very compact, and which runs on a "pseudo" computer. An interpreter converts the p-code into acceptable code for the actual computer on which the program is run. This makes the system very "portable;" that is, easy to move between computers. Only a very small interpreter need be written for each computer on which the p-System runs. The p-System now works on over fifty different computers, with new ones being added all the time.

The system is highly interactive and consists of five main parts:

1) The full-screen editor allows you to write both programs and text. It is easy to learn and use. There is also an advanced screen editor which has capabilities equal to sophisticated word processors.

2) The system compilers convert your source code into p-code. The Pascal compiler is integrated with the editor. When a syntax error occurs, you can return to the editor at the exact point where the error was detected. The compiler error messages are accurate and informative.

3) The system filer allows you to format disks and list, copy, rename, and remove files. File names may be up to sixteen characters long. The filer will also check for errors on the disk and mark bad areas.

4) The system linker will automatically link separately compiled "units" of p-code together. This allows you to build libraries of useful procedures which can be used by many different programs.

5) Finally, the interpreter converts the p-code to executable code. This is done automatically when the program is run.

The system is highly integrated and relatively easy to learn and use. Although expensive, it is useful for beginners as well as professional programmers. There is a full range of application programs which run under the p-System, including spreadsheets, word processors, and accounting programs. Several well known programs were developed using the p-System. These include VisiSchedule from Visi-Corp and MBA from Context.

There is an alternate version of the p-System available from Network Consulting, Inc. Their version offers hard disk support, 25% more storage, and a number of other utilities. They frequently have updates available and provide excellent technical support by telephone. Network Consulting, Inc.

UHF Ultra High Frequencies.

Ultima I* Your character begins in the Medieval period, using the weapons and transportation of the time to fulfill various quests. As you grow in experience, you move into the future and finally enter the space age with all its technological developments. The playing time is very long, and the game comes on two disks. 48K; disk. Sierra On-Line.

Ultimate Player/Missile Editor, The* An advanced editor which controls graphic functions. Allows the user to create and color his/her own detailed char-

acters. Includes instruction manual. 32K; disk. Swifty Software, Inc.

Ultimate Renumber Utility* A fast, well-designed, and well-documented program for renumbering and rearranging your program listings. 8K cassette or 16K disk. Atari Program Exchange.

Ulysses & The Golden Fleece* Win riches and position by finding the Golden Fleece and delivering it to the king. When you successfully overcome the many hazards and hurdles, you ride home with the prize on Pegasus. This game presents about 150 mappable locations and a lot of difficult problems. 40K; disk. Sierra On-Line.

Understanding Atari Graphics* Written by Michael Boom, this hands-on book teaches Atari graphics. Although you do not need prior programming experience, a knowledge of Atari BASIC is needed. Alfred Publishng Company.

Unibus A minicomputer bus, invented by DEC for its PDP-11, with more than 100 signals. It is not used by the LSI-11. (Trademark of Digital Equipment Corp.).

Unix A mini- and microcomputer operating system developed by Bell Labs which features multiprogramming, a hierarchical file structure, and numerous useful utilities.

Unstack Same as POP. To remove from the top of a stack.

uP Microprocessor.

Up Arrow (↑) Pressing CTRL/Up Arrow will move the cursor up one line in the same column it previously occupied on the screen. This function is common in text and command entry. Although these are the recommended values, this key may be defined differently by application programs. See also Control Keys.

Up One Space To move the cursor up one line, press CTRL/Up Arrow. Enter BASIC statement:
```
PRINT CHR$(30)
```
This only moves the cursor; it does not erase data on the screen.

UPC Universal Product Code.

UPI Universal Peripheral Interface.

Upward Compatible The term upward compatible indicates that software developed for one version of a programming language, operating system, application package, or computer hardware will work without alteration on an improved and updated version of the same language, system, package, or hardware. For hardware, the term "upward compatible" refers to the possibility of improving and updating the hardware without reprogramming. The Atari computer line, for example, is upward compatible, in that, for the most part, software developed for the 400 and 800 is usable on the 600XL, 800XL, 1200XL, 1400XL, and 1450XLD.

us Microsecond—one millionth of a second.

USACII-8 Same as ASCII.

USART Universal Synchronous/Asynchronous Receiver/Transmitter. A chip which handles all the operations associated with synchronous data communications, such as bisync.

USASCII Same as ASCII.

User A user is a person who owns or uses a computer. Find the nearest mirror.

User Friendly If you are writing programs that others might someday use, you should never forget to give clear prompts (q.v.) for input data, to freeze the screen long enough to be read, to provide clear error messages, etc. Taking care of such issues is often referred to as "human engineering"—because it makes the program easy to use, as well as technically correct. Another term for this side of programming is making the program "user friendly."

Several other guidelines exist for writing user friendly programs. If a complex series of data items has been typed in and some entries turn out to be invalid, the user should be able to reenter only the bad items. Error messages should indicate not only that an entry is invalid, but also just how it is invalid and, if possible, hints on correcting it.

User Groups A user group is a club whose attention is focused on some aspect of computers. Most groups are centered on a particular type of computer. Some groups focus on a language, an operating system, an area of application, programming in general, or some other aspect of computing. Most Atari user groups have sub-groups within them, giving their attention to these various aspects of computing as they relate specifically to the Atari.

Users groups provide a valuable opportunity to get and give advice on Atari hardware, software, and applications. Often you can talk to someone who used a product you are contemplating buying. User group newsletters may also offer useful information. If you need a programmer or consultant, you may meet or hear about a good one at a users group meeting.

Two of the largest Atari User Groups are A.C.E. (Atari Computer Enthusiasts), and M.A.C.E. (Michigan Atari Computer Enthusiasts). A list of many Atari User Groups is at the back of this book.

USR Atari BASIC Command. Permits BASIC to access Machine language subroutines and pass values to that routine using optional operands. A value may be returned to BASIC through the numeric variable that must precede the USR statement. One operand must follow the USR that tells BASIC the address of the Machine language routine. This address may be a decimal number, a numeric variable, or the address of a string. The example below causes BASIC to JUMP to the Atari's warmstart vector:

DUMMY=USR(58484)

USRT Universal Synchronous Receiver/Transmitter. A serial-to-parallel converter for high-speed communications.

Utilities Software which facilitates the operation and use of the computer for a variety of applications. Examples of utilities are editors, sorts, debuggers, or file handlers.

Utility Diskette II* Useful package of utilities to assist the BASIC programmer. Among the five programs, each has a function to help ease problems or find desired files. Lister prints unprintable characters using a table to identify their meaning, Menu displays the programs on a disk, Hexdump gives the hexidecimal contents of a file, Compare checks two programs and gives the statements that differ between them (table of other stats too), and Sort sorts through a given file for desired data. 24K; disk. Atari Program Exchange.

Utility Programs See ACTION! AESD II, Atari BASIC Rev A, Atari BASIC Rev B, Atari CP/M Module, Atari Macro Assembler, Banner Generator, BASIC Commander, BASIC Crossreference Utility, BASIC XL, BJ DOSPATCH, Calculator, CAS-DIS, CASDUP, Colortrack and Soundtrack, Combined BASIC Commander and MMG BASIC Debugger, DISKDUP, DISKPAK, Disk Boot Maker, Disk Commander II, Disk Doctor, Disk Fixer, Disk Manager, Disk Utilities, Disk Wizard, Disked, Diskette Inventory, Diskette Librarian, Diskey, Diskmenu, Diskscan, Diskwiz, DOWNLD, Dsembler, Edit 6502, Enhanced BASIC FULMAP Commander, FULMAP, Graphic Generator, Happy Warp Drive Software, Happy 810 Enhancement, IEEE Bus Controller, Instedit Rev.2, Keypad Controller, Letter Writer, Load'n Go, MAC 65, Machine Language Monitor, Magic Dump, Monkey Wrench, Multibase Calculator, Music Box, Next Step, Omnimon!, Page Six, RAM Test II, RPN Calulator Simulator, S.A.G.E., SAM, Screen Maker, Screen Printer Interface, Sound Editor, Speed-O-Disk, Supersort, Synassembler, Tach Master, Ultimate Renumber Utility, Utility Diskette II. XKEF

UUT Unit Under Test.

UV UltraViolet.
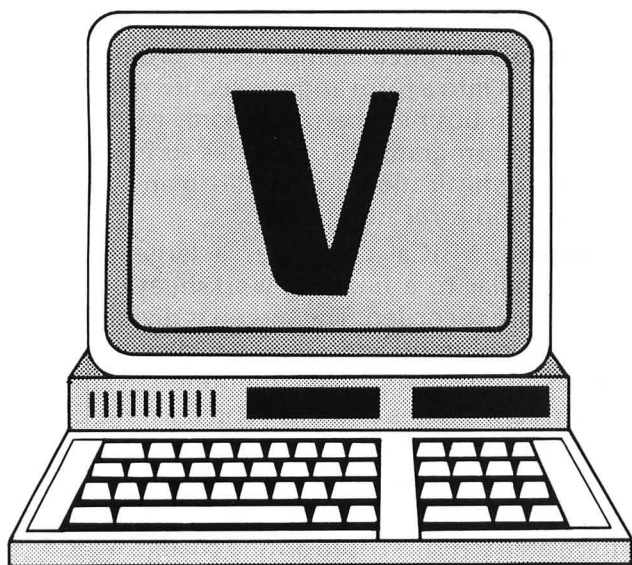
V Codes. ATASCII = 86, HEX = 56. v—ATASCII = 118, HEX = 76.

V Volt. Also, the oVerflow status flag.

VAL Atari BASIC Function. VAL, if followed (in parentheses) by the name of a string that starts with a number, returns an actual number of the same value as the number stored in the string. Using this function, an operator can cause the computer to do arithmetic problems on strings. The format is:

<variable>=VAL(<x$>)

<x$> is a string variable.

Valdez* You are the captain of an oil tanker, navigating your ship through Alaskan waters. The ship's rudder and engine speed respond to your keyboard control. Hazards abound, from craggy icebergs to other supertankers. You watch the simulated radar screen. Its going to be a long night. 24K; disk. Dynacomp.

Variable A symbolically named entity which may assume an assigned value, or a number of values.

Variable Changer* Changes the names of BASIC variables throughout a program. Unless you really know what you are doing, it is possible to mess up your program. 24K; disk. Atari Program Exchange.

Variable Names A variable is any quantity, numeric or string, which may (but not necessarily) change during the course of its use within a program. In Atari BASIC, you may use up to 128 different variables in each program, each with a different name. The name for each variable may be up to 120 characters long. There are some limitations, however, to be considered when naming your variables. Each name must start with an alphabetic letter and must

contain no characters other than alphabetic letters, numerals, and spaces. A dollar sign character ($), although it may not be used in the name itself, must be appended directly at the end (no space) of the name as a type declaration character for string variables. Numeric variables need no type declaration character. The only other difference in the mechanics of using string variables as opposed to numeric variables is that the string variable must be dimensioned, whereas the numeric variable needs no dimensioning. It is advisable not to use a reserved word (q.v.) as the first part of a variable name.

Vaults of Zurich* A multi-level, action adventure game, depicting a nine-floor Swiss bank with a very elaborate security system. You, of course, must penetrate all this security, reach the inner sanctum (the chairman's office), and escape with all the loot. All this is within a limited time. Controlled by joystick, and special combinations from the keyboard cue game functions, such as fighting or drilling through safe doors. 32K; disk or cassette. Artworx.

VAX A 32-bit minicomputer manufactured by Digital Equipment, which can also execute PDP-11 Machine language.

V-COS* V-COS is a Machine language utility program that gives you control over your cassette. You can control the cassette baud rate, tape leader length, screen background color, character set color, and screen margins. IJG, Inc.

VDI Video Display Input.

VDT Video Display Terminal. The term used in the newspaper community for CRT.

VDU Video Display Unit. The British term for CRT.

Vector Display A CRT which moves the electron beam randomly to trace figures on the screen. Contrast this with a raster display, which sweeps the beam through a fixed pattern, building up an image with a matrix of points. Vector displays are used in many arcade games.

Vectored Interrupt Interupt scheme where information about the type of event which caused the interrupt is provided by hardware at the time of the interrupt.

Vectoring Automatic branching to a specified address. See Interrupt.

Versions Programs and software packages are updated occasionally to correct errors or add new capabilities. Such updates are usually released under the same name, but with new version or

release numbers assigned to them. See Program—Version or Release.

V/F Voltage-to-Frequency converter.

VHF Very High Frequency.

Video Command* A joystick cursor or game controller. It has less spring tension than the Joystick (tm)—a relief over a long period of use. But it isn't as accurate for precise positioning during fast games that require you to get back to the natural position before the next movement. Zircon.

Video Easel* A fast computer art program that includes two drawing modes that are accessed from a menu. The draw command allows you to draw hi-res colored lines on the screen. Quad drawing draws four lines in a symmetric pattern. The most interesting part of the package is "Life." The computer simulates the regeneration of a colony of shapes and develops them in colorful patterns. 16K; cartridge. Atari, Inc.

Video Kaleidoscope* Even young children will enjoy using this spectacular graphics package. First, use a joystick to create design which is automatically repeated in the four quadrants of the screen. Then, use the kaleidoscope function to generate special effects, such as rotating rainbows, flashing colors and pulses, graduated color spectra, and more. 40K; disk. Joystick, Atari BASIC cartridge required. Atari Program Exchange.

Video Math Flashcards* Choose any one of the four basic arithmetic functions, and take a twenty-question exam. Specific numbers may be selected for the drill. 8K cassette or 24K disk. Atari Program Exchange.

Video Signal An electronic signal containing information that specifies the location and brightness of each point on a CRT screen, along with timing signals to place the image properly on the screen.

VIP An RCA board using the COSMAC MPU.

Virtual Address A user- or system-generated address which references objects in a logical address space, regardless of the physical memory location where they reside. A virtual address must be translated by the operating system into a valid physical address, which may, in turn, involve the movement of data between primary and secondary storage (usually disk).

Virtual Memory The memory address space available to any process running on the processor. It may be larger than the physical memory.

VisiCalc* The original electronic spreadsheet. VisiCalc translates once complicated programming procedures into a form and procedure resembling those which businessmen commonly carry out on paper. The program also provides sufficient processing sophistication to handle many business planning and forecasting needs.

On screen, VisiCalc emulates a large piece of paper, similar to a financial worksheet on which statistics are recorded. The screen is divided into a matrix of columns and rows. which intersect to form small rectangular cells, identified by row and column coordinates. Numbers and formulas can be placed in these cells.

VisiCalc remembers how these numerical values are derived and can recalculate a great web of interrelated statistics based on one change. VisiCorp.

VisiDex* An information organization and retrieval program which lets the user file and recall any type of information. It prints out lists, notes, and memos; and keeps track of a daily calendar, alerting the user to upcoming events. Visicorp.

VisiFile* A comprehensive electronic filing system that makes it simple to organize, maintain, and effectively use all the information a business needs. It will accurately store, search, sort, retrieve, display, calculate, and print reports, lists, and mailing lists. Visicorp.

VisiTrend/Plot* A statistical and graphics package which enables the user to easily input, transform, and project time series data, and quickly see the results in professional-looking charts and graphs. The program will automatically generate line, bar, pie, area, x-y, and high-low charts, with many options. Visicorp.

VLSI Very Large Scale Integration. A technology that allows a single chip to hold over 10,000 transistors.

VMOS Vertical MOS. The technology used to increase the density of components per square inch, by cutting a V-shaped groove in the silicon substrate.

Voice Box II* Teach your computer to talk and sing with this high-quality speech synthesizer. Make games more interesting and fun, and use as an educational aid. It contains a comprehensive music system, is coordinated with graphics screens to create lip-sync animation, and can speak in foreign languages. 48K; disk. The Alien Group.

Volatile Storage Storage which loses its contents when power is removed.

VOM Volt Ohm Multimeter. A test instrument for measuring voltage, resistance, and current. It is usually portable, with an analog meter or digital display for readout.

Votrax* Understandable speech is generated by this sound synthesizer which enables the computer to talk over phone lines. There are sixty-three phoneme commands, four different voices, and 252 synthesizer inputs. Ohio Scientific.

VSS Voltage for Substrate and Sources. The ground for MOS circuits.

VSYNC Vertical SYNC signal in a TV. It determines the vertical position of the image.

VTAM Virtual Teleprocessing Access Method (IBM mainframe telecommunications system).

VTR Video Tape Recorder.
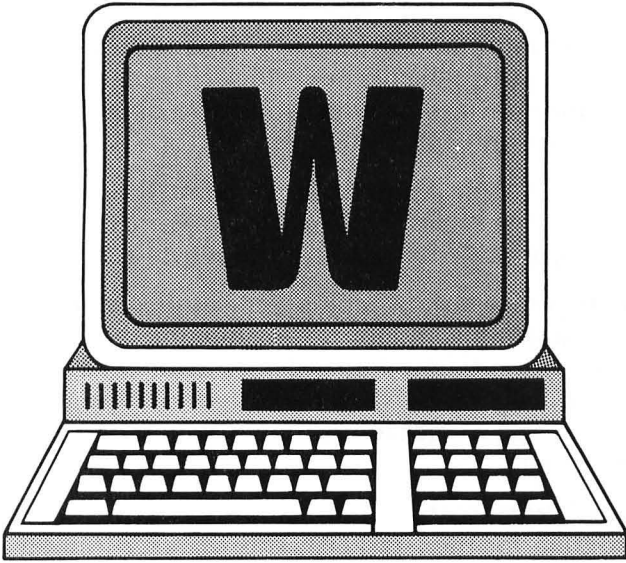
W Codes. ATASCII = 87, HEX = 57. w—ATASCII = 119, HEX = 77.

W Write.

Wafer A slice of a silicon ingot on which integrated circuits are fabricated. After testing and fabrication, the wafer is cut up into individual circuits called dice or chips. The dice are packaged, sorted, and further tested before being used as finished IC components.

WAIS-R* A psychological test for adolescents and young adults. Southern Micro Systems For Educators.

Wait State A microcycle or internal state entered by an MPU when a synchronizing signal is not present. It is used to synchronize a fast processor with a slower memory.

Wallwar* An arcade-style game where one or two players defend their plasma supply with Microbots. Whoever destroys his opponent's plasma supply first, wins. The combatants are separated by a mobile, multi-layered wall of colored bricks. Bullets are fired fast and straight, or slowly with direction. Unfortunately, the boredom of knocking down endless bricks before striking a target makes this game somewhat slow. However, the game does feature beautiful graphics. 48K. Sierra On-Line.

Wand A device used to read the optically coded product labels (usually bar codes) found on retail sales items.

War* An action packed, strategy game that involving aircraft, armies, engineer units, and armored units. For one or two players. 32K, disk. Adventure International.

Warmstart Pressing the SYSTEM RESET console button on the Atari, for the purpose of returning to the beginning of a program, system, or application, results in what is called a warm boot. See Reboot.

Wayout* A 3-D maze game with great graphics. You're equipped with compass and mapmaker, and your mission is to find the shortest way out of the maze. There's an elusive exit and a sneaky thief that can nab your equipment. There are twenty-six different mazes with various levels of difficulty. It takes patience and perseverance to play this challenging game. 48K; disk. Sirius Software.

WD Western Digital Corp., a manufacturer of processor and controller chips.

WE Write Enable.

Weekly Planner* An electronic calendar for the years 1981 through 1999. Keep track of important dates and deadlines with this flexible, easy-to-use program. Important annual dates such as birthdays and anniversaries can be carried over from year to year. It includes a feature to display a three-day schedule that is useful for short term planning. 32K; disk. APX.

WEMA Western Electronics Manufacturers Association.

What's Different* Figure out what is different about one of the words in a group of four. Ten games, with twenty-five words per game. For second through sixth grades. 8K; disk or cassette. Program Design, Inc.

Wildcard File Name Characters In Atari DOS file names, ? and * can be used as special global file name characters to allow selecting a particular group of files or one file from a specific group. ? means any single character in this position. Thus ABC? will match ABCA, ABC1, ABC9, ABCZ, etc. * means all characters from this point on, including blanks or none. ABC*, therefore, matches everything ABC? matches plus all longer file names starting with ABC, but without an extension. The file extension is considered a totally separate match, with ? and * having the same meaning as in the first part of the file name. As a commonly used example, *.*, when used for viewing the disk directory, will call up all file names on the disk. Atari DOS allows the use of wild cards when using the following DOS menu options: disk directory, copy file, delete file, rename file, lock file, unlock file, and duplicate file.

Winchester Disk A hard disk system characterized by very light read/write heads, low head-to-disk clearance, and complete enclosure of the

magnetic media in a dust-free environment to achieve high information density and fast access-time. In the world of microcomputers, hard disk and Winchester disk are essentially synonyms.

Winchester Disks* This is a 6M, 12M, or 20M Winchester disk subsystem. An optional tape cartridge is available for backup. Tallgrass Technologies.

Winchester Hard Disk Drives* Four stand-alone Winchester hard disk drives. The 5M and 10M models are for 5-inch disks. The 20M and 40M models are for 8-inch disks. Orion Software Associates.

Winchester Hard Disks* An add-on 5 ¼-inch Winchester hard disk subsystem, 5 & 10MB. Data Compass Peripheral Products Group.

Window A section of a CRT screen dedicated to displaying specific types of information.

Wire Wrap A mechanical method for connecting wires in complex circuits. Each wire is tightly wound several turns around square posts to make the electrical connection. This technology is now seldom used, except in hardware during system development.

WISC-R Computer Report* This administrative report interprets subtests and achievement scores. It generates a 6-page printed report including recommendations. Southern Micro Systems for Educators.

Wizard and the Princess, The* The wizard has imprisoned the princess in his far-off, well-guarded castle. There are hazards from the beginning, and they become even more difficult as you progress. You must use the objects you find to your advantage—some are endowed with unearthly powers, some are seemingly useless. This is a good, straightforward adventure that all ages will enjoy. 40K; disk. Sierra On-Line.

Wizard of Wor* An accurate and exciting rendition of the arcade game of the same name. It is played on twenty-one increasingly difficult skill levels and features our hero, the warrior, pitted against an assortment of mystical and mean creatures, each with its own offensive style and special powers. The longer you can help your man defend himself, the deeper he penetrates into the maze and the more dangerous his foes become. Joystick required. Roklan Corp.

Wizard's Gold* An adventure game that helps beginners learn the ropes. Easy to use and contains good documentation. 24K; disk. Atari Program Exchange.

WOM Write-Only Memory. Usually used as a semi-humorous term for parts of the address space of a computer which is not actually populated with memory devices or which must be disabled for some reason.

Word A logical unit of information. It may have any number of bits, but, for MPUs, a word is usually 4, 8, 16, or 32 bits. Atari uses an 8-bit byte as its word.

Word Processor A computer-based system for writing, editing and formatting documents such as letters, reports, and books. It may be either a specialized hardware system dedicated to these tasks, or a program package run on a general purpose computer.

Word Processor* A full-feature word processing program for the Atari 800. This is a user friendly, menu-driven system that offers editing, printing, and formatting capabilities. Documentation is complete and well-written. Includes a demonstration disk and audio tape that are coordinated with the first lessons in the user's manual. 48K; disk. 10K ROM cartridge for demo disk; printer recommended. Atari, Inc.

Word Processors See Alog Pagewriter, Atari World, Atari Writer, Atext, Bank Street Writer, Letter Writer, PluPerfect, Scipt Wizard, Spell Perfect, Spell Wizard, Text Wizard, Word Processor, Word Wizard.

Word Race* Increase your vocabulary by matching the correct definition to each word. One to four players can participate. Three levels of difficulty. 32K; disk. Don't Ask Software.

Word Wiz* Tests your vocabulary and understanding of the English language. One to four players can play among themselves or against the computer. A definition is given and the player must supply the word. 24K; disk. The Programmers Workshop.

Word Wizard* A powerful word processor which features editor, formatter, disk manager, and much more! Can perform DOS instructions from the menu. Datasoft.

Wordgo* Have fun while improving your language skills. This fascinating board game involves using different letter combinations to form words, and configuring them in intersecting lines. Learn correct spelling, and build your vocabulary. Requires joystick and Atari BASIC cartridge. 40K; disk. Atari Program Exchange.

Wordmaker* Create as many three- or four-letter words as possible in a given time range. Points are

deducted for misspellings. Play against a friend or the computer. 32K cassette or 40K disk. Dynacomp.

Words, Reserved BASIC reserved words have particular meanings in BASIC and are used for commands, statements, and function and operator names. These words should not be used as variable names and variable names should not be a reserved words followed by a type declaration character ($).

The reserved words, when used, are to be delimited (separated with space or spaces around them) so that they are easily recognized by BASIC. If you accidentally use one of the reserved words, you may see an error message or have strange results when you execute the program. See also BASIC Reserved Words.

Workspace An area of memory allocated for working storage.

WPM Words Per Minute.

Write Generally, to input data to memory. See PUT, Memory.

Write Data to File BASIC. See PUT.

Write-Protect To prevent information from being written onto a storage medium. Floppy disks often come with adhesive tabs which can be removed or placed on the disk. This write-protects the disk, by blocking a sensor which enables the disk drive's write circuitry. Cassettes have a similar plastic break-out tab. See also Tab, Adhesive.

Write-Protected Disk A disk is write-protected if it does not have a write-protect notch about one inch down on the right hand side. The notch could be covered over with an adhesive tab. See also Tab, Adhesive.

Write-Protected File A file on a disk can be closed by using Option F from the Atari DOS menu. This prevents inadvertently writing over the file. Such a file is said to be write-protected. See Protected Files.

WS WorkSpace.

WV Working Voltage.
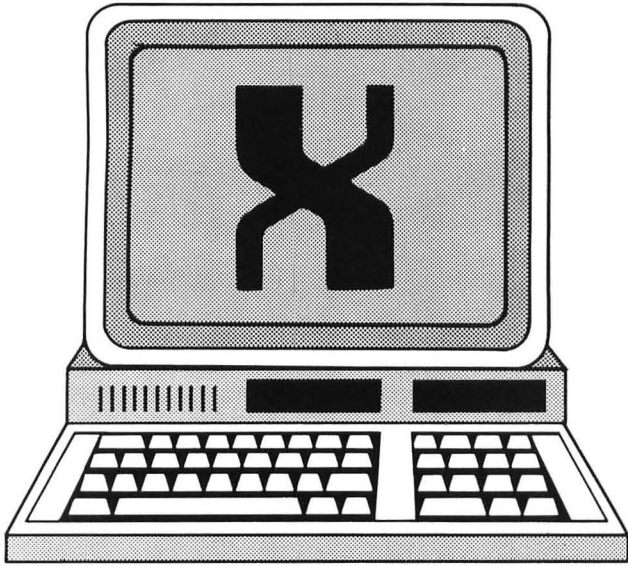
X Codes. ATASCII = 88, HEX = 58. x—ATASCII = 120, HEX = 78.

X Index Register.

X DOS 3.0 command to select a user-defined program.

XENIX The Microsoft implementation of the UNIX operating system for microcomputers.

XIO Atari BASIC Command. The XIO command may be used to perform various input output functions from BASIC. The following are examples of some common XIO commands with English translations. Additional XIO commands are available for using RS-232 ports. Detailed explanations of these additional commands may be found in Atari's 850 Interface Manual.

XIO 3,#1,4,0,"D:FILENAME.EXT"

OPEN IOCB #1 and a disk file named FILENAME.EXT to read. Change the 4 in the example above to 8 to write, 9 to append, or 12 to read/write.

XIO 12,#1,0,0,"D:FILENAME.EXT"

Close IOCB #1 and a disk file named FILENAME.EXT.

XIO 13,#1,4,0,"D:FILENAME.EXT"

Check the STATUS of the specified disk file.

XIO 17,#5,12,0,"S:"

This XIO can be used instead of DRAWTO, but there does not appear to be any advantage in replacing a DRAWTO with an XIO.

XIO 18,#6,12,0,"S"

This XIO is used to fill an area on the screen with a previously specified color. The Atari BASIC Reference Manual provides an example of a fill in the GRAPHICS MODES & COMMANDS chapter.

XIO 32,#1,0,0,"D2:FILENAME.EXT,NEWNAME.EXT"

This function can be very useful in avoiding a call to DOS to simply rename a file. Note that the device is not repeated before the second file name in the example above. The example command will cause a file named FILENAME>EXT to be renamed as NEWNAME.EXT.

XIO 33,#1,0,0,"D:FILENAME.EXT"

The example above will cause the file named FILENAME.EXT on disk drive 1 to be deleted.

XIO 35,#1,0,0,"D:FILENAME.EXT"

This command will LOCK the file specified.

XIO 36,#1,0,0,"D:FILENAME.EXT"

This command will UNLOCK the file specified.

XIO 254,#1,0,0,"D:"

This command will format the diskette on disk drive #1.

The XIO command can be executed from within a BASIC program, or in immediate mode. The disk I/O commands are quite useful in avoiding inconvenient calls to the DOS utilities. BASIC XL users have such commands in the form of keywords where PROTECT replaces LOCK, UNPROTECT replaces UNLOCK, etc.

XL Graphics Modes:

MODE	TYPE	COL	ROW	COLORS	RAM REQ.
12	CHAR	40	20	4	1154
13	CHAR	40	10	4	664
14	MAP	160	160	2	4270
15	MAP	160	160	4	8112
28	CHAR	40	24	4	1152
29	CHAR	40	12	4	660
30	MAP	160	192	2	4296
31	MAP	160	192	4	8138

XMIT TransMIT.

XMT TransMiT.

XR EXternal Reset.

XREF A cross reference utility program that rivals MASHER* for speed. It comes in handy as a debugging tool for finding each reference to the variables used in your BASIC programs. It also lists the number of times each numeric constant is used. APX.

XTAL CrysTAL.

X–Y Plotter A device which draws points or lines on a sheet of paper based on X and Y coordinates from a computer.
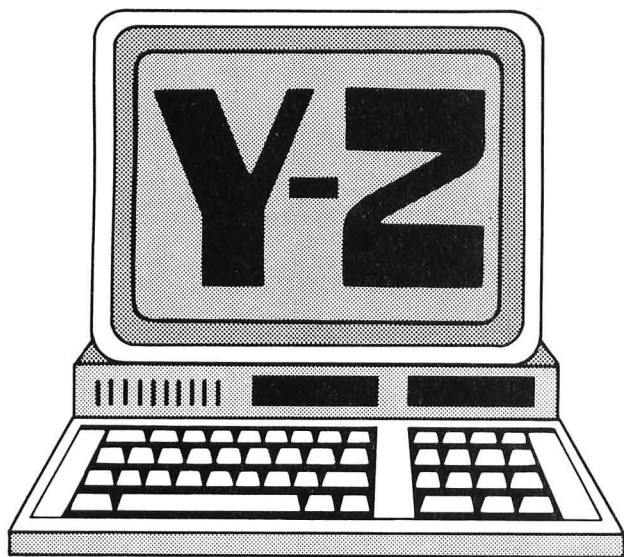
Y Codes. ATASCII = 89, HEX = 59. y—ATASCII = 121, HEX = 79.

Yield The proportion of usable chips in a production batch. Yield = good chips/total chips on a wafer.

Your Atari Computer This book includes: How to Operate the Atari Computer, Programming in BASIC, Advanced BASIC Programming, The Program Recorder, Atari Printers, The Atari 810 Disk Drive, Introductory Graphics, Advanced Graphics, Sound, BASIC Statements and Functions, Error Messages, Status Statement Codes, BASIC Keywords and Abbreviations, Memory Usage, Useful PEEK and POKE Locations. Osborne/McGraw-Hill.

Z Codes. ATASCII = 90, HEX = 5A. z—ATASCII = 122, HEX = 7A.

Z Impedance measured in ohms. Also, the Zero Flag.

Zaxxon* Another favorite arcade game translated for the Atari. It features three-dimensional graphics as you control a fighter plane past laser towers and launching rockets. The fighter must fly over two fortresses and take on a squadron of fighter planes on his way to the large robot Zaxxon and his heat-seeking missiles. The game comes in two versions, but the disk has better graphics and joystick response. 32K disk or 16K cassette. Datasoft.

Zeppelin* You must break through a series of potentially dangerous devices protecting the power-base of the Tyrants of Zafakir. You need courage and skill to navigate the caverns without touching off earthquakes and other disasters. Synapse.

Zilog Manufacurer of the Z-80 and many other widely used chips. Zilog also publishes technical reference material on the Z-80 and other microprocessors.

Zombies* A fast action game that features scrolling, 3-D graphics, on-line instructions, one or two players in cooperative play, seven different dungeons, full sound and color, and spectacular underground scenery. You must avoid meeting the zombies, poisonous snakes, giant spiders, evil orbs, talismans, and other assorted nasty creatures. Disk and cassette. Bram, Inc.

Zone, Print See Print Zones.

Zones Each group of 10 spaces across the print line is called a print zone. A comma (,) in an LPRINT list of items to be printed means "start printing the following item at the start of the next print zone." Contrast this with the semicolon (;), which means the next item is to print immediately after this one, without even a single space between. The print zones begin in columns 1, 11, 21, 31, 41, 51, 61, and 71. See also Print Lines.

Zork I: The Great Underground Empire* This fantasy adventure is the first chapter in the Zork Trilogy. The players journey through the caverns and mazes of the Underground Empire and encounter perils ranging from the mystical to the macabre. Infocom, Inc.

Zork II: The Wizard of Frobozz* More wonders and dangers unfold before the adventurers, as Zork II steers them into new depths of the subterranean realm. Surrounded by dragons and demons, players meet the Wizard, exiled from the Great Underground Empire ages ago. Infocom, Inc.

Zork III: The Dungeon Master* The final test of courage and wisdom. Players meet new, clever opponents and are tossed into harrowing predicaments while wandering from the shores of an underground ocean to the Royal Museum. Infocom, Inc.

3-D Supergraphics & Color Game Development System* Create your own games and programs in 3-D color or black and white. Pictures may be rotated, enlarged, or reduced. 40K; disk or cassette. United Software of America.

3-D Tic-Tac-Toe* A three-dimensional version of tic-tac-toe played on fourplanes, each a four by four grid. Play can be against the computer or another person. Graphics are quite good. 16K; cartridge. Atari, Inc.

6 Lines Per Inch To set the printer at 6 lines/inch, enter BASIC statement:

LPRINT CHR$(27);"2"

See also Type Formats.

8 Lines Per Inch To set the printer at 8 lines/inch, enter BASIC statement:

LPRINT CHR$(27);"0"

See also Type Formats.

9-Bit Rotation Rotation where the carry bit of the CPU is considered a ninth, high-order bit for the 8-bit register being rotated.

10—ASCII The ASCII numeral 10 is used with the BASIC Command LPRINT to advance the paper one line without a carriage return. The format is:

LPRINT CHR$(10)

or use the "line feed" (LF) button of printer.

10 Characters Per Inch To return to normal, ten (10) characters/inch print, you must turn off all non-standard print options. See also Type Formats, Atari 825 Printer.

12—ASCII The ASCII numeral 12 is used with the BASIC Command LPRINT to advance the paper to the top of the next page. The format is:

LPRINT CHR$(12)

or use the "top of form" or "form feed" manual control button (FF) on the printer.

15—ASCII The numeral ASCII 15 is used with the BASIC command LPRINT to set the printer for small type. The format is:

LPRINT CHR$(15)

or

LPRINT CHR$(143)

either in a program at the point you want to start printing in the small type, or directly, without a line number. This gives 132 characters on the 8-inch line or about 16 characters/inch. To return to normal size print, enter:

LPRINT CHR$(146)

See also Type Formats.

16 Characters Per Inch For small, compressed print, enter BASIC statement:

LPRINT CHR$(15)

or

LPRINT CHR$(143)

either in a program at the point you want to start printing in the small type, or directly, without a line number. This gives 132 characters on the 8-inch line, or about 16 characters/inch. To return to normal size print, enter:

LPRINT CHR$(146)

On the Atari 825 Printers, start compressed print with

LPRINT CHR$(27);CHR$(20)

and end it with:

LPRINT CHR$(27);CHR$(19)

See also Type Formats, Atari 825 Printer.

27—ASCII The ASCII numeral 27 is an escape value for BASIC LPRINT statements when setting lines/inch, page length, and print size. See also Type Formats.

28—ASCII The ASCII numeral 28 is used with the BASIC command LPRINT to move the cursor one space to the right. The format is:

PRINT CHR$(28)

This only moves the cursor; it does not erase data on the screen.

From the keyboard, enter:

CTRL/(→)

29—ASCII The ASCII numeral 29 is used with the BASIC command PRINT to move the cursor one space to the left. The format is:

PRINT CHR$(29)

This only moves the cursor; it does not erase data on the screen.

From the keyboard enter:

CTRL/(←)

30—ASCII The ASCII numeral 30 is used with the BASIC command PRINT to move the cursor one space up. The format is:

PRINT CHR$(30)

This only moves the cursor; it does not erase data on the screen.

From the keyboard:

CTRL/(↑)

31—ASCII The ASCII numeral 31 is used with the BASIC command PRINT to move the cursor one space down. The format is:

PRINT CHR$(31)

This only moves the cursor; it does not erase data on the screen.

From the keyboard:

CTRL/(↓)

49—ASCII The ASCII numeral is used with the BASIC command PRINT to set the printer at 72/7 lines/inch. The format is:

LPRINT CHR$(155);"1"

or

LPRINT CHR$(155);CHR$(49)

50—ASCII The ASCII numeral 50 is used with the BASIC command LPRINT to return to the standard line spacing of 8 lines/inch after using a different lines/inch setting. The format is:

LPRINT CHR$(155);CHR$(50)

See also Type Format.

64K—Measurement of Bytes Byte is a label for the storage required to hold one character (letter, digit, etc.) in computer memory, internal or diskette. Abbreviated B or in thousands KB, or simply K (actually, 1K = 1024, because this is an even power of 2).

72/7 Lines Per Inch To set for this line spacing, enter BASIC statement:

LPRINT CHR$(27);"1"

To return to the standard 8 lines/inch, this special line spacing must be turned off. In order to do this, enter BASIC statement:

LPRINT CHR$(27);"0"

This line spacing is a good setting for spacing with compressed print.

See also Type Formats.

101 Atari Computer Programming Tips & Tricks* Written by Alan North, this book is a collection of programming techniques and shortcuts in the areas of graphics, games, educational tools, and home finance. ARCsoft Publishers.

132 Characters Per Line See 27—ASCII.

371 Chip Cassette controller. Made by NEC.

372 Chip FDC. Made by NEC.

400 Chip 4-bit slice. Made by TI.

481 Chip 4-bit slice. Made by TI.

601 Chip 16-bit chip. Made by Data General.

747 Landing Simulator* Attempt to safely land an airliner from twenty miles out at an altitude of 5,000 feet and a speed of 600 miles/hour. This isn't an easy task, or an easy game to master. Graphics are not great, and control of the airliner is difficult. 24K cassette or 32K disk. APX.

1000 Chip 4-bit microprocessor available in various versions. Also called TMS-1000. Made by TI.

1070 See: 1000 Chip.

1100 See: 1000 Chip.

1200 See: 1000 Chip.

1270 See: 1000 Chip.

1300 See: 1000 Chip.

1600 Chip Designed for PDP-11/03 emulation. Made by Western Digital.

1702 Chip An ultraviolet-erasable PROM, organized as 256 words by 8 bits.

1771 Chip Single-density floppy disk controller chip.

1791 Chip Double-density floppy disk controller chip.

1802 Chip Cosmac 8-bit CMOS microprocessor. Made by RCA.

2102 Chip Common static RAM integrated circuit, organized as 1k by 1 bit.

2114 Chip Static RAM organized as 1k by 4 bits.

2650 Chip 8-bit microprocessor. Made by Signetics.

2651 Chip 2650 UART. Made by Signetics.

2652 Chip SDLC chip. Made by Signetics.

2655 Chip 2650 PIO. Made by Signetics.

2702 Chip See: 1702 Chip.

2708 Chip An ultraviolet-erasable PROM organized as 1k by 8 bits.

2716 Chip An ultraviolet-erasable PROM organized as 2K by 16 bits. Made by Intel.

2716 Chip An ultraviolet-erasable PROM organized as 2k by 8 bits Not compatible with the Intel part. Made by TI.

2732 Chip An ultraviolet-erasable PROM organized as 4k by 8 bits.

2900 Chip A family of 4-bit slice components. Widely used to construct special-purpose controllers and microprocessors. Introduced by AMD and second-sourced by many other manufacturers.

2901 Chip A 4-bit slice processor. Made by AMD.

2902 Chip Look-ahead carry generator. Made by AMD.

2903 Chip An improved version of 2901. Made by AMD.

2909 Chip Microprogram sequencer. Made by AMD.

2911 Chip Microprogram sequencer. Made by AMD.

2914 Chip PIC. Made by AMD.

3000 Chip Family of 2-bit slice components. Made by Intel.

3001 Chip Microprogram control unit. Made by Intel.

3002 Chip Central processing element 2-bit slice. Made by Intel.

3003 Chip Look-ahead carry generator. Made by Intel.

3270 Personality * 3270 interfaces with 3704/3705 communications controllers, and emulates 3276 Control Unit Display Station. Supports 3278 displays and 3287 printers. Automated Business Machines.

3850 Chip The F8 family processor chip. Part of an 8-bit two-chip microcomputer. Made by Fairchild.

3851 Chip The F8 family program storage unit used with the 3850. Made by Fairchild.

3852 Chip Dynamic memory interface for the F8. Made by Fairchild.

3853 Chip SMI for the F8. Made by Fairchild.

3854 Chip DMA for the F8. Made by Fairchild.

3861 Chip PIO for the F8. Made by Fairchild.

3870 Chip An 8-bit, one-chip microprocessor. Contains 4032 bytes of ROM, and 128 bytes of RAM. Made by Mostek.

3876 Chip An 8-bit one-chip microprocessor. Upgrade of the 3870, contains 4032 bytes of ROM, and 256 bytes of RAM. Made by Mostek.

3880 Chip Mostek Z80.

4004 Chip 4-bit microprocessor. Made by Intel.

4040 Chip 4-bit microprocessor. Upgrade of the 4004, contains more registers and executes a larger instruction set. Made by Intel.

4044 Chip Static RAM organized as 4k by 1 bit.

4116 Chip Dynamic RAM organized as 16k by 1 bit.

4164 Chip Dynamic RAM organized as 64k by 1 bit.

4264 Chip 4040 PIO.

4308 Chip ROM 1k by 8 + I/O ports for the 4040. Made By Intel.

5701 Chip MMI 4-bit slice predecessor of the 2901 mil version.

6100 Chip Intersil 12-bit CMOS microprocessor which emulates the PDP-8.

6502 Chip 8-bit microprocessor. Widely used in mass-marketed computer systems, such as Apple, Pet, and Atari. Made by MOS Technology.

65XX Chip Support chips belonging to the 6502 family. Made by MOS.

6502 Disassembler* Enables you to disassemble Machine Code into Assembly language. 16K cassette or 24K disk. Quality Software.

6520 Chip PIO. Made by MOS Technology.

6530 Chip RAM, ROM, I/O and timer. Made by MOS Technology.

6701 Chip Same as the 5701 in the commercial version.

6800 Chip 8-bit microprocessor. Made by Motorola.

6801 Chip 8-bit, one-chip microprocessor.

6802 Chip 8-bit, two-chip microprocessor. Upgrade of the 6800, contains functions that were previously in the other 6800 family components. Made by Motorola.

6809 Chip   8-bit, high-performance upgrade of the 6800. Has an expanded instruction set, and 16-bit word handling capability. Made by Motorola.

6820 Chip   6800 PIO. Made by Motorola, Fairchild, and Mostek.

6828 Chip   PIC. Made by Motorola.

6845 Chip   CRT controller. Made by Motorola.

6850 Chip   6800 UART. Made by Motorola.

6860 Chip   Modem. Made by Motorola, Fairchild, and AMD.

6870 Chip   Clock. Made by Motorola.

7400 Chip   Series of TTL logic. Made by TI.

8008 Chip   8-bit microprocessor. Made by Intel.

8048 Chip   8-bit family of one-chip microprocessor with one-chip RAM and ROM. The 8748 version has an EPROM on the same chip as the processor.

8080 Chip   8-bit microprocessor. An upgrade from the 8008, it has a different instruction set, but retains a similar architecture to the 8008. The 8080 was the dominant microprocessor of the 1970s. Because it runs a large library of CP/M code, the 8080 is available for the PC or the XEDEX Baby Blue Card. Made by Intel.

8085 Chip   8-bit microprocessor. An upgrade of the 8080, it contains functions that were previously on other 8080 family chips, as well as two extra instructions and four interrupt levels. Made by Intel.

8086   Full 16-bit version of the 8088.

8086 Chip   16-bit, byte-oriented microprocessor that resembles the 8085, but has an expanded instruction set and 16-bit arithmetic capabilities. Made by Intel.

8087 Chip   Numeric data co-processor for the 8086 and the 8088. Implements proposed IEEE floating-point standard.

8088   16-bit processor from Intel used as the CPU for the IBM PC. The 8088 is a slightly stripped-down version of Intel's original 1978 8086.

8089 Chip   16-bit input/output processor. Made by Intel.

8212 Chip   Parallel latch and buffer in the 8080 family. Made by Intel.

8224 Chip   Clock generator for the 8080. Made by Intel.

8228 Chip   System controller for the 8080. Made by Intel.

8251 Chip   USART for the 8080 family. Also called a PCI. Made by Intel.

8253 Chip   Programmable interval timer for the 8080 family. Made by Intel.

8255 Chip   Programmable parallel interface for the 8080 family. Made by Intel.

8257 Chip   Direct memory access controller for the 8080 family. Made by Intel.

8259 Chip   Interrupt controller for the 8080 family. Made by Intel.

8271 Chip   Single-density floppy disk controller in the 8080 family. Made by Intel.

8273 Chip   Synchronous data link controller in the 8080 family. Made by Intel.

8275 Chip   CRT controller in the 8080 family. Made by Intel.

8279 Chip   Keyboard and display controller in the 8080 family. Made by Intel.

8291 Chip   IEEE 488 bus talker/listener interface chip. Made by Intel.

8292 Chip   IEEE 488 bus controller chip. Made by Intel.

8708 Chip   See 2708.

8748 Chip   8048 with EPROM on the same chip as the processor. Made by Intel.

9080 Chip   AMD's 8080.

9400 Chip   Bipolar Macrologic family. Made by Fairchild.

9511 Chip   Arithmetic processing chip. Made by AMD.

9900 Chip   16-bit microprocessor compatible with the 990 series of minicomputers. Made by TI.

9904 Chip   9900 clock. Made by TI.

9914 Chip   IEEE 488 bus interface chip. Supports talker/listener and controller functions.

9940 Chip   16-bit one-chip microcomputer.
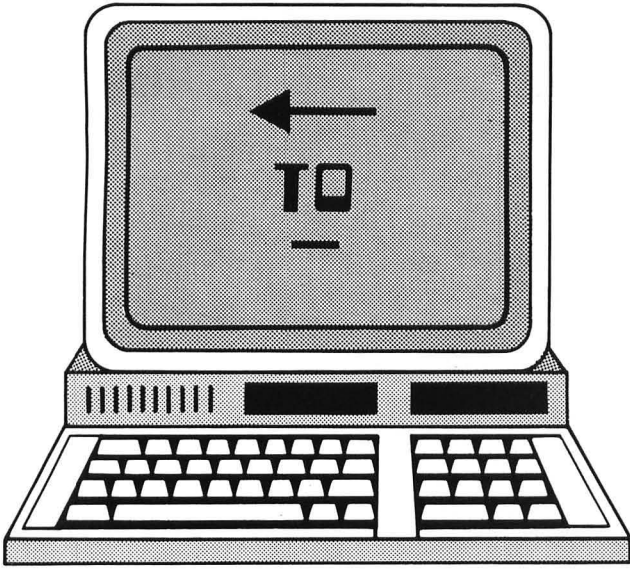
← Backspace Press BACK S/DELETE to delete the last character entered. This is valid under DOS and in BASIC. See also Control Keys.

↓ See Down Arrow.

← See Left Arrow.

→ See Right Arrow.

↑ See Up Arrow.

"" To get one or more spaces between fields printed by your BASIC programs, use a literal of spaces like: "". To get several spaces between the printed values of A$ and B$, enter BASIC statement:
LPRINT A$;"";B$
See also Print Zones.

$ Variable names in BASIC must end in $ if they are 0 to 255 character long.

' In BASIC, a special character indicating the single quotation mark, or apostrophe.

(In BASIC, a special character indicating the left parenthesis. Cannot be used for any other purpose.

) In BASIC, a special character indicating the right parenthesis. Cannot be used for any other purpose.

* In BASIC, a special character indicating the times sign (multiplication).

* In DOS file names, * and ? can be used as special "wildcard" characters to allow matching a whole group of files (or one file from a partial specification). ? means any single character occurring in this position is considered a match. Thus ABC? will match any four character file name starting with ABC including ABCA, ABCZ, ABCS, etc. * indicates that from this point on in the name any characters

(including blanks or none) are considered a match. So ABC* matches everything ABC? matches, plus all longer file names starting with ABC. The file ABCDE will match ABC* but not ABC?

The file extension is considered a totally separate match, with ? and * used in exactly the same way as in the file name. Global file name characters are not allowed in a command name. They may only be used in command parameters.

+ In BASIC, a special character indicating the plus sign (addition). Cannot be used for any other purpose.

, Comma. Each group of 10 spaces across the print line is called a print zone. A comma (,) in an LPRINT list of items to be printed means "start printing the following item at the start of the next print zone." The print zones begin in columns 1, 11, 21, 31, 41, 51, 61, and 71. See also Print Lines, Semicolon.

,, Double Comma. To leave space on the print line between items, put an extra comma (,,) in the print list. Enter BASIC statement:
LPRINT A,,B
This would print A in print zone 1, nothing in print zone 2, and put B in print zone 3, (col 21).
See also Print Zones.

- In BASIC, a special character indicating the minus sign (subtraction). Cannot be used for any other purpose.

. In BASIC, a special character indicating the period or decimal point.

. Period. In a file name, the : and . are specified to delimit drive name, and extension respectively.

/ In BASIC, a special character indicating the division symbol or slash. Cannot be used for any other purpose.

: Colon. In a file name, the : and . are specified to delimit drive name, and extension respectively.

: Colon. Used for Multiple BASIC Statements on a line. You can put a colon (:) at end of one statement and continue entering another statement on the same line, without giving a new line number. The line number at left refers to all statements on the line.

; Semicolon. Each group of 10 spaces across the print line is called a print zone. The semicolon (;) means the next item is to print immediately after this one, without even a single space between. The print zones begin in columns 1, 11, 21, 31, 41, 51, 61, and 71. See also Print Lines, Comma.

< In BASIC, a special character indicating the less than symbol. Cannot be used for any other purpose.

= In BASIC, a special character indicating the equal sign or an assignment symbol. Cannot be used for any other purpose.

> In BASIC, a special character indicating the greater than symbol. Cannot be used for any other purpose.

? In BASIC, a special character indicating the question mark or PRINT abbreviation.

? In DOS file names, ? and * can be used as special "wildcard" characters to allow matching a whole group of files (or one file from a partial specification). ? means any single character occurring in this position is considered a match thus ABC? will match any four character file name starting with ABC including ABCA, ABCZ, ABCS, etc. * indicates that from this point on in the name any characters (including blanks or none) are considered a match. So ABC* matches everything ABC? matches, plus all longer file names starting with ABC. The file ABCDE will match ABC*, but not ABC?

The file extension is considered a totally separate match, with ? and * used in exactly the same way as in the file name. Global file name characters are not allowed in a command name. They may only be used in command parameters.

? Prompt. This is program's way of letting you know that it is waiting for you to type in information. ? is the prompt from a program written in the BASIC language which is running and needs you to type in data in answer to a question. In this case, it is a good idea to include a descriptive prompt such as "Enter check amount 9999.99" in the program so the operator (or you) will know exactly what should be entered in response to the ? prompt. An example of how to do this:

```
100 PRINT "ENTER CHECK AMOUNT 9999.99":
          INPUT CHECKAMOUNT
```

which will give the operator using this program this prompt on the screen:

ENTER CHECK AMOUNT 9999.99 ?

\ In BASIC, a special character indicating the integer division symbol or backslash. Cannot be used for any other purpose.

^ In BASIC, a special character indicating the exponentiation symbol or caret. Cannot be used for any other purpose.

_ In BASIC, a special character indicating the underline symbol. Cannot be used for any other purpose.

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Mind Movers, Inc.
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OSS, Inc.
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Penguin Graphics Software
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Public Domain Software
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TMQ Software, Inc.
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Wadsworth Electronic
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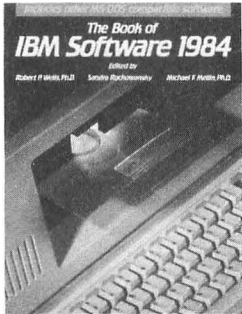
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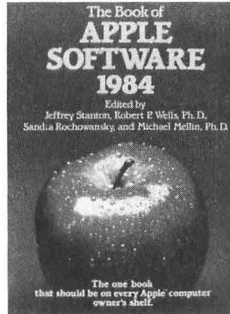
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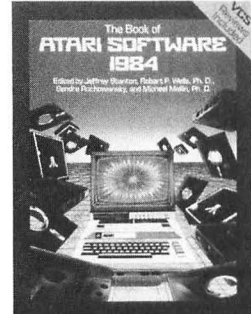
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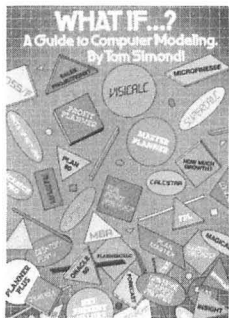
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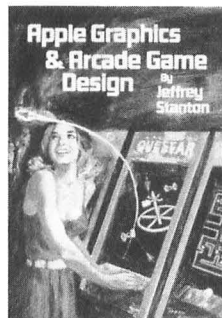
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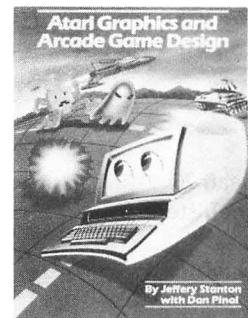
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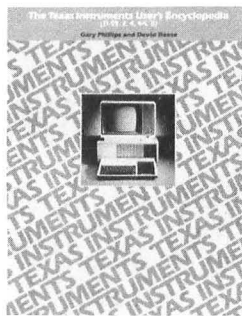
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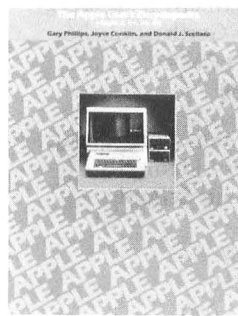
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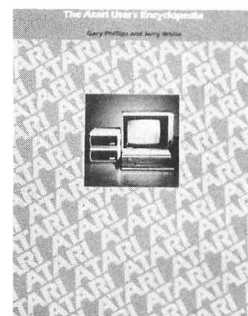
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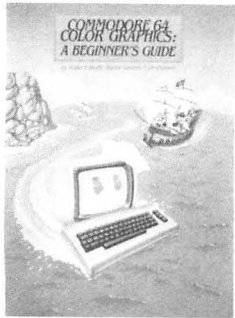
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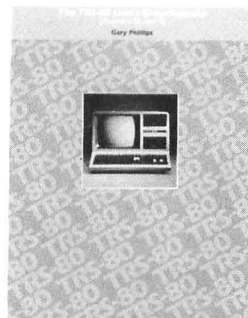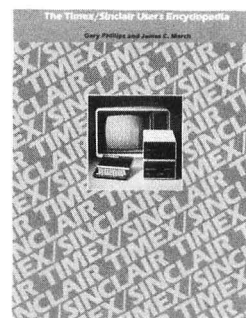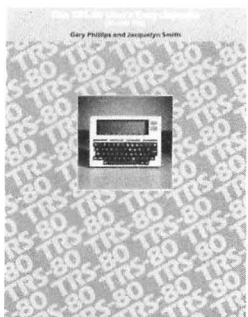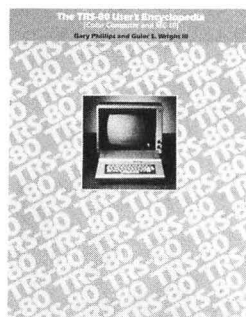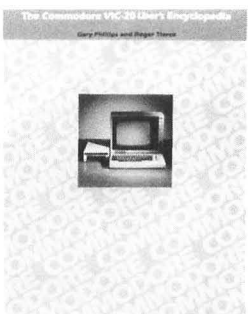
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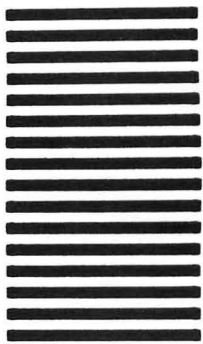Total Amount Enclosed $ _____ (California residents add sales tax. Postage will be paid by The Book Company.)

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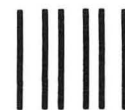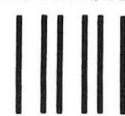**FROM:**

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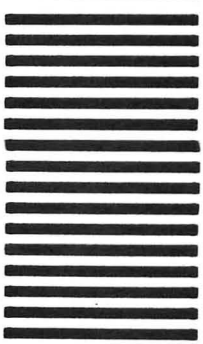The Book Company
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