```
ECHO PASSES %2 TO THIRD.BAT
THIRD %2
```

Finally, enter the following program and save it with the filename THIRD.BAT:

```
ECHO THIRD.BAT USES THIRD P
ARAMETER: %1
```

At this point you have three batch programs, all of which expect parameters. To run the programs, enter FIRST followed by any three strings or numbers. Be sure to separate each parameter with a space. For instance, you might enter FIRST PARAM/ONE &H464 IBMBIO.COM. The FIRST.BAT program takes in all three parameters, processing the first (displaying it in an ECHO statement) and passing the other two when it runs SECOND. SECOND.BAT processes the second parameter and passes the third to THIRD.BAT.

As shown in these examples, batch programs use dummy parameters (% followed by a digit from 0–9) to mark the spot where the real parameter is expected. When you run a batch program, each dummy parameter is replaced by actual data *in the order it is received*. Thus, the FIRST.BAT program above uses %1 to signify the first parameter, %2 to represent second, and so on. Dummy parameter %0 can only be replaced by a drive designator (A or B) and filename: Don't use it unless you want to pass such information.

Be sure to keep the dummy parameter numbers straight when chaining batch programs. The dummy number represents the order *in which that program receives the data*. In the example above, FIRST.BAT received three parameters, which it represents with the three dummies %1, %2, and %3. SECOND.BAT receives two parameters, using %1 to signify the first parameter it receives, and %2 to represent the second. Likewise, THIRD.BAT uses %1 to represent its single parameter. (Note that THIRD.BAT can't use %3 for the dummy. Though you, the programmer, may think of this parameter as the "third," it's the first one that THIRD.BAT receives.)

Batch Commands

In addition to ordinary DOS commands, a batch program may include the following special batch commands: ECHO, FOR, GOTO, IF, SHIFT, PAUSE, and REM. ECHO ON causes DOS commands to be displayed as they're performed in a batch program; ECHO OFF turns off the display. As you saw above, ECHO can also display messages. GOTO is discussed in Part 2 of this article. REM lets you include remarks, and SHIFT is used when more than ten parameters are passed at one time.

The remaining commands (FOR, IF, and PAUSE) permit loops, conditional tests and limited user input. The short file copying program listed below demonstrates all three of these commands. Enter the program as listed, saving it with the filename COPYUNQ.BAT (or any other name ending in .BAT).

```
ECHO off
REM----------------------------
 ------------------------------
 ------------
REM name: COPYUNQ.BAT
REM syntax: COPYUNQ
 source-drive-letter
 target-drive-letter  (no
 colons)
REM purpose: Only unique files
 are copied from source to
 target disk
REM----------------------------
 ------------------------------
 --------------
%1:
FOR %%f in (*.*) DO IF exist
 %2:%%f ECHO %%f WILL NOT BE
 COPIED
PAUSE READY TO BEGIN COPIES,
FOR %%f in (*.*) DO IF not
 exist %2:%%f COPY %1:%%f %2:
 /V
%2:
```

The COPYUNQ.BAT program automatically copies files from a source disk to a target disk, copying only those files that don't already exist on the target disk. This ensures that existing files are not replaced, an improvement over DOS's COPY command, which would write over any like-named files on the target disk. To run this program, enter its name followed by the letter of the source drive and the letter of the target drive. Colons are not required after the drive letters. For instance, you would enter COPYUNQ.BAT A B when drive A holds the source disk and drive B holds the target disk. The program displays the names of files that are not copied.

FOR And IF

COPYUNQ.BAT offers a good demonstration of FOR and IF, which work very differently than their BASIC equivalents. Since a FOR statement can't contain another FOR statement, you can't use nested FOR loops (one FOR loop enclosed by another). FOR statements take the following general form:

FOR *%%variable* **IN** (*set*) **DO** *DOS command*

The *set* value after IN represents a group of files and must be some variation of a filename and extension. This parameter determines which disk files the FOR loop will affect. Since the pattern-matching symbols * and ? can be used, you may define this group to be very broad or very selective. The program shown above uses the statement IN (*.*) to affect the broadest possible group: every file on the disk. In other cases, you might use IN (*.BAS) to affect all files ending with .BAS, IN (ABC*.*) to affect all files starting with ABC, and so on.

The first FOR statement in COPYUNQ.BAT (FOR %%f IN (*.*) DO) affects every file on the disk. As the FOR loop executes, the variable %%f represents each filename in order. Translated into plain English, this statement means "cycle through every filename on the source disk, using %%f to represent each filename in turn."

IF can perform only a few tests. One of these (IF EXIST *filename*) tests whether a given file exists on the disk. Now you can understand the second part of the FOR statement (IF EXIST %2:%%f). The %2 parameter is a dummy, replaced by the second drive letter you entered when running the program. And the variable %%f is replaced by actual filenames when the program runs. In plain English, this statement means "if the current filename exists on the disk in the target drive...."

Batch programs don't have the equivalent of BASIC's THEN statement (THEN is implied). But in other respects IF processing works much as it does in BASIC. Statements that come after the IF test (on the same line) are performed when

the IF test is true, and skipped when the test is false. Consequently, in COPYUNQ.BAT, the ECHO command (which prints "*filename* WILL NOT BE COPIED") executes only when the file in question exists on both the source and target disks.

Once you understand that much of COPYUNQ.BAT, the rest is not hard to decipher. PAUSE makes the system stop and display the message "Strike any key when ready." This is the only batch command that allows user input. Unfortunately, your choices are severely limited: You can continue only by pressing a key (perhaps after changing disks, etc.) or end the program by pressing Ctrl-Break. In Part 2 of this article, we'll show how to expand this number of options.

NOT And ERRORLEVEL

The second FOR line in COPYUNQ .BAT has a FOR loop and an IF test very similar to the first. However, in this case NOT reverses the logic of the IF test. When the named file *does not exist* on the target disk, the IF test is true and the file is copied.

In addition to testing EXIST (with or without NOT), IF can test two conditions: the equality symbol (==) and ERRORLEVEL. The equality symbol tests whether two strings are identical. ERRORLEVEL is always a number, ordinarily used to pass information from one program to another (indicating whether the first worked successfully and thus set ERRORLEVEL to the expected value). ERRORLEVEL is discussed further in Part 2.

As shown in these brief examples, batch programs can be very powerful: IF lets you pick only the files you want, and FOR lets you repeat commands until the whole task is done. In one sense, the lack of opportunity for user input is an advantage: The entire procedure is automated, and you don't need to understand anything except how to type in the program name. On the other hand, batch programming can seem rigid, limiting, and visually quite dull. Part 2 improves on that situation, offering program examples and a routine that adds colorful graphic displays and multiple-option menu selection to batch programs. ©

News & Products

Commodore Memory Expansion, Interface

Cardco, Inc., has announced *S'more* (Super Memory Optimized RAM/ROM Expansion), a cartridge utility for the 64 which allows more than 60K RAM for programming and adds over 60 new and enhanced BASIC commands and functions. The memory increase is not restricted, and can be used for arrays, variables, and BASIC programs which would normally overload a Commodore 64. *S'more* provides such programming aids as CATALOG (view disk directory), AUTO (line numbering), FIND, CHANGE, TRACE, DUMP, KEY (define function keys), and others.

Function keys are preprogrammed, but can be redefined. For example, F2 runs the current program in memory, F3 reads and displays the disk drive error channel, and F7 displays the current disk directory. The suggested retail price is $69.95. Cardco also plans to introduce the *S'more BASIC Compiler* for $39.95.

Also recently introduced is G Whiz, an improved version of Cardco's +G printer interface, which allows Commodore computers to be hooked up to virtually any Centronics printer. Additional features include faster printing speed (up to 18 times faster with many dot matrix printers), and increased speed on high-resolution screen dumps. The interface also comes with two character sets and open access to DIP switches. The interface attaches directly to the parallel port, eliminating the ribbon connector. Suggested retail price is $69.95.

Cardco, Inc., 300 S. Topeka, Wichita, KS 67202

Circle Reader Service Number 232.

IBM, ST Expert Investment Help

Batteries Included has introduced the first product in its Integral Solutions line of productivity software. The *Isgur Portfolio System* was designed by Lee Isgur, a well-known Wall Street analyst and first vice president of Paine-Webber, Inc. The program allows both casual and professional investors to track up to ten portfolios, each with 50 stocks and 15 separate holdings. With a ten-megabyte hard disk, storage capacity jumps to 1,000 portfolios, with more than 2,000 stocks and 600 holdings of each.

Special tracking and advisory features help determine how and when to raise money, when to sell holdings, and how to prepare for changes in the status of holdings. Built-in telecommunications functions put the user online with major telecommunications services at the touch of a key or two.

The *Isgur Portfolio System* is available for the Atari 520 ST and IBM PC for $249.95.

Batteries Included, 30 Mural St., Richmond Hill, Ontario, Canada L4B 1B5

Circle Reader Service Number 233.

Home Control Package

The X-10 Powerhouse interface is a freestanding controller for lights, heating, cooling, security devices, and other appliances, which you preset with your computer by following simple software-driven onscreen icons representing controllers for each room of your home or business. Available initially for the Apple II series, the system is scheduled to be available for the Commodore 64/128 in September and the IBM PC/PCjr in October.

The Powerhouse lets you control up to 72 lights and appliances plugged into System X-10 modules, which in turn are plugged into your home's electrical outlets. To program the Powerhouse interface, you use a joystick to graphically "install" lights and appliances in each room in positions which correspond to the actual locations in your own home. Once programmed with your computer, the system operates independently. X-10 modules can be purchased at electronics stores. The Powerhouse interface sells for approximately $125, while the appropriate software and connecting cable retails for an additional $25.

X-10 (USA), Inc., 185A LeGrand Avenue, Northvale, NJ 07647

Circle Reader Service Number 234.

PlayWriter Series Expands

Woodbury Computer Associates, Inc.,

has introduced two new titles in its PlayWriter Series of write-your-own-book learning programs: *Mystery!*, a detective book for children nine years of age and older, and *Castles & Creatures*, a fantasy book for children eight and up. With these programs, and the earlier *Tales of Me* and *Adventures in Space* (ages seven to fourteen), children can write, illustrate, print, and bind in hardcover each book they create.

The packages sell for $39.95 each and are available for the Apple II family, Commodore 64/128, and IBM PC/PCjr. Refill packs and teacher's manuals are $9.95 each. Woodbury, in association with Grolier Electronic Publishing, will sponsor a national writing contest this fall with entries handled through schools and retailers.

Woodbury Computer Associates, Inc., 127 White Oak Lane, CN#1001, Old Bridge, NJ 08857

Circle Reader Service Number 235.

IBM, Apple Educational Software

World Book Discovery, Inc., a subsidiary of World Book, Inc., recently released its line of Discovery software for Apple IIe, IIc, and IBM PCjr computers. The series includes 21 programs for children ages three and up.

Discovery software is divided into three categories: Preschool (ages three to five), which focuses on readiness skills like number and pattern recognition); primary (ages six to ten), which offers practice in skills like arithmetic, problem-solving and vocabulary-building; and intermediate (ages ten and up), which helps older students further expand skills learned earlier.

Each series of seven programs is available for $249.95. Individual programs retail for $39.95.

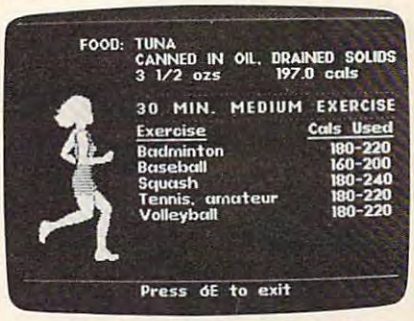
World Book, Inc., The Merchandise Mart, Fifth Floor, Chicago, IL 60654

Circle Reader Service Number 236.

Diet, Adventure Programs

Among several new programs introduced by Bantam Electronic Publishing are *The Complete Scarsdale Medical Diet* ($39.95) for the Apple II series and IBM PC/PCjr, and *The Fourth Protocol*, a graphics and text adventure game based on Frederick Forsyth's bestselling novel, for the Commodore 64/128 ($34.95) and Apple II series ($39.95).

Two adventure programs, the first releases in Bantam's new Choose Your Own Adventure Software Series, are being introduced in September. Entitled *Escape* and *The Cave of Time*, the programs are based on the popular series of books published by Bantam Books, Inc., the software division's owner. They will be available for the Apple II series and for the Commodore 64/128 at a suggested retail price of $34.95.



A sample screen from Bantam's The Complete Scarsdale Medical Diet *program for the IBM and Apple computers.*

Bantam has also announced its Micro-Workshop Series of learning software for children. The first three titles in the series are *Fantastic Animals* (ages four through nine), *Creative Contraptions* (ages seven and up), and *Road Rally U.S.A.* (ages ten and up). The emphasis in each package is to encourage creativity while teaching basic learning skills. The IBM PC/PCjr and Apple II-

series versions will sell for $39.95, while the Commodore version, to be ready this fall, is set at $34.95.

Bantam Electronic Publishing, 666 Fifth Avenue, New York, NY 10103

Circle Reader Service Number 237.

Fast Apple Disk Drive

The Micro Disk Drive (MDD-640), from Tymac, can store up to four and a half times the information possible on a standard Apple drive and can retrieve information up to 93 percent faster. It can be used with Apple II, II+, and IIe computers. Compatible with both DOS 3.3 and ProDOS, the drive uses 3½-inch disks. Suggested retail price is $399.

Tymac Controls Corporation, 127 Main St., Franklin, NJ 07416

Circle Reader Service Number 238.

New Printer Interfaces

Telesys Computer Peripheral Products has announced several new printer interfaces for Apple, Atari, and Commodore computers. For the Atari, Telesys has introduced the TurboPrint/A ($59.95), a graphics and text parallel printer interface which emulates the printer interface portion of the Atari 850 Interface Module. The TurboPrint/A has external DIP switch access and its own power supply. The TurboPrint/GTA ($99.95) is an advanced graphics and text parallel printer interface with optional plug-in 16K or 32K buffer for Atari computers. It is completely software-compatible with the Atari 850, prints Atari graphics characters (including reverse characters), doubles the printing speed of printers without onboard memory, and has external DIP switches. The B16 16K TurboBuffer ($79.95) and the B32 32K TurboBuffer ($109.95) are available for the TurboPrint/GTA. Both TurboPrint interfaces work with Atari 400, 800, 800XL, 65XE, and 130XE computers.

For the Commodore 64/128 and VIC-20 computers, Telesys has introduced the TurboPrint/C ($49.95), a text-only parallel printer interface; the TurboPrint/GC ($69.95), a parallel interface which prints Commodore graphics including reverse characters, prints four typefaces (normal, expanded, compressed, and expanded-compressed combined), and has external DIP switches; and the TurboPrint/GTC ($89.95), a buffer-expandable parallel interface which prints enhanced Commodore graphics. The TurboBuffers mentioned above are available for the GTC at the same prices.

For the Apple IIe and II+ computers, Telesys has announced the TurboPrint/IIe ($59.95), which prints text with many popular Centronics-type printers and graphics with Epson and Epson-compatible parallel printers. The TurboPrint/IIc ($89.95) performs serial to parallel conversions, has switch-selectable baud rates, and is compatible with most Centronics-type printers. All cables required for installation are included with both interfaces.

Telesys Computer Peripheral Products, 43334 Bryant Street, Fremont, CA 94539

Circle Reader Service Number 239.

Inexpensive Daisy Wheel Printer

Apropos Technology has added a daisy wheel printer to its line of microcomputer printers. The Aprotek Daisy 1120 is equipped with a standard Centronics parallel interface and supports many type fonts, including superscripts, subscripts, underlining, and boldfacing. It has a 2K buffer. Options include an automatic cut sheet feeder ($195) and tractor feed ($82). The printer retails for $364 and has a one-year warranty.

Apropos Technology, 1071-A Avenida Acaso, Camarillo, CA 93010

Circle Reader Service Number 240.

Productivity, Young Learning Packages

Six new educational programs for youngsters ages four through six have been announced by Grolier Electronic Publishing for the Apple II series and the Commodore 64/128 computers at $29.95 per package. Three of the programs—*The Story of Miss Mouse, Rhyme Land,* and *First Steps to Reading: Phonics I and II*—concern reading-readiness. The other three packages—*Exploring Your World: Me and Others, Exploring Your World: The Weather,* and *Play Together, Learn Together*—introduce children to the concepts of body parts, clothing, the weather, and the world around them.

Grolier has also created two new productivity packages, *The Information Connection,* a combination telecommunications program, text editor, and tutorial on one disk for the Apple II family and the IBM PC/PCjr ($59.95 each) and for the Commodore 64/128 ($39.95); and *EduCalc,* a spreadsheet designed to be used in homes and schools, for the Commodore 64/128, Apple II series, and the IBM PC/PCjr ($49.95 home, $59.95 school). The *EduCalc Template,* sold separately for $19.95, features ten application templates preformatted for such home and school applications as budgeting, science, math, and sports.

Grolier Electronic Publishing, 95 Madison Avenue, New York, NY 10016

Circle Reader Service Number 241.

Graphics Control for Commodore

Xetec has introduced the Super Graphix, a graphics interface for Commodore computers. Features include an 8K buffer, ten printing modes, and correct graphics/text aspect ratio for all major printers. Internal fonts support superscripts, subscripts, underlining, boldfacing, and a choice of nine pitches. The Super Graphix comes with a lifetime warranty and retails for $99.95.

Xetec, Inc., 3010 Arnold Rd., Salina, KS 67401

Circle Reader Service Number 242.

More From Mindscape

Mindscape has unveiled several new programs. *The Mist,* based on the Stephen King novella of the same name, and *A View to a Kill,* based on the latest James Bond movie, are text adventures. Each is available for the Apple II line, Apple Macintosh, and IBM PC, and costs $39.95.

Deja Vu is Mindscape's first product developed specifically for the Macintosh. It is a graphics/text adventure in the style of an old 1940s Hollywood mystery movie. It retails for $49.95.

The Luscher Profile, developed in cooperation with Dr. Max Luscher, provides a psychological profile of an individual based on his or her reaction to different colors. It is available for the Apple II line, Macintosh, and IBM PC, for $39.95.

Mindscape, Inc., 3444 Dundee Road, Northbrook, IL 60062

Circle Reader Service Number 243.

Electronic Writing Aids

Simon & Schuster Electronic Publishing Group announced several new titles at the Summer Consumer Electronics Show. Among them is the *Webster's New World Series,* which includes *Webster's New World Spelling Checker* (IBM PC/PCjr, $59.95; Apple II series, $49.95), *Webster's New World Word Processor* (with online thesaurus and spelling checker; IBM PC/PCjr, Apple II series, $124.95), and *Webster's New World Electronic Thesaurus* (IBM PC/PCjr, $59.95).

Simon & Schuster also announced an interactive adventure based on the popular television series *Star Trek. STAR TREK: The Kobayashi Alternative* retails for $39.95, and is available for the IBM PC/PCjr, Apple II series, and Commodore 64.

Simon and Schuster Electronic Publishing Group, Simon & Schuster Building, 1230 Avenue of the Americas, New York, NY 10020

Circle Reader Service Number 244. ©

The Beginners Page

Tom R. Halfhill, Editor

Forget Your Algebra

Don't be misled into thinking that an extensive math background is necessary to program computers. Sometimes, it turns out, too much math knowledge confuses things when you're learning to program.

For instance, the following statement is perfectly acceptable in BASIC, but utter nonsense in mathematics: X = X + 1. It would probably earn you extra homework in a beginning algebra class because one of the first things they teach you is that one side of an equation must equal the other.

But in BASIC, not only is X = X + 1 valid, so is X = X + 2 or even X = X + 10000. Part of the difference is in the way that algebra and BASIC handle the symbol X, called a *variable*. In algebra, a variable is an unknown value; it represents a number you're trying to discover by solving the equation. In BASIC, a variable is a method of storing a value that can change as the program runs. Ordinary numbers are known as *constants*, because numbers don't change. In the statement X = X + 1, the number 1 is a constant, and 1 is always 1.

A variable, on the other hand, is like a flexible number. It can equal anything. And you can change what it equals anywhere in the program. The statement X = 5, called an *assignment statement*, sets the variable X equal to 5. (Actually, X = 5 is an abbreviation for LET X = 5. But the keyword LET is optional in almost all modern versions of BASIC, so it's rarely used anymore.)

After a variable has been assigned the value of 5, the computer treats it like a 5 anytime it subsequently encounters that variable when running the program. The advantage of using a variable instead of a constant to represent 5 is that the variable can be manipulated in a number of ways. Try running this simple program:

```
10 X=5:PRINT X:X=X+1:PRINT X
```

When it's done, you should see the numbers 5 and 6 on the screen, even though the program starts by setting X equal to 5. Why? Because the third statement—X = X + 1—is another assignment statement which adds 1 to the current value of X. Since the current value happens to be 5, then 5 plus 1 equals 6. The final statement prints the new value.

Run the program again after removing the first statement. You'll probably see a 0 and 1 on the screen. That's because almost all personal computers automatically *initialize* variables to zero when the program starts. Be aware, however, that some larger computers don't do this. Instead, the variable may contain an unknown, or *garbage*, value. To keep these garbage values from messing up calculations, programs written for these computers usually begin by initializing all variables to zero.

Variable Names

You're not limited to the letter X as a variable name, of course. You can use any letter from A to Z. Longer names are possible, too, and help make your programs easier for others (and even yourself) to understand. For instance, if you need a variable to hold the sum of a series of numbers added together, SUM is more readable than S.

Different versions of BASIC have different rules for variable names. In Commodore and Applesoft BASIC, variables can consist of letters and numbers but no symbols, as long as the first character is a letter. A1 is allowed, but not 1A. Commodore and Apple variables can be of any length, but only the first two characters are *significant*. That means the computer looks only at the first two characters of the name to decide if it's unique. SUM and SAM are treated as different variables, but SUM1 and SUM2 are not. Watch out for this, because it can lead to mysterious programming bugs.

Also, Commodore and Applesoft BASIC (and most other versions of BASIC) don't allow variables with *reserved words*. That is, any word that BASIC recognizes as a command, statement, or function cannot be part of a variable name. This restriction, too, can lead to mysterious errors. An example is the variable TOTAL. It looks as innocent as SUM, but contains the keyword TO (which is part of the FOR/NEXT loop statement, as in FOR X = 1 TO 10).

IBM BASIC permits variables with letters, numbers, and decimal points, as long as the name starts with a letter. Names can be of any length, and the first 40 characters are significant. Although a variable cannot be a reserved word, it can *contain* a reserved word. Therefore, the variable TOTAL is okay but the variable TO is not.

In Atari BASIC, variables may contain letters and numbers, as long as they start with a letter, and can be of any length with *all* characters significant. What's more, variables can include reserved words or even consist of a reserved word if the assignment statements use the optional keyword LET. Thus you can have a statement such as LET LET = LET + LET. In TI BASIC, variables are limited to 15 characters (all significant) and can start with either a letter or one of the following symbols: @, [,], /, and _. Oddly, though, the rest of the name cannot *contain* a [,], or /.

Up to now we've been discussing *numeric* variables—variables that represent ordinary numbers. Next month we'll examine other types of variables. ©

Computers and Society

David D. Thornburg, Associate Editor

Compilers, Interpreters, And Flow: Conclusion

Over the past two columns I've explored some ways in which programming with an interpreter or compiler can influence the nature and complexity of the programs we write. As this is written, I'm approaching the end of a Logo-based programming course that I've been teaching to graduate students at Stanford. (Yes, Virginia, there is Logo after second grade!) Because I wanted my students to have access to a high-speed runtime language, I elected to use a Logo compiler in this course.

As was mentioned last month, the speed improvements in compiled programs have a lot to do with the program's ability to maintain a sense of "flow" with the user. But, just as the compiler's benefits are directed toward the user, interpreters provide quite a few benefits to the programmer—especially if the programmer is just learning to use the language. When computer languages are taught in school, the assignments and lectures usually structure the learning process for the students, and the work at the keyboard tends to reinforce what has already been learned rather than encourage new discoveries. It is when learning a new language on your own that an interpreter is of tremendous value.

Instead of studying a new language in a book before trying to create programs, I usually jump in with both feet and start sloshing around, trying to get something to work. In educational circles, this experimental learning style is called *discovery-based learning*. In the realm of videogames, people like Bernie DeKoven call it "learning by dying." One of the reasons videogames can be learned without referring to extensive manuals is that you can usually figure out what caused you to lose your turn or one of your "lives," so you can avoid that mistake the next time.

A well-designed interpreter and program editor could allow people to master new programming languages in this way. (This approach could also be applied to education in general, but that's a topic for another column.)

Bug Detectors

One example of this is Macintosh Pascal. Mac Pascal contains both an interpreter and a powerful program editor that allows beginners to learn this language in a highly interactive and self-paced fashion. Those of you who know Pascal may think that the "sloshing around" style of learning is ill-suited to a language whose structure is more like a faceted jewel than a lump of clay. But I believe the rigid structure imposed on Pascal programs makes an "intelligent" editor and program interpreter of tremendous value.

The program editor automatically indents program lines and boldfaces Pascal keywords, making the listing very easy to scan. Furthermore, if the interpreter detects an error as the program is running, helpful "bug detection" tools point out the line with the problem and provide as much help in fixing the problem as possible.

This interaction between the interpreter and program editor encourages the programmer to try new constructs and ideas, safe in the knowledge that "bad grammar" will be detected and clearly identified.

The interaction between the interpreter and program editor does not stop here. You can also execute programs line by line, place "stop signs" at various locations in the program to help debug the code, and even create windows to show the values of certain variables as the program runs.

Normally, Pascal doesn't allow you to execute single-line programs. But Macintosh Pascal does, so you can type fragments of Pascal code to see how they behave. This makes the language far easier to learn. Fortunately, Mac Pascal is being adapted for the Apple IIe and IIc computers as well, thus bringing this style of Pascal programming to a far larger audience.

The Best Compromise

The choice between an interpreter or a compiler, then, depends on the application and the point of view. From the user's perspective, compiled programs have the advantage of execution speed. For programmers, interpreters have more advantages. Since most programs involve both users and programmers, this suggests that widely used programming languages should be available in two forms—an interpreter for creating and testing programs, and a compiler to produce the final product.

Furthermore, it's essential that these modules be compatible with each other's source code. Programmers should be able to take a program that was written and debugged with the interpreter and drop it into the compiler to generate the highly efficient runtime code for the user.

As progress continues along these lines, we'll see a trend toward application programming in increasingly higher-level languages. No longer will programmers have to learn machine language to build industrial-strength programs. Anyone who knows how to write in high-level languages will be able to create efficient programs of all types for their own use, as well as for the use of others.

David Thornburg welcomes letters from readers, but regrets that he cannot personally answer all his mail. Correspondence should be sent in care of COMPUTE!. ©

Telecomputing Today

Arlan R. Levitan

SIG Wars

You may recall that last month we raised the question of what the commercial information services would do about system operators (sysops) of special interest groups (SIGs) or discussion forums who were beginning to set up branches of their SIGs on competing services.

The shoe has finally dropped. In May, users of the Delphi information service noticed that the Delphi branch of MAUG (Micronetworked Apple User Group) mysteriously vanished after a couple of weeks of existence, to be replaced by a generically named Apple SIG with a new sysop.

Apparently CompuServe, the current SIG heavyweight among information services, was still smarting from the wholesale defection of its Commodore forum sysops to another competing service. In any case, CompuServe won back the sysop of MAUG (its most popular SIG forum) with an offer that couldn't be refused.

Shortly after the disappearance of MAUG/Delphi, MAUG/CompuServe became *three* SIGs: one for Apple II owners, a second for Macintosh fans, and a third for Apple software and hardware developers. All of the SIGs remained under the able tutelage of the original MAUG sysop, who ended up with three SIGs rather than one (or zero).

This incident does raise some disturbing issues which should be aired and discussed within the telecomputing community. At the conclusion of this column, I'll give you a way to participate in this debate.

Two Points Of View

A lot of users cried foul after the MAUG affair, accusing one of the parties involved of restraint of trade and illegal chicanery. Much of this was mildly sour grapes from MAUG regulars who had regarded MAUG/Delphi as welcome relief for their pocketbooks. MAUG/Delphi's off-shift hourly rate for 1200 bits-per-second (bps) modems was half that of CompuServe's. In fact, Delphi's off-shift rate even for 2400 bps was still less than CompuServe's 1200 bps charges. (CompuServe is the leading information service, so its competitors are offering lower rates in an effort to entice customers.)

Setting emotions aside for a minute, there is no evidence that anyone involved in the MAUG incident abrogated the legal rights of any other party. As for whether the negotiations tended toward "hard ball," all I can do is remind mild-mannered telecomputerists that in the words of Jack Tramiel, "business is war."

Users who regularly upload public domain software to SIGs get little in return other than bills for their connect time. Shouldn't there be a greater reward than simply a pat on the back?

The situation does have aspects of David versus Goliath though, and since we love to root for the underdog (even when Sweet Polly isn't involved), it's hard on a gut level not to side with the sysops. Even the most influential sysops tend to have less bargaining power than corporations with legal staffs.

Who Owns The Info?

Another issue that tends to bother many telecomputing regulars is the question of who owns (or who they think should own) the information contained in a SIG. By the terms of most information service user contracts, the contents of both the message base and program download areas are the property of the service. Yet, the messages and the files uploaded to the program area are provided by the users. So SIG users pay the information service to distribute their messages and programs.

There is little doubt that a case may be made for the information service owning the message base, but what about ownership of the public domain programs?

Users who regularly upload public domain software to SIGs get little in return other than bills for their connect time. Shouldn't there be a greater reward than simply a pat on the back? Many noncommercial bulletin board systems offer special benefits to regular contributors. Why shouldn't commercial services do the same?

To be perfectly fair, SIG users do receive value from the service in the form of replies to messages and software to download. Hopefully the value received is commensurate with the tariffs levied.

Time For An E-Poll

How do you feel about this issue? Am I being too tough or not tough enough on the information services? Am I off base or stealing home on a suicide squeeze? E-mail your opinions to me and I'll print the results of our electronic mini-poll in the months to come.

Arlan R. Levitan
Source ID: TCT987
Delphi: ARLANL
People Link: ARLANL
CompuServe: 70675,463

A Robot Toddler

A couple of months ago, the Heath Company of Benton Harbor, Michigan sent me a HEROjr personal robot to review on the PBS show *The New Tech Times*. HEROjr costs $600 in kit form and is a 19-inch tall, 22-pound comedian. He comes with a repertoire of slapstick sayings (like "Nanu! Nanu!" and "Beam me up, Scotty!"), corny songs (like "Old MacDonald Had a Robot"), and special robot games (like "Cowboys and Robots"). He can order a hamburger and fries at MacDonald's, imitate a Dr. Pepper commercial, and carry on an animated conversation with a vacuum cleaner that he has mistaken for a human being.

Despite his impressive technical credentials—including full programmability, speech output, light, sound, and infrared sensors, ultrasonic sonar, a clock/calendar, a burglar alarm, a 17-key keypad, an RS-232 interface, and whatnot—HEROjr has an aura of lovable vulnerability. He is not very tall, he talks in a shy little voice, and he is single-minded about looking for human beings to play with or serenade. If he were a little smaller, he'd make a perfect lap robot.

During the day, HEROjr wanders around our house singing, gabbing, and reciting nursery rhymes. He is about the size of a toddler and he acts like a toddler. He is unpredictable, has a mind of his own, and frequently gets into mischief. I keep a toddler gate at the top of the stairs, since most of HEROjr's exploring takes place on the second floor of our house, and I wouldn't want him falling down the steps.

The main difference between HEROjr and a toddler is that when you want HEROjr to take a nap, you just push the SLEEP switch on the back of his head. This feature comes in handy when HEROjr gets himself stuck under the kitchen table, or when you want to plug a new personality cartridge into his brain. Or when his two six-volt, nickel-cadmium batteries are low and you need to recharge them.

HEROjr got a chance to see something of the world recently when I received a speaking invitation from the School Trustees Association in Vancouver, British Columbia. The school trustees (equivalent to school board members in the U.S.) were having their annual meeting, and they wanted me to speak about the future of computers in schools. I had become so attached to HEROjr by this time that at the last minute I decided to take him along.

There's A Robot On This Airplane!

Our trip began with HEROjr riding with me in the back of a taxicab to the Roanoke airport early one morning to catch a plane to Chicago. When I introduced the robot to Red Eye, my favorite Roanoke cabbie, Red Eye said, "Junior, eh? That's a good name for a robot!"

From that point on, HEROjr became "Junior."

Junior and I spent the rest of that day catching planes and running frantically across airports trying to make connecting flights. People reacted to Junior in a variety of ways. A few were hostile—like the flight attendant on one airline who wouldn't say hi to Junior "Because," she said (obviously having given great thought to the matter), "I don't say hi to robots!" But most people were openly curious and receptive. And some had a strong tendency to anthropomorphize the robot. They wanted to talk with Junior, play with him, protect him, and care for him. For example, one flight attendant wasn't comfortable until she had tucked a pillow behind Junior's head and a blanket around his wheels—"Just in case he gets chilly," she explained with a smile.

On the plane from Chicago to Seattle, I overheard a woman in the seat ahead of me asking her husband about Junior. "I hope the robot has its seatbelt on," she said.

But Junior wasn't wearing his seatbelt. He was sleeping in the coat closet at the back of the airplane because it was the only place he would fit, and also because it kept him hidden from nervous passengers and unfriendly flight attendants. Suddenly our plane hit some turbulent weather, and Junior apparently bumped into a hanging bag hard enough to throw his switch from SLEEP to NORM. Instantly Junior woke up and began singing to someone's overcoat. "Daisy, Daisy," he crooned, "Give me your answer, true. I'm half crazy, all for the love of you...."

The passengers near the coat closet began laughing, but some passengers were worried, too. "Who is that in there?" asked one man. Another cried, "There's a robot on this airplane!"

The flight attendant rushed to my seat in the forward section of the plane and took me to Junior's rescue. By the time I got there, he was screaming "Help! Help! Help!" This means that he had tried to explore but couldn't, because his wheels were stuck. As I reached into the coat closet and pushed his switch back to SLEEP, the flight attendant said, "I tried to calm him by telling him that you were coming. But he just kept crying for help."

Next month I'll tell you some more of Junior's adventures, and I'll have some thoughts about how people react when they meet their first real robot—up close and in person. ©

Donald B. Trivette

The Mysterious Editors

Recently I asked a group of computer users—mostly those with IBM PCs—how many used an editor. I got a blank stare. Most had only the vaguest idea of what an editor is and what you do with one—the consensus being that editors are either useless or redundant. (Self-preservation prevents me from making a comparison between the software and the profession.) No one confessed to actually owning an editor, yet everyone who has an IBM PC or PCjr has at least three of them.

An editor is a program that allows you to enter text, numbers, or other data (binary, hexadecimal, etc.) into the computer's memory; to display, modify, and change that data; and to store and retrieve it using an external device such as a disk drive. You may recognize that word-processing programs fall within this definition, for word processors are in fact very fancy editors. Most of the commands (and complications) of a word processor are for formatting and printing text in a *pretty* way—the actual editing commands are relatively few and easy to use.

The first editor IBM gives you is built into the hardware. It's a part of the BASIC language—the part that allows you to type BASIC statements and to move the cursor around the screen with the arrow keys. This is called *full-screen editing*. The BASIC editor comes up automatically when you turn on a PC or PCjr without a disk in the drive, or when you type BASIC (or BASICA) at the DOS A> prompt (the PCjr requires Cartridge BASIC in this case). It's a special-purpose editor designed to make entering and correcting BASIC statements easy, and it can't really be used for anything else. Nevertheless, it *is* an editor.

The second editor IBM gives its users is on the DOS disk and is named DEBUG. This is also a special-purpose editor. Using DEBUG, a programmer can follow the step-by-step execution of a machine language program and trace the contents of memory as it changes. DEBUG can also be used to display and change the contents of a file—particularly a program file containing machine language instructions. However, you must know something about machine language to use DEBUG effectively.

The third editor is one almost no one uses, although it too comes on the DOS disk. It's called EDLIN for LINe EDitor. The story goes that some programmers at Microsoft put together a quick and dirty editor for their own use while working on the then-secret IBM PC project. When IBM bought DOS and BASIC from Microsoft, the editor was shipped along by mistake. Supposedly some folks at IBM thought EDLIN was supposed to be a consumer product, so it was included on the DOS disk along with BASIC and DEBUG. What was intended to be an internal tool has now permeated thousands of homes and offices.

The Ugly Duckling

Neither Microsoft nor IBM is especially proud of EDLIN. It doesn't showcase the PC's power, so it remains the ugly duckling of IBM software. Still, it has many of the requisites for a general-purpose editor: You can use it to create, display, and modify a file, and you can use it to save and load files. If only it had a print command, it might have been the PC's first word processor. And if it supported full-screen editing like BASIC, instead of primitive line-editing, it might be one of the PC's most popular programs. Still, it's not a totally useless editor—once you get used to it.

Some rainy Saturday, when you want to learn something new, take out your DOS disk and try EDLIN. The documentation is in the DOS manual, and you're likely to need it. Here are a few tips:

- At the A> prompt, type EDLIN *and* the name of the file you want to edit. EDLIN won't start unless you give it the name of a file, new or existing, when you start the program.
- The DOS disk is write-protected, so either copy EDLIN to another disk or edit a file on drive B. For example, to edit a new file named ABC on the disk in drive B:, type EDLIN B:ABC.
- The asterisk (*) you'll see when EDLIN is active is the EDLIN prompt, just as A> prompts for DOS and Ok for BASIC.
- EDLIN comes up with the * prompt. To begin entering input, type an I (for input mode) at the prompt.
- Line numbers are typed *before* editor commands. For example, to list lines 20 through 30, the command is 20,30L. This is exactly backward from BASIC.

There *are* some reasons, other than curiosity, to use EDLIN. It has so few commands (14) that it's super compact. The whole program is just 4600 bytes long. That means there's room for EDLIN on almost any disk, so you can always have an editor online to create a new BATCH file or even to quickly modify a text file. And because it's so small, there's lots of memory left for the file itself—an important consideration for PCjr users. More than once on the Junior I've had to use EDLIN to edit a file too large for my memory-hungry word processor. That's when an ugly duckling truly becomes a swan.

Donald B. Trivette is the author of Putting Jr to Work: A Guide to the IBM PCjr, *published by COMPUTE! Books.*

Programming the TI

C. Regena

The OPEN Statement

Recently I received a call from a young programmer who wanted to know more about the OPEN statement. I really couldn't give him an adequate answer over the phone ("look at your manuals"), so I'll give several examples here.

The OPEN statement means about the same thing in all versions of BASIC, but each computer has its own variations. As the statement implies, the function of OPEN is to open a *file*—or, as I like to think of it, to get the attention of another device to be used with the main console. Various forms of the OPEN statement are described in the manuals that come with the peripherals.

OPEN statements are generally followed by the number of the device you want to address. In TI BASIC, you may use any constant or variable with a value of 1 to 255 for the device number. The number is preceded by the # sign, such as OPEN #1: to open file #1.

Whenever you use an OPEN statement, it is good programming practice to include a CLOSE statement when you're finished with the device. If your program stops with an error, the files are automatically closed.

Speech Synthesis

If you have the TI Speech Synthesizer and the *Terminal Emulator II* command module, use an OPEN statement to make the computer talk:

```
OPEN #1:"SPEECH","OUTPUT
```

This alerts the speech device to be ready for output. Then all you need is a PRINT #1 statement (pronounced "print file one"):

```
PRINT #1:"HELLO"
```

Within a program, you can print on the screen with a regular PRINT statement and produce speech with the PRINT # statement:

```
10 OPEN #5:"SPEECH","OUTPUT
20 PRINT "THIS IS A TEST."
30 PRINT #5:"THIS IS A TEST."
40 CLOSE #5
```

By the way, if you'd like to hear your program listing, use the command LIST "SPEECH."

Printing

To get the most out of a printer, you really need to study your printer and interface manuals. The Texas Instruments RS-232 interface manual shows all the different parameters for accessing your printer. Here are some examples of OPEN statements:

```
OPEN #1:"TP"
OPEN #1:"PIO"
OPEN #1:"RS232.BA=600"
OPEN #1:"RS232.TW.BA=110"
```

Once you've determined the necessary OPEN statement for your hardware configuration, you can use PRINT #1 (or whatever file number you opened) to send any command to the printer. If someone else wants to modify your program for another configuration, they can simply change the OPEN statement for their setup.

PRINT # lets you print constants, variables, and strings. You can align columns with the TAB function. In Extended BASIC, the PRINT #1, USING statement also is handy to format the output. Here's a short example of sending output to the printer:

```
10 OPEN #1:"RS232.BA=600"
20 PRINT #1:TAB(10);"THIS SHOULD
    PRINT."
30 CLOSE #1
```

File Processing

If you want to learn more about file processing with the OPEN statement, the manual that comes with the TI-99/4A contains a good description of various forms of OPEN. I also discussed file processing in my COMPUTE! columns of March, April, and May 1984. And a program which saves names and addresses on cassette is in my book, *Programmer's Reference Guide to the TI-99/4A*.

This month's example program shows how to use the OPEN statement to save a drawing on cassette. Type in and run the program, then press the arrow keys to draw a low-resolution picture on the screen. When you're done, press CTRL-S to save the picture on tape. You can load it by pressing CTRL-L.

The program uses different character numbers for the different-colored drawing squares. These are defined in lines 140–200. When the program loads a picture, it uses the character numbers to determine the locations of the colored squares.

Lines 540–870 contain the drawing procedure. The variable X is the row and Y is the column. C is the character number. If you press the space bar, C is incremented by 4 and the color of the square changes. The arrow keys move the square, and it stops at each screen edge.

Lines 890–990 keep track of the character numbers for each column in each row if you want to save the picture. Lines 1000–1050 save the strings of G$, which contain the character numbers on cassette. The procedure takes quite a while because each item saved has its own leader. You can hear the cassette recording during this process. The OPEN statement in line 1000 opens device #1 as "CS1," or cassette, for OUTPUT. INTERNAL and FIXED are two options available in the OPEN statement for cassette that specify how to save the data. FIXED 96 is used because each G$ will be 96 characters long.

Lines 1150–1210 load the picture from cassette. Notice how the OPEN statement in line 1160 matches the format of line 1000, except that it specifies INPUT instead of OUTPUT. The INPUT #2 statement reads G$ row by row.

Input variables must match the way they were previously saved, although you can use different variable names. Lines 1230–1320 recreate the picture on the screen from the information read off tape.

If you'd like to save typing effort, you can obtain a copy of this program by sending a blank cassette or disk, a stamped, self-addressed mailer, and $3 to:

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Cedar City, UT 84720

Doodle With CS1

```
100 REM  DOODLE WITH CS1
110 DIM G$(24)
120 CALL CLEAR
130 PRINT TAB(11);"DOODLE":
    :::
140 FOR C=10 TO 16
150 D=C*8+24
160 CALL CHAR(D,"")
170 CALL CHAR(D+4,"FFFFFFFF
    FFFFFFFF")
180 CALL COLOR(C,C,C-7)
190 NEXT C
200 CALL COLOR(10,2,3)
210 PRINT "CHOOSE:"
220 PRINT :"1 DRAW"
230 PRINT :"2 LOAD PICTURE"
    :::
240 CALL KEY(0,K,S)
250 IF K=50 THEN 1160
260 IF K<>49 THEN 240
270 REM
280 CALL CLEAR
290 PRINT "PRESS SPACE BAR
    TO CHANGE"
300 PRINT "SCREEN COLOR."
310 PRINT :"PRESS <ENTER> F
    OR DESIRED(3 SPACES)COL
    OR."
320 SC=3
330 CALL SCREEN(SC)
340 CALL SOUND(100,1497,2)
350 CALL KEY(0,K,S)
360 IF K=13 THEN 420
370 IF K<>32 THEN 350
380 SC=SC+1
390 IF SC=16 THEN 380
400 IF SC=17 THEN 320 ELSE
    330
410 REM
420 CALL CLEAR
430 PRINT "MOVE ARROW KEYS
    TO DRAW."
440 PRINT :"PRESS SPACE BAR
     TO CHANGE(3 SPACES)COL
    ORS."
450 PRINT :"PRESS CTRL S TO
     SAVE."
460 PRINT :"PRESS CTRL L TO
     LOAD."
470 PRINT :"PRESS CTRL E TO
     END."
480 PRINT ::"NOW PRESS ANY
    KEY TO START."
490 X=12
500 Y=16
510 C=104
520 CALL KEY(0,K,S)
530 IF S<1 THEN 520
540 REM  DRAW
550 CALL CLEAR
560 CALL SCREEN(SC)
570 CALL KEY(0,K,S)
580 CALL HCHAR(X,Y,32)
590 CALL HCHAR(X,Y,C)
600 IF K=147 THEN 890
610 IF K=140 THEN 1160
620 IF K=133 THEN 1350
630 IF K<>32 THEN 680
640 C=C+4
650 IF C<>160 THEN 570
660 C=104
670 GOTO 570
680 IF K<>69 THEN 730
690 X=X-1
700 IF X>0 THEN 570
710 X=1
720 GOTO 570
730 IF K<>83 THEN 780
740 Y=Y-1
750 IF Y>0 THEN 570
760 Y=1
770 GOTO 570
780 IF K<>68 THEN 830
790 Y=Y+1
800 IF Y<33 THEN 570
810 Y=32
820 GOTO 570
830 IF K<>88 THEN 570
840 X=X+1
850 IF X<24 THEN 570
860 X=24
870 GOTO 570
880 REM  SAVE
890 CALL SOUND(150,1200,2)
900 FOR ROW=1 TO 24
910 G$(ROW)=""
920 FOR COL=1 TO 32
930 CALL GCHAR(ROW,COL,G)
940 IF G<>32 THEN 960
950 G=200
960 G$(ROW)=G$(ROW)&STR$(G)
970 NEXT COL
980 CALL SOUND(50,1200,2)
990 NEXT ROW
1000 OPEN #1:"CS1",OUTPUT,I
     NTERNAL,FIXED 96
1010 FOR ROW=1 TO 24
1020 PRINT #1:G$(ROW)
1030 NEXT ROW
1040 PRINT #1:X,Y,C,SC
1050 CLOSE #1
1060 PRINT ::"CHOOSE:"
1070 PRINT :"1 GO BACK TO S
     AME DRAWING"
1080 PRINT :"2 START NEW DR
     AWING"
1090 PRINT :"3 SAVE ANOTHER
      COPY"
1100 PRINT :"4 LOAD PICTURE
     "
1110 PRINT :"5 END"
1120 CALL KEY(0,K,S)
1130 IF (K<49)+(K>53)THEN 1
     120
1140 ON K-48 GOTO 1230,280,
     1000,1160,1350
1150 REM  LOAD
1160 OPEN #2:"CS1",INPUT ,I
     NTERNAL,FIXED 96
1170 FOR ROW=1 TO 24
1180 INPUT #2:G$(ROW)
1190 NEXT ROW
1200 INPUT #2:X,Y,C,SC
1210 CLOSE #2
1220 REM
1230 CALL CLEAR
1240 CALL SCREEN(SC)
1250 FOR ROW=1 TO 24
1260 FOR COL=1 TO 32
1270 G=VAL(SEG$(G$(ROW),COL
     *3-2,3))
1280 IF G<>200 THEN 1300
1290 G=32
1300 CALL HCHAR(ROW,COL,G)
1310 NEXT COL
1320 NEXT ROW
1330 GOTO 570
1340 REM
1350 CALL CLEAR
1360 END
```

©

INSIGHT: Atari

Bill Wilkinson

Using Serial Input/Output

Last month, I introduced the structure of Atari's operating system (OS). My most important point was that the OS consists of several layers. When you type in a BASIC statement such as LPRINT "Hi There!", you cause a fairly complex chain of events. First, BASIC figures out that LPRINT means you want to use a printer, so it calls the OS to open a channel to the printer (always channel number 7, in this case). Then BASIC sends the bytes to be printed to a part of the OS called Central Input/Output (CIO), which in turn realizes that a file to the printer has been opened on that channel. CIO calls the printer driver, which collects bytes until it has a block of them (or until it gets a carriage-return character or a CLOSE command). Finally, the printer driver sends a block of bytes to the printer by calling *Serial Input/Output* (SIO)—another subroutine inside the OS, and the subject of this month's discussion.

I'd like to point out that this process stops at SIO only as far as the computer is concerned. The printer interface (for example, an 850 Interface Module) also contains a microprocessor which collects the block sent to it by SIO. Then the interface passes the block, a byte at a time, to the printer. Within the printer, yet another microprocessor is usually employed to control the various motors and hammers and wheels that actually place the characters on paper.

Did you note that the process of printing even a single character most probably requires the use of three microprocessors? Did you stop to think that each of these processors requires software to make it work? Did you ever wonder why there are so many people making a living at programming? (Though barely, in the case of some of us.)

Perhaps the most amazing thing is that, for the most part, the three microprocessors work reliably and efficiently together. (It is even more amazing when you consider that either the printer or interface module is often made by a company other than the one which made the computer!) The secret to success here is standardization. The usual printer connection is a fairly simple one, originally defined by a company named Centronics and now adopted by almost every manufacturer in the microcomputer market.

The way your Atari computer "talks" to your interface module, though, is strictly an Atari invention—the SIO. There is a well-defined protocol associated with SIO. It includes such niceties as Command and Data Frames, Acknowledgment, Nonacknowledgment, Command and Bus Errors, and more. Luckily, 99 percent of all Atari programmers need never learn these gory details, since there really isn't anything you can do to change their workings.

Disk Access Via SIO

Some programmers, however, do want to send and receive blocks via SIO. And usually the blocks to be transferred are disk sectors. So let's look at how one reads or writes a specific disk sector.

When SIO is called by a program, it expects to find certain information in a *Device Control Block* (DCB). There is only one DCB, located at $0300–$030B (768–779 decimal). It contains four one-byte values and four two-byte (word) values, all of which must be set up properly. The accompanying table briefly describes each location in the DCB. See COMPUTE! Books' *Mapping the Atari* for more details.

Does all this look confusing? Not to worry. Program 1 below is a subroutine which does most of the work for you. Just type it in, LIST it to disk or cassette, and use it in your own programs whenever you wish. Program 2 demonstrates how to use the subroutine, though I hope the comments make it pretty much self-explanatory. (Perhaps I should note that a command of R reads a sector, P writes a sector without verifying it, and W both writes and verifies a sector.) To use Program 2, you must add the subroutine from Program 1. You can either type in the lines from Program 1, or ENTER them from disk or tape if you have LISTed out a copy of Program 1. Program 3 is the source code behind the DATA statements in line 9210 of Program 1.

If you type in and use Program 2, you might like to remember that the *volume table of contents* (VTOC) of a DOS 2.0-compatible disk is in sector 360. The directory occupies sectors 361 to 368. Sectors 1, 2, and 3 are for booting only. All other sectors from 4 to 719 should be DOS file sectors. (See COMPUTE! Books' *Inside Atari DOS* for more info. Caution: The diagram of the sector link bytes is wrong.)

Finally, I give you a hint and challenge for next month: Most drives not made by Atari allow the user to specify their configuration (for example, single or double density). You can read their configuration blocks with an SIO command of N (or write via O). But be careful! DSIZE must be given as 12 bytes. Can you modify our subroutine to read the configuration block? Good luck.

DCB Layout Table

Location Hex	Location Dec	Name	Size	Purpose
300	768	DDEVIC	1	Name of device on SIO bus (all disk drives use "1," $31, as a name).
301	769	DUNIT	1	Unit number of device (to distinguish D1: from D2:, for example).
302	770	DCOMND	1	Command, usually an ATASCII letter, such as "R" for read sector (but "!" will format a disk!).
303	771	DSTATS	1	Direction control before call to SIO; status of operation upon return.
304	772	DBUF	2	Address of buffer to read from or write to, as appropriate.
306	774	DTIME	2	Timeout value. SIO waits this many seconds before giving up.
308	776	DBYTE	2	Number of bytes to transfer (always 128 or 256 for disks).
30A	778	DAUX	2	Purpose varies; always sector number when used with disks.

Program 1: SIO Subroutine

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing In Programs" published bimonthly in COMPUTE!.

```
LF 9000 REM ..................
        ............
JG 9010 REM DISK SECTOR I/O
        ROUTINE
JF 9020 REM . ENTER:
JD 9030 REM .{3 SPACES}secto
        r number in SECTOR
ND 9040 REM .{3 SPACES}drive
         number in DRIVE
DC 9050 REM .{3 SPACES}buffe
        r address in ADDR
IP 9060 REM .{3 SPACES}comma
        nd in CMD$
NJ 9070 REM .{3 SPACES}densi
        ty in DENSITY
GM 9080 REM (only "R","W","P
        " are valid for CMD$
        )
EA 9090 REM (only 1=SGL and
        2=DBL are valid for
        DENSITY)
FA 9100 REM . EXIT:
CH 9110 REM .{3 SPACES}statu
        s in SIOSTATUS
LA 9120 REM
OI 9160 TRAP 9220:REM activa
        ted if SIOCALL$ alre
        ady DIM'd
IO 9170 DIM SIOCALL$(16)
MC 9180 RESTORE 9210
JP 9190 FOR CNT=1 TO 14:READ
         BYTE
EN 9200 SIOCALL$(CNT)=CHR$(B
        YTE):NEXT CNT
MC 9210 DATA 104,32,89,228,1
        73,3,3,133,212,169,0
        ,133,213,96
FB 9220 TRAP 40000:REM turn
        off TRAP
MO 9230 POKE 768,ASC("1"):RE
        M don't ask me why
GC 9240 POKE 769,DRIVE:REM m
        ust be 1 through 8
OJ 9250 POKE 770,ASC(CMD$)
DN 9260 POKE 771,128:REM ass
        ume write
LP 9270 IF CMD$="R" THEN POK
        E 771,64
HA 9280 POKE 773,INT(ADDR/25
        6):REM buffer addres
        s
PF 9290 POKE 772,ADDR-256*PE
        EK(773)
FB 9300 POKE 774,3:REM short
         timeout
JK 9310 POKE 775,0:REM (high
         byte of timeout)
AA 9320 POKE 776,128:POKE 77
        7,0:REM assume singl
        e density
LG 9330 IF DENSITY=2 THEN PO
        KE 776,0:POKE 777,1
KK 9340 POKE 779,INT(SECTOR/
        256)
LD 9350 POKE 778,SECTOR-256*
        PEEK(779)
HM 9360 SIOSTATUS=USR(ADR(SI
        OCALL$))
LD 9370 RETURN
```

Program 2: SIO Demo

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing In Programs" published bimonthly in COMPUTE!.

```
KC 1000 REM PROGRAM TO DEMON
        STRATE SECTOR READ S
        UBROUTINE
HJ 1010 REM NOTE: rather tha
        n ask questions, we
EB 1020 REM .{5 SPACES}assum
        e that we will work
        with drive
KP 1030 REM .{5 SPACES}numbe
        r 1 and that it is s
        ingle
HK 1040 REM .{5 SPACES}densi
        ty (128 byte sectors
        )
KK 1050 REM
PA 1100 DIM BUFFER$(256):REM
         guaranteed adequate
ML 1110 ADDR=ADR(BUFFER$):RE
        M required by subrou
        tine
PI 1120 DRIVE=1:REM assumpti
        on...easily changed
HC 1130 DENSITY=1:REM assump
        tion...ditto
JO 1140 DIM CMD$(1):CMD$="R"
        :REM always, for thi
        s demo
KL 1150 REM
NB 1160 PRINT "What sector t
        o display";
CJ 1170 INPUT SECTOR
BD 1180 GOSUB 9000
EM 1190 GRAPHICS 0
DL 1200 PRINT "Read Sector "
        ;SECTOR;" gave Statu
        s ";SIOSTATUS
OP 1210 SIZE=DENSITY*128:REM
         size is 128 or 256
CJ 1220 SECTOR=PEEK(ADDR+SIZ
        E-3)
JC 1230 FILE=INT(SECTOR/4)
EP 1240 SECTOR=SECTOR-4*FILE
ON 1250 SECTOR=SECTOR*256+PE
        EK(ADDR+SIZE-2)
EA 1260 CNT=PEEK(ADDR+SIZE-1
        )
DO 1270 PRINT "If DOS file s
        ector, this is file
        #";FILE
NB 1280 PRINT "  there are "
        ;CNT;" bytes in this
         sector"
NA 1290 PRINT "  and the nex
        t sector is number "
        ;SECTOR
FB 1300 PRINT
JL 1310 FOR LINE=0 TO DENSIT
        Y*128-1 STEP 8
FP 1320 BYTE=LINE:GOSUB 1500
        :PRINT ":";
NK 1330 FOR CNT=0 TO 7
PD 1340 BYTE=PEEK(ADDR+LINE+
        CNT):GOSUB 1500:PRIN
        T " ";
ON 1350 NEXT CNT
NN 1360 FOR CNT=0 TO 7
DA 1370 BYTE=PEEK(ADDR+LINE+
        CNT)
AD 1380 IF BYTE>127 THEN BYT
        E=BYTE-128
BB 1390 PRINT CHR$(27);CHR$(
        BYTE);
OJ 1400 NEXT CNT
FD 1410 PRINT
CD 1420 NEXT LINE
FF 1430 PRINT
MK 1440 GOTO 1160
LA 1450 REM ..................
        ..................
        ...
PF 1460 REM A QUICKY DECIMAL
         TO HEX CONVERTER
MF 1500 TRAP 1520
DO 1510 DIM HX$(16):HX$="012
        3456789ABCDEF"
PD 1520 TRAP 40000
EK 1530 HX=INT(BYTE/16)+1:PR
        INT HX$(HX,HX);:HX=B
        YTE-16*HX+17:PRINT H
        X$(HX,HX);
KK 1540 RETURN
```

Program 3: Subroutine Source Code

Note: This listing is provided for informational purposes; it requires an assembler to enter into your computer.

```
    *= anyplace
CALLSIO
  PLA      ;throw away count
           ; of arguments
  JSR SIOV   ;(at $E459)
  LDA DSTATS ;SIO status
             ; (from DCB)
  STA FR0 ;floating point
          ; register 0, $D4
  LDA #0
  STA FR0+1 ;(to get a two-
            ; byte value)
  RTS ;back to BASIC caller
```

Jump Search

Jerry Sturdivant

Learn how the binary search method can speed up data handling. The short demonstration program listed below runs on the Atari 400/800, XL, and XE series; Apple II-series; IBM PC/PCjr; all Commodore computers; TI-99/4A; the Radio Shack Color Computer; and other personal computers with BASIC.

Searching for a specific item in a collection of data is a fundamental computing task. Word processors, databases, and address book programs all need to locate data quickly and accurately. This article shows how to use the simple binary search method in BASIC programs for efficient data handling.

For a demonstration, type in, save, and run "Jump Search" below. Program 1 is a general version for Commodore, IBM, Apple, and the TRS-80 Color Computer. For the Atari, make the line changes listed in Program 2. For the TI-99/4A, one small change is needed to use Program 1. TI BASIC does not allow variables as arguments in DIM statements, so line 110 should be replaced with the following:

```
110 DIM S$(10), PP(10)
```

If you have another computer not mentioned above, use Program 1; it should run with little or no modification.

The demo program creates a list of ten city names in alphabetical order, with population figures for each city (of course, an actual program would contain much more data). Lines 100–140 store the city names in a string array and the population figures in a matching numeric array. (On the Atari, the string array is simulated by manipulating substrings within a single string variable, since there are no true string arrays in Atari BASIC.) Once this is done, you can find the population of any city in the list by searching for its name. For example, if your search finds that AKRON is stored in array element S$(2), then the population for Akron can be found in the numeric array element PP(2).

The city names are stored in the array in alphabetical order because *this search technique works only on data that has been arranged in alphabetical or numeric order.* If you consider the situation for a moment, you'll realize that no organized searching method can speed up the hunt for a particular item in a randomly arranged set of data. If you can't tell whether a word you've found should come before or after the word you're looking for, then you'll have to examine every word in the list until you find an exact match. Arranging the data into alphabetical or numeric order, called *sorting*, is a separate problem and has been considered in previous articles. Just remember that only ordered data can be searched efficiently.

The simplest way to find a word in an alphabetical list is to start at the A's and hunt forward through the alphabet until you find a match. A sequential search of this type is very easy to program (all you need is a FOR-NEXT loop), but it's also slow and inefficient. When the target word is toward the end of the alphabet, sequential searching wastes a lot of time looking through all the preceding words.

Jump To The Center

The binary search method (called *binary* because it repeatedly divides the data list in half) is much faster. Rather than starting at the beginning of the alphabet, it jumps in at the center. Let's look at the example program to see how this works.

The variable B stands for the beginning of the word list, E stands for the end, and C represents the center. Say that your target word is ATLANTA. When the search begins, line 200 finds the center of the ten-word list and jumps to that position (in this case finding the sixth word, ANAHEIM). Since ANAHEIM doesn't match ATLANTA, the program skips to line 250 for a critical test.

At this point the database is divided into two blocks, lower and higher. The program first decides which block holds the target word, then jumps to the center of that block to continue the search. Since ATLANTA comes after ANAHEIM in the alphabet, it must be stored in the higher block of words. Note that in just one step, you've eliminated the need to look at anything in the first half of the database. A sequential search (which compares ATLANTA to ABILENE, then to AKRON, then to ALBANY, etc.) takes six steps to accomplish the same result.

Now it's time for the second jump. Lines 260–270 set a new beginning point just above the center (B = C + 1) and go back to line 200. The program finds the center of the new list (which consists of four words, ANCHORAGE to AUSTIN) and jumps to that position. This time the target word matches the found word. While the binary method found the target word with only two comparisons, a sequential search would require nine (eight comparisons to eliminate ABILENE through ATHENS, and a ninth to confirm ATLANTA).

The more data you have, the more time the binary method saves. For instance, if the list contains 1,000 words, most words are found in about eight comparisons (the sequential method usually requires hundreds). If you expand the list to 10,000 words, only about twelve

comparisons are required (compared to thousands for the sequential method). The secret lies in the halving technique. By repeatedly chopping the list in half, this method quickly eliminates large chunks of data from consideration and zeros in on the target. Of course, you're not limited to string data. With slight modifications this routine can search numeric data as well

For instructions on entering these listings, please refer to "COMPUTE!'s Guide to Typing In Programs" published bimonthly in COMPUTE!.

Program 1: Jump Search (General Version)

```
100 N=10
110 DIM S$(N),PP(N)
120 FOR I=1 TO N
130 READ S$(I),PP(I)
140 NEXT I
150 E=N
160 B=1
170 P=0
180 PRINT "ENTER CITY"
190 INPUT C$
200 C=INT((E+1-B)/2)+B
210 IF E-B<3 THEN 300
220 IF C$<>S$(C) THEN 250
230 P=C
240 GOTO 340
250 IF C$<S$(C) THEN 280
260 B=C+1
270 GOTO 200
280 E=C-1
290 GOTO 200
300 FOR I=B TO E
310 IF C$<>S$(I) THEN 330
320 P=I
330 NEXT I
340 IF P<>0 THEN 370
350 PRINT "DATA NOT FOUND."
360 GOTO 150
370 PRINT S$(P),PP(P)
380 GOTO 150
999 REM CITY & POPULATION DATA
1000 DATA ABILENE,89000
1010 DATA AKRON,237000
1020 DATA ALBANY,250000
1030 DATA ALBUQUERQUE,332000
1040 DATA ALVERINA,29000
1050 DATA ANAHEIM,219000
1060 DATA ANCHORAGE,174500
1070 DATA ATHENS,150000
1080 DATA ATLANTA,425000
1090 DATA AUSTIN,346000
```

Program 2: Atari Line Changes

```
110 DIM C$(15),S$(N*15),P
    P(N):S$=" ":S$(N*15)=
    S$:S$(2)=S$
130 READ C$,A:S$((I-1)*15
    +1,I*15)=C$:PP(I)=A
190 INPUT C$:L=LEN(C$)
220 IF C$<>S$((C-1)*15+1,
    (C-1)*15+L) THEN 250
250 IF C$<S$((C-1)*15+1,(
    C-1)*15+L) THEN 280
310 IF C$<>S$((I-1)*15+1,
    (I-1)*15+L) THEN 330
370 PRINT S$((P-1)*15+1,P
    *15),PP(P)
```


128 Sound And Music

Part 2

Philip I. Nelson
Assistant Editor

The second installment of this two-part article explores the Commodore 128's FILTER, SOUND, and PLAY commands and includes three short demonstration programs.

In Part 1 (COMPUTE!, August 1985), we discussed the Commodore 128's VOL, TEMPO, and ENVELOPE commands as well as the basics of sound envelopes and waveforms. This month we'll examine the three remaining sound commands: FILTER, SOUND, and PLAY. Since your *128 User's Guide* explains the fundamentals, we'll focus on less obvious features and note how these complex commands interact with one another.

FILTER Needs PLAY

Like the ENVELOPE command (see Part 1), FILTER does nothing noticeable until you turn the filter on with a PLAY statement. Insert X1 inside the PLAY string wherever you want to turn the filter on, and X0 where you want to turn it off. If you leave out the X parameter, PLAY ignores preceding FILTER commands (the filter remains off). In the simplest case (a FILTER command followed by PLAY"X1"), the filter affects all three voices. However, you can also filter each voice individually:

```
FILTER 1000,1,0,0,15
PLAY "V1 X1 V2 X0 V3 X0
```

These statements turn the low-pass filter on for voice 1 and turn it off for voices 2 and 3. The 128 remembers which voice to filter when it executes subsequent PLAY statements (more about multivoice music is explained below). However, you can use only one filter *setting* at a time. For instance, you can't use a low-pass filter for voice 1 and a band-pass filter for voice 2. Whenever X1 appears in a PLAY string, the 128 uses the most recent FILTER setting. If no FILTER command has been executed, this may result in silence.

A FILTER Editor

As with other sound effects, the best way to learn is to listen and experiment; Program 1 below, "128 FILTER Editor," lets you do just that. It's self-prompting, so you need only type it in, save a copy, and run it. The menu screen displays all the current filter parameters and lets you change whatever you like. To select any option, press a number key from 0 to 9 and follow the prompts. The program begins with no filtering (all filters off) for comparison.

Option 9 switches you to the display screen, plays an ascending musical scale with whatever filter-

ing you've selected, and displays the FILTER statement currently in effect. Once you find a filter setting you like, write down the FILTER statement displayed on the screen and use it in your own programs. From this screen the number keys 1–6 select different octaves for the scale. Press the space bar to return to the main screen.

Option 7 lets you select any of the 128's ten predefined instrument envelopes, and option 8 controls the tempo at which the scale is played. Note that some of the predefined envelopes don't work well at fast tempos: The note ends before the sound envelope can complete its natural cycle. Use a slower tempo to slow things down and study a particular effect.

The SID filter is a bit notorious. While it works fine on some machines (my old 64 has a great one), its performance may vary from one SID chip to the next. The manual for our preproduction 128 notes that filtering "cannot be counted on," suggesting that nothing was done to improve the 128's filter. With practice you should be able to achieve satisfactory effects on your own machine, though they might sound somewhat different on another computer.

The SOUND Command

SOUND is a very powerful command intended for sound effects rather than music. Unlike PLAY (which defaults to maximum volume), SOUND has a default volume setting of zero. Thus, you must turn the volume up with VOL before the first SOUND statement in a program. And whereas PLAY delays the rest of your program until it completes the current PLAY string, SOUND statements play "in the background" while the program continues. To demonstrate, enter NEW and press RUN/STOP–RESTORE (to clear the SID chip), then type in and run the following two-line program:

```
10 VOL15:SOUND 1,5000,200:SOUN
   D 2,4000,200:SOUND 3,3000,2
   00
20 FORJ=1TO10:PRINT"PROGRAM CO
   NTINUING":NEXT:PRINT"DONE"
```

Notice how the three-voice sound continues even after this program ends and returns the computer to READY mode.

The first number in a SOUND statement (1, 2, or 3) picks one of the 128's three voices. By using different voice numbers, you can play up to three sounds at once. However, the 128 ordinarily waits until a voice has finished the current SOUND statement before starting a new SOUND statement *for that voice*. To illustrate, in line 10 of the above program, change the 2 and 3 to 1; then run it again. Now voice 1 plays three notes in sequence.

In most cases SOUND's background-playing ability is desirable: Sound effects don't slow down the rest of your program. However, in other cases you might want to interrupt a sound immediately (if, for example, the user wants to exit the program). Fortunately, this is easy to do: SOUND statements with zero duration take effect immediately, whether or not preceding sounds have finished. Thus, SOUND 1,0,0 silences voice 1; use FOR J=1 TO 3: SOUND J,0,0: NEXT to silence all three voices.

Since variables can be used for any SOUND parameter, you can create more dynamic, integrated effects by incorporating other program variables in SOUND commands. For example, say that your game uses the variable X to represent a spaceship's screen position. To make a cruising sound, you might substitute something like X*1000 for the frequency number in a SOUND command.

A SOUND Editor

"128 SOUND Editor," listed below, lets you experiment with SOUND commands and design sound effects for your own programs using up to three voices at once. Type in and save Program 2, then run it. The first thing you'll hear are three complex, multivoice sound effects (don't worry if they're not exactly to your taste—you'll soon know enough about SOUND to replace them with your own). Next, the editing screen appears, displaying ten options and all the current SOUND parameters (your *User's Guide* explains the meaning of each parameter). To choose an option, press a number key from 0 to 9. The program instructs you how to proceed and does not let you enter inappropriate values.

Option 1 lets you switch from one voice to another. Option 9 switches you to the display screen, which plays the current sound and displays the SOUND statements that create it. It's fun to experiment with 128 SOUND Editor, and it can save a lot of programming time. Use it to design exactly the sound you want, then copy the SOUND statements from the display screen and use them in your programs. (Though the program can play sounds with one, two, or three voices at once, it's not necessary to use multiple voices. Zero-duration SOUND statements produce no sound and may be ignored.)

The PLAY Command

Designed for real music-making, PLAY is the most versatile of all the 128's sound commands. As outlined in the *User's Guide*, PLAY works much like the familiar PRINT statement. Each PLAY command is followed by a string containing special control characters. The letters A–F are interpreted as notes; thus, the statement PLAY"C D E F" plays the four notes C-D-E-F. In the last example PLAY was followed by a string of characters enclosed in quotation marks. However, PLAY can also handle string variables (A$="C D E F": PLAY A$).

To see this method at work, type in and save Program 3, "128 PLAY Demonstrator." It plays a short, Bach-like tune with several different instrument envelopes. Note that all of the music control characters are stored in DATA statements. Line 50 READs each line of data into a string named A$, and the subroutine at line 20 PRINTs each music string just before it is PLAYed.

Like other strings, PLAY strings can be concatenated (combined) with the + operator, and manipulated with any of the string-related functions: MID$, LEFT$, RIGHT$, LEN, VAL, CHR$, ASC, and STR$. Program 1 contains several different examples.

For complex music you might want to store PLAY strings in a string array. For instance, the following statement stores 100 elements of music data in a string array named M$( ): FOR J=1 TO 100: READ M$(J): NEXT. Once the

music array is created, you can quickly access any string it contains: PLAY M$(3) plays the third music string held in M$( ), and so on. This is very helpful for repeating certain passages. You may also find it useful to create separate arrays for different purposes (one to store notes, another for duration characters, and so forth).

Multivoice Music

Since the SID chip has three voices, PLAY can play up to three notes simultaneously. The V control character (followed by 1, 2, or 3) determines which voice is affected. Thus, the statement PLAY "V1 C V2 E V3 G" plays a simple three-note chord. After processing V1 C, the 128 "looks ahead" to see whether it should play other notes at the same time; however, the computer looks ahead only *as far as the next note*. Thus, the statement PLAY "V1 CDE V2 CDE" does not play the notes C-D-E simultaneously with two voices. Instead, it plays two sequential notes (C-D) with voice 1, then two simultaneous notes (E and C) with voices 1 and 2, followed by two sequential notes (D-E) with voice 2.

When all voices play notes of the same duration, multivoice music is not particularly difficult to write: Insert V1 before each note for voice 1, V2 before each voice 2 note, and so forth (concatenations like A$="V1"+A$ can help condense the otherwise cumbersome code). However, when different voices play notes of different durations, you must make sure that all the durations add up.

For instance, you might want voice 1 to hold a long whole note while voice 2 plays a series of sixteenth notes. To keep the timing straight, you should not let voice 1 play another note until voice 2 has finished the equivalent of a whole note (16 sixteenths or whatever). Similarly, the timing may be thrown off if voice 2 plays *more* than 16 sixteenths before voice 1 gets back in the act. The M control character supposedly tells the 128 to wait until all voices finish the current measure before moving ahead. But M is just an adjuster. It can't magically repair music that doesn't add up in the first place.

Interactions

As noted throughout this article, certain 128 sound commands work with certain others. The VOL command, for instance, is needed only for SOUND statements (PLAY sets volume independently with the U control character). TEMPO, FILTER, and ENVELOPE, on the other hand, seem designed to work with PLAY. TEMPO is irrelevant to SOUND (which sets its own duration and so on); ENVELOPE and FILTER have no effect until activated by PLAY.

However, other interactions are possible (at least on our 128, admittedly a preproduction model). For instance, though the SOUND statement provides no way to turn on the filter, SOUNDs can be affected by "leftover" filter settings. If the 128 executes a FILTER statement followed by PLAY"X1", the filter remains on and affects subsequent SOUND statements. PLAY"X0" turns the filter off for SOUND as well as for PLAY.

This interaction can be viewed either as an advantage—filtering is otherwise unavailable with SOUND—or as a pitfall for unwary programmers. To prevent unwanted interactive effects, begin sound and music programs by setting all sound parameters at zero or default values. Commodore 64 programmers often clear the SID chip with FOR J=54272 TO 54296: POKE J,0: NEXT. Though this statement does clear the 128's SID chip, it doesn't necessarily change the 128's sound settings, which are recorded elsewhere in memory.

For instructions on entering these listings, please refer to "COMPUTE!'s Guide to Typing In Programs" published bimonthly in COMPUTE!.

Program 1: 128 FILTER Editor

```
100 GOSUB570:GOTO310
110 FORJ=1TO3:SOUNDJ,0,0:NEXT:
    FILTER0,0,0,0,0,0:RETURN
120 PLAY A$:RETURN
130 LP$=" OFF":IFLP=1THENLP$="
     {RVS}ON {OFF}"
140 RETURN
150 BP$=" OFF":IFBP=1THENBP$="
     {RVS}ON {OFF}"
160 RETURN
170 HP$=" OFF":IFHP=1THENHP$="
     {RVS}ON {OFF}"
180 RETURN
190 PRINTD$"SET CUTOFF FREQUEN
    CY (0-2047)"
200 INPUTA:IFA<0ORA>2047THENGO
    SUB550:GOTO190
210 FQ=A:RETURN
220 LP=ABS(LP=0):RETURN
230 BP=ABS(BP=0):RETURN
240 HP=ABS(HP=0):RETURN
250 PRINTD$"SET FILTER RESONAN
    CE (0-15)":INPUTA:IFA<0ORA
    >15THENGOSUB550:GOTO250
260 RE=A:RETURN
270 PRINTD$"CHOOSE SOUND ENVEL
    OPE (0-9)":INPUTA:IFA<0ORA
    >9THENGOSUB550:GOTO270
280 WV$="T"+CHR$(A+48):RETURN
290 PRINTD$"CHOOSE TEMPO (1-25
    5)":INPUTA:IFA<1ORA>255THE
    NGOSUB550:GOTO290
300 TM=A:RETURN
310 PRINT"{CLR}{RVS} 128 FILTE
    R EDITOR ":PRINT
320 PRINT"1 {RVS} FREQUENCY
    {OFF}"FQ"{LEFT}{4 SPACES}"
330 PRINT"2 {RVS} LOW
    {2 SPACES}PASS {OFF}";:GOS
    UB130:PRINTLP$
340 PRINT"3 {RVS} BAND PASS
    {OFF}";:GOSUB150:PRINTBP$
350 PRINT"4 {RVS} HIGH PASS
    {OFF}";:GOSUB170:PRINTHP$
360 PRINT"5 {RVS} RESONANCE
    {OFF}";RE"{LEFT} ":PRINT"
    {2 SPACES}{RVS}----------
    {OFF}"
370 PRINT"7 {RVS} ENVELOPE
    {2 SPACES}{OFF} "MID$(WV$,
    2)T$(VAL(MID$(WV$,2)))
380 PRINT"8 {RVS} TEMPO
    {5 SPACES}{OFF}"TM"{LEFT}
    {2 SPACES}":PRINT"9 {RVS}
    {SPACE}PLAY{6 SPACES}{OFF}
    ":PRINT"0 {RVS} QUIT
    {6 SPACES}{OFF}{DOWN}"
390 PRINT"{RVS}ENTER YOUR CHOI
    CE (0-9)":PRINT"{3 SPACES}
    {UP}"
400 GETKEYA$:IFA$<"0"ORA$>"9"O
    RA$="6"THENPRINT:GOSUB550:
    PRINT:GOTO390
410 IFA$="9"THEN440
420 IFA$="0"THENEND
430 ONVAL(A$)GOSUB190,220,230,
    240,250,250,270,290:PRINTE
    $:GOTO320
440 PRINTCHR$(147)"OCTAVE "MID
    $(OC$,2)CHR$(13)
450 PRINT"LOW{2 SPACES}PASS "L
    P$:PRINT"BAND PASS "BP$:PR
    INT"HIGH PASS "HP$:PRINT
460 PRINT"{RVS}CURRENT FILTER
    {SPACE}STATEMENT:":PRINT:P
    RINT"FILTER ";
470 PRINTMID$(STR$(FQ),2)","MI
    D$(STR$(LP),2)","MID$(STR$
    (BP),2)",";
480 PRINTMID$(STR$(HP),2)","MI
    D$(STR$(RE),2):PRINT:FILTE
    R FQ,LP,BP,HP,RE
490 PRINT"PRESS {RVS} 1 - 6
    {OFF} FOR OCTAVE"CHR$(13)S
    PC(6)"{RVS} SPACE {OFF} TO
     EXIT"
500 F$="X0 ":IFLP=1ORBP=1ORHP=
    1THENF$="X1 "
510 A$=F$+WV$+"S":GOSUB120:TEM
    PO TM
520 GET B$:IFB$=CHR$(32)THENGO
    SUB110:GOTO310
530 IFB$=>"1"ANDB$<="6"THENOC$
    ="O"+CHR$(VAL(B$)+48):PRIN
    T"{HOME}"SPC(6)VAL(B$)
540 A$=OC$+"CDEFGAB":GOSUB120:
    GOTO520
```

```
550 GOSUB110:FORJ=1TO3:SOUNDJ,
    1000+J*500,15,0,0,0,2,J*10
    00:NEXT
560 PRINT"{UP}{RVS}INAPPROPRIA
    TE":SLEEP1:PRINT"{UP}
    {13 SPACES}{3 UP}":RETURN
570 PRINTCHR$(14)CHR$(8):FORJ=
    54272TO54296:POKEJ,0:NEXT:
    VOL15:D$=CHR$(19)
580 FORJ=1TO15:D$=D$+CHR$(17):
    NEXT:FQ=1000:LP=0:BP=0:HP=
    0:RE=15:WV$="T7":TM=55
590 FORJ=1TO35:X$=X$+CHR$(32):
    NEXT:E$=D$+X$+CHR$(13)+X$+
    CHR$(19)+CHR$(13)
600 FORJ=0TO9:READX$:T$(J)="
    {2 SPACES}"+X$:NEXT:OC$="O
    3":GOSUB110:RETURN
610 DATA"PIANO{6 SPACES}","ACC
    ORDION{2 SPACES}","CALLIOP
    E{3 SPACES}","DRUM
    {7 SPACES}","FLUTE
    {6 SPACES}"
620 DATA"GUITAR{5 SPACES}","HA
    RPSICHORD","ORGAN
    {6 SPACES}","TRUMPET
    {4 SPACES}","XYLOPHONE
    {2 SPACES}"
```

Program 2: 128 SOUND Editor

```
10 GOSUB30:GOSUB570:GOTO320
20 PRINT"{CLR}{RVS}128 SOUND E
   DITOR":PRINT:RETURN
30 FORJ=1TO3:SOUNDJ,0,0:NEXT:R
   ETURN
40 PRINTD$"CHOOSE VOICE (1-3)"
   :INPUTA:IFA<1ORA>3THENGOSUB
   550:GOTO40
50 VC=A:RETURN
60 PRINTD$"CHOOSE FREQUENCY (0
   -65535)"
70 INPUTA:IFA<0ORA>65535THENGO
   SUB550:GOTO60
80 FQ(VC)=A:RETURN
90 PRINTD$"CHOOSE DURATION (60
   0=10 SECONDS)"
100 INPUTA:IFA<0THENGOSUB550:G
    OTO90
110 DU(VC)=A:RETURN
120 PRINTD$"CHOOSE DIRECTION O
    F SOUND SWEEP"
130 PRINT"0=UP{2 SPACES}1=DOWN
    {2 SPACES}2=OSCILLATE":INP
    UTA:IFA<0ORA>2THENGOSUB550
    :GOTO120
140 DI(VC)=A:RETURN
150 PRINTD$"CHOOSE MINIMUM FRE
    QUENCY FOR"
160 PRINT"SOUND SWEEP (0-65535
    )":INPUTA:IFA<0ORA>65535TH
    ENGOSUB550:GOTO150
170 IFA=>FQ(VC)THENGOSUB550:GO
    TO150
180 MI(VC)=A:RETURN
190 PRINTD$"CHOOSE STEP VALUE
    {SPACE}FOR SOUND SWEEP"
200 PRINT"(LESSER OF 32767 OR"
    FQ(VC)-MI(VC)+1"{LEFT})"
210 INPUTA:IFA<0ORA>32767THENG
    OSUB550:GOTO190
220 IFA>(FQ(VC)-MI(VC))THENGOS
    UB550:GOTO190
230 SV(VC)=A:RETURN
240 PRINTD$"CHOOSE WAVEFORM
    {SHIFT-SPACE}{5 SPACES}0=T
    RIANGLE"
250 PRINT"1=SAWTOOTH{2 SPACES}
    2=PULSE{2 SPACES}3=WHITE N
    OISE"
260 INPUTA:IFA<0ORA>3THENGOSUB
    550:GOTO240
270 WV(VC)=A:RETURN
280 PRINTD$"CHOOSE PULSE WIDTH
    "
290 PRINT"(0-4095)":INPUTA:IFA
    <0ORA>4095THENGOSUB550:GOT
    O280
300 PW(VC)=A:RETURN
310 GOSUB20
320 PRINT"1 {RVS} VOICE
    {6 SPACES}{OFF}"VC:PRINT"2
     {RVS} FREQUENCY{2 SPACES}
    {OFF}"FQ(VC)"{LEFT}
    {4 SPACES}"
330 PRINT"3 {RVS} DURATION
    {3 SPACES}{OFF}"DU(VC)"
    {LEFT}{4 SPACES}"
340 PRINT"4 {RVS} DIRECTION
    {2 SPACES}{OFF}"DI(VC)DI$(
    DI(VC))
350 PRINT"5 {RVS} MINIMUM
    {4 SPACES}{OFF}"MI(VC)"
    {LEFT}{4 SPACES}":PRINT"6
    {SPACE}{RVS} STEP VALUE
    {OFF}"SV(VC)"{LEFT}
    {4 SPACES}"
360 PRINT"7 {RVS} WAVEFORM
    {3 SPACES}{OFF}"WV(VC)WV$(
    WV(VC))
370 PRINT"8 {RVS} PULSEWIDTH
    {OFF}"PW(VC)"{LEFT}
    {4 SPACES}"
380 PRINT"9 {RVS} HEAR SOUND
    {OFF}":PRINT"0 {RVS} QUIT
    {7 SPACES}{OFF}":PRINT
390 PRINT"{RVS}ENTER YOUR CHOI
    CE (0-9)":PRINT"{3 SPACES}
    {UP}"
400 GETKEYA$:IFA$<"0"ORA$>"9"T
    HENPRINT:GOSUB550:PRINT:GO
    TO390
410 IFA$="9"THEN440
420 IFA$="0"THENGOSUB30:END
430 ONVAL(A$)GOSUB40,60,90,120
    ,150,190,240,280:PRINTE$:G
    OTO320
440 PRINT"{CLR}THE FOLLOWING S
    OUND STATEMENTS":PRINT"
    {2 SPACES}CREATE THE SOUND
    S YOU HEAR."
450 PRINT"ZERO-DURATION SOUNDS
     ARE SILENT."
460 FORJ=1TO3:SOUNDJ,FQ(J),DU(
    J),DI(J),MI(J),SV(J),WV(J)
    ,PW(J):NEXT
470 FORJ=1TO3:PRINT:PRINT"SOUN
    D ";
480 PRINTMID$(STR$(J),2)","MID
    $(STR$(FQ(J)),2)","MID$(ST
    R$(DU(J)),2)",";
490 PRINTMID$(STR$(DI(J)),2)",
    "MID$(STR$(MI(J)),2)","MID
    $(STR$(SV(J)),2)",";
500 PRINTMID$(STR$(WV(J)),2)",
    "MID$(STR$(PW(J)),2):NEXT
510 PRINT:PRINT"PRESS {RVS}RET
    URN{OFF} TO EXIT":PRINTSPC
    (6)"{RVS}SPACE {OFF} TO RE
    PEAT"
520 GETKEYA$:IFA$=CHR$(13)THEN
    GOSUB30:GOTO310
530 IFA$=CHR$(32)THENGOSUB30:G
    OTO440
540 GOTO520
550 GOSUB30:FORJ=1TO3:SOUNDJ,1
    000+J*500,15,0,0,0,2,J*100
    0:NEXT
560 PRINT"{UP}{RVS}INAPPROPRIA
    TE":SLEEP1:PRINT"{UP}
    {13 SPACES}{3 UP}":RETURN
570 PRINTCHR$(14):D$=CHR$(19):
    FORJ=54272TO54296:POKEJ,0:
    NEXT:FORJ=1TO15
580 D$=D$+CHR$(17):NEXT:GOSUB2
    0:VOL15:FORJ=1TO38:X$=X$+C
    HR$(32):NEXT
590 VC=1:E$=D$+X$+CHR$(13)+X$+
    CHR$(13)+X$+CHR$(19)+CHR$(
    13)
600 FORK=2000TO4000STEP220:FOR
    J=1TO3:SOUNDJ,K*2+J*20,45,
    2,K,K/3,2,4095-K
610 NEXTJ,K:FORJ=45TO1STEP-5:S
    OUND1,J*1000,5,1,J*100,J*2
    80,2,2300
620 SOUND2,3200-J*20,5,0,0,0,2
    ,1500:SOUND3,J*1200,5,1,J*
    120,J*300,2,3000
630 NEXT:FORJ=1TO3:SOUNDJ,1000
    0,200,1,J*2000,J*400,2,230
    0:NEXT:FORJ=1TO3
640 READFQ(J),DU(J),DI(J),MI(J
    ),SV(J),WV(J),PW(J):NEXT:F
    ORJ=0TO3:READA$
650 WV$(J)="--- "+A$:NEXT:FORJ
    =0TO2:READA$:DI$(J)="--- "
    +A$:NEXT:RETURN
660 DATA10000,260,2,2000,60,2,
    2000,0,0,0,0,0,0,2000,0,0,
    0,0,0,0,2000
670 DATA"TRIANGLE","SAWTOOTH",
    "PULSE{3 SPACES}","NOISE
    {3 SPACES}"
680 DATA"UPWARD{3 SPACES}","DO
    WNWARD ","OSCILLATE"
```

Program 3: 128 PLAY Demonstrator

```
10 GOTO30
20 PRINTA$:PLAYA$:RETURN
30 PRINTCHR$(147)CHR$(14)SPC(3
   )CHR$(18)"128 PLAY DEMONSTR
   ATOR"CHR$(13)
40 FORJ=54272TO54296:POKEJ,0:N
   EXT:FILTER0,0,0,0:FORJ=1TO3
   :SOUNDJ,0,0:NEXT
50 READA$:IFA$<>"Z"THENGOSUB20
   :GOTO50
60 PRINT:PRINTSPC(2)CHR$(18)"P
   RESS P TO PLAY AGAIN, Q TO
   {SPACE}QUIT"
70 GETKEYG$:IFG$="P"THENRUN
80 IFG$<>"Q"THEN70
90 END
100 DATA U15 X0 V1 S
110 DATA T7 O5 C O4 B O5 IC SO
    4 GRERGR
120 DATA T6 CDC O3 B O4 IC SO3
    GRERGR
130 DATA T7 CGDGEGDGC
140 DATA O4 C O3 BAGFEDC
150 DATA O5 C O4 BAGFED
160 DATA T6 CGDGEGFGEGDG
170 DATA CG O3 #A O4 G O3 A O4
    G O3 G O4 G
180 DATA O3 F R O5 FE I F S DR
    O4 BR O5 DR
190 DATA T2 G O6 G O5 A O6 G O
    5 B O6 G C O6 GDGFG
200 DATA ERDCDGC O5 B
210 DATA T4 ERDCDGC O4 B
220 DATA T6 ERDCDGC O3 B
230 DATA T0 ERDCDGC O2 BC
240 DATA T7 O3 CDEFGABC
250 DATA O4 CDEFGABC
260 DATA O5 CDEFGAB
270 DATA O6 CR O5 CR I O3 CR
50000 DATA Z
```

EASY Apple Screen Editing

Roland Brown

Here's a way to make BASIC programming easier and more fun: an advanced screen editor that makes up for the Apple's lack of full-screen editing. COMPUTE! published an earlier version of this utility, "BASIC Line Editor," in February 1983. This month's all-new version has been updated and enhanced to work on any Apple II-series computer (including the Apple IIc) with DOS 3.3 or ProDOS, in 80-column as well as 40-column mode.

Although Applesoft BASIC is a powerful language, its screen editor leaves much to be desired. Some Apple II owners invest in a ROM editor, others write their programs with a word processor, and the rest just suffer with the frustrating ESCape codes. But ROM editors cost money, word processors don't let you flip back and forth between the text editor and BASIC to test changes, and suffering isn't *always* good for the soul. So here's a better solution: "BASIC Line Editor," a powerful utility that lets you easily modify BASIC program lines.

To prepare the BASIC Line Editor, type in and save the program listed below. It's a BASIC filemaker that POKEs the machine language program into memory, then BSAVEs it to disk as a binary file (named BLE2 to distinguish it from BLE, the original version of the program).

Once you've run the filemaker, you're ready to use the BASIC Line Editor. Start it by typing BRUN BLE2 and pressing RETURN. The program loads at memory address $2000, then checks to see which operating system is present before moving itself to a safe location. (Note that this process can destroy part of a long BASIC program. If you have a long BASIC program in memory, you should save it *before* you activate the BASIC Line Editor.)

Now you're ready to put the Editor to work. To edit a BASIC program line, type & followed by the desired line number. For instance, enter &100 to edit line 100. The BASIC Line Editor displays the line on the screen in a format somewhat different than Applesoft's. The line is continuous rather than centered on the screen, there are no extra spaces in the line except between quotation marks, and all control characters are displayed in inverse video.

Editing Commands

The BASIC Line Editor provides 13 new editing functions. Most are accessed by pressing the CTRL (Control) key together with a letter key. Here's a quick reference table followed by a detailed description of each command:

CTRL-B	**block back**
CTRL-C	**convert hex to decimal**
CTRL-D	**delete right**
CTRL-F	**block forward**
CTRL-H	**cursor left**
CTRL-I	**insert**
CTRL-M	**return**
CTRL-S	**search**
CTRL-T	**truncate**
CTRL-U	**cursor right**
CTRL-V	**verbatim**
DELETE	**delete left**
ESC	**return to BASIC**

CTRL-B (block back) moves the cursor back to the previous colon, or if there is no previous colon, to the beginning of the line.

CTRL-C (convert hex) converts hexadecimal numbers to decimal. This command moves the cursor above the line being edited, prints a $ prompt on the screen and waits for you to enter a number. This value is converted to decimal and printed. Then the cursor returns to its original position on the line.

CTRL-D (delete right) deletes the character under the cursor. The cursor stays where it is and everything to the right moves back one space.

CTRL-F (block forward) moves the cursor forward to the next colon, or if there is no colon, to the end of the line.

CTRL-H (cursor left) moves the cursor back one space.

CTRL-I (insert) puts the BASIC Line Editor in insert mode. Any characters you type are inserted in the line until you use another Editor command.

CTRL-M (return) is the same as pressing RETURN. No matter where the cursor is located on the line, pressing CTRL-M enters the line into the program.

CTRL-S (search) searches for the next character entered.

CTRL-T (truncate) truncates the line at the cursor position (deletes everything after the cursor). The cursor ends up one space beyond the new end of the line.

CTRL-U (cursor right) moves the cursor forward one space.

CTRL-V (verbatim) lets you enter control characters verbatim. If the keypress immediately after CTRL-V is a CTRL key combination, it is interpreted as a control character rather than as a BASIC Line Editor command. CTRL-V is useful for adding RETURN (CTRL-M) or backspace (CTRL-H) characters to a line for improved printing control. If the keypress immediately following CTRL-V is not a CTRL key combination, CTRL-V has no effect. Remember that the BASIC Line Editor shows control characters in reverse video.

DELETE (delete left) deletes the character to the left of the cursor and moves the cursor back one space. (The DELETE key is found only on the IIe and IIc.)

ESC (return to BASIC) puts you back in BASIC. If you make a mistake when editing a line with the BASIC Line Editor, press ESC to

exit back to BASIC without losing the line.

Program Notes

Activating the Editor resets the stack to the same level as does BASIC, sets up the ampersand vector ($3F5), moves the DOS buffers downward to protect DOS, and restarts BASIC. The Editor uses existing BASIC routines to read the input line and find the desired line in memory. If you try to edit a line that doesn't exist, the Editor simply returns to BASIC. If the line is found, its contents are read and listed on the screen. Text characters are listed just as they are stored. When the Editor finds a token (an encoded BASIC keyword), it locates the word in the BASIC keyword table and lists it on the screen.

Once the Editor lists the line, it enters editing mode. This part of the program gets a command from the keyboard, processes it, and updates the screen. Space doesn't permit a detailed explanation of how each Editor command works. If you're familiar with Apple machine language programming, you may find it interesting to trace through the various routines on your own.

BASIC Line Editor

Version By Tim Victor, Editorial Programmer

For instructions on entering this listing, please refer to "COMPUTE!'s Guide to Typing In Programs" published bimonthly in COMPUTE!.

```
53 80 FOR I = 8192 TO 9157: READ
      A: POKE I,A: NEXT
80 90 PRINT CHR$ (4);"BSAVE BLE2
     ,A$2000,L$3C6": END
1E 100 DATA 173,0,191,201,76,208
     ,13,169,3,32
6B 110 DATA 245,190,24,165,116,1
     05,4,76,27,32
AB 120 DATA 56,165,116,233,3,133
     ,116,133,207,141
2D 130 DATA 175,32,165,115,133,2
     06,141,174,32,169
2B 140 DATA 177,133,235,169,32,1
     33,236,160,0,177
AB 150 DATA 235,145,206,230,206,
     208,2,230,207,230
B5 160 DATA 235,208,2,230,236,16
     5,235,201,70,208
75 170 DATA 234,165,236,201,35,2
     08,228,177,235,230
1F 180 DATA 235,208,2,230,236,14
     1,176,32,17,235
19 190 DATA 240,41,173,176,32,24
     ,109,174,32,133
8E 200 DATA 206,177,235,230,235,
     208,2,230,236,109
0D 210 DATA 175,32,133,207,24,17
     7,206,109,174,32
B3 220 DATA 145,206,200,177,206,
     109,175,32,145,206
43 230 DATA 136,240,200,173,174,
     32,141,246,3,173
F8 240 DATA 175,32,141,247,3,169
     ,76,141,245,3
FA 250 DATA 160,11,185,162,32,32
     ,240,253,136,16
5E 260 DATA 247,96,141,217,196,1
     93,197,210,160,178
1E 270 DATA 197,204,194,141,56,3
     2,32,32,12,218
6E 280 DATA 32,26,214,176,1,96,1
     04,104,32,156
5D 290 DATA 252,160,2,177,155,20
     0,170,177,155,32
2C 300 DATA 36,237,160,6,140,123
     ,5,132,206,165
99 310 DATA 37,141,151,2,165,155
     ,133,235,165,156
C8 320 DATA 133,236,160,4,177,23
     5,200,201,0,240
44 330 DATA 44,16,36,162,208,142
     ,68,0,142,69
4E 340 DATA 0,41,127,170,173,255
     ,255,48,17,224
96 350 DATA 0,208,3,32,72,1,238,
     68,0,208
4B 360 DATA 239,238,69,0,208,234
     ,202,16,243,32
50 370 DATA 72,1,56,176,205,160,
     6,169,192,141
62 380 DATA 152,2,132,207,32,34,
     1,32,12,253
1E 390 DATA 201,255,208,2,169,12
     8,201,160,144,81
5E 400 DATA 44,152,2,48,15,112,6
     5,141,70,1
8C 410 DATA 32,35,2,169,192,141,
     152,2,48,218
0C 420 DATA 112,34,72,164,207,13
     2,227,164,206,140
5F 430 DATA 149,2,200,32,236,1,1
     32,207,32,96
86 440 DATA 1,206,149,2,198,207,
     164,227,196,207
E5 450 DATA 208,242,32,34,1,104,
     32,110,1,164
75 460 DATA 207,196,206,200,144,
     3,32,236,1,76
F7 470 DATA 105,0,164,207,169,19
     2,141,152,2,48
BC 480 DATA 157,44,152,2,48,13,8
     0,240,162,192
2A 490 DATA 142,152,2,73,192,201
     ,64,208,213,162
DD 500 DATA 192,142,152,2,201,14
     1,240,12,201,155
77 510 DATA 240,46,164,207,32,25
     3,1,76,105,0
88 520 DATA 160,0,132,207,32,34,
     1,32,155,1
1D 530 DATA 73,128,16,2,41,63,16
     4,207,153,0
87 540 DATA 2,200,196,206,208,23
     2,169,0,153,0
4E 550 DATA 2,160,1,162,255,76,6
     8,212,164,206
70 560 DATA 32,34,1,160,0,240,23
     5,72,173,151
11 570 DATA 2,133,37,152,197,33,
     144,6,229,33
61 580 DATA 230,37,176,246,133,3
     6,141,123,5,32
33 590 DATA 34,252,104,96,132,20
     7,32,34,1,32
32 600 DATA 155,1,201,70,96,140,
     150,2,9,128
17 610 DATA 201,160,176,2,73,192
     ,32,110,1,164
E0 620 DATA 206,200,32,236,1,172
     ,150,2,96,172
09 630 DATA 149,2,32,34,1,32,155
     ,1,164,207
AB 640 DATA 32,34,1,141,153,2,16
     5,37,72,173
5F 650 DATA 123,5,133,36,72,173,
     153,2,32,240
6D 660 DATA 253,104,205,123,5,20
     8,7,197,36,165
F5 670 DATA 36,141,123,5,104,144
     ,7,197,37,208
4B 680 DATA 3,206,151,2,173,153,
     2,96,173,123
DF 690 DATA 5,172,179,251,192,6,
     208,22,44,31
87 700 DATA 192,16,17,141,1,192,
     72,56,101,32
BD 710 DATA 74,144,3,44,85,192,1
     04,105,0,74
18 720 DATA 168,177,40,44,84,192
     ,96,192,0,240
FF 730 DATA 37,32,247,1,132,207,
     132,227,32,15
34 740 DATA 2,140,149,2,196,206,
     240,13,32,96
3E 750 DATA 1,238,149,2,230,207,
     172,149,2,208
D1 760 DATA 239,164,207,32,236,1
     ,164,227,96,132
A9 770 DATA 206,32,34,1,32,156,2
     52,164,206,96
07 780 DATA 192,0,240,1,136,96,1
     62,11,202,48
06 790 DATA 250,221,127,2,208,24
     8,189,138,2,141
66 800 DATA 14,2,176,255,196,206
     ,240,1,200,96
22 810 DATA 169,128,44,169,0,44,
     169,64,141,152
36 820 DATA 2,96,169,186,141,70,
     1,164,207,196
0E 830 DATA 206,240,6,200,32,61,
     1,208,244,164
D5 840 DATA 207,96,169,186,141,7
     0,1,164,207,240
52 850 DATA 6,136,32,61,1,208,24
     6,164,207,96
16 860 DATA 172,151,2,136,132,37
     ,32,34,252,169
9E 870 DATA 0,141,123,5,32,156,2
     52,162,0,169
56 880 DATA 164,32,110,1,32,12,2
     53,157,0,2
23 890 DATA 232,201,141,208,242,
     32,199,255,32,167
62 900 DATA 255,169,189,32,240,2
     53,165,63,166,62
72 910 DATA 32,36,237,164,207,96
     ,128,132,136,149
43 920 DATA 148,137,147,150,134,
     130,131,179,188,232
69 930 DATA 0,221,6,9,12,18,38,5
     6,35,0
B9 940 DATA 59,0,62,0,77,0,80,0,
     85,0
B9 950 DATA 93,0,103,0,108,0,124
     ,0,131,0
B1 960 DATA 134,0,139,0,153,0,15
     7,0,162,0
E4 970 DATA 165,0,176,0,180,0,19
     0,0,193,0
DF 980 DATA 200,0,205,0,214,0,22
     5,0,238,0
60 990 DATA 241,0,248,0,251,0,28
     ,1,36,1
3C 1000 DATA 64,1,67,1,73,1,84,1
     ,90,1
F1 1010 DATA 93,1,97,1,100,1,103
     ,1,108,1
F4 1020 DATA 111,1,123,1,149,1,1
     52,1,199,1
73 1030 DATA 206,1,209,1,216,1,2
     19,1,224,1
AE 1040 DATA 231,1,239,1,3,2,8,2
     ,11,2
2F 1050 DATA 30,2,36,2,46,2,56,2
     ,64,2
F7 1060 DATA 72,2,93,2,0,0
```

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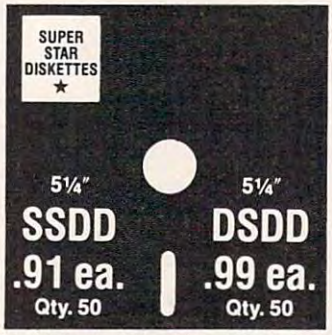

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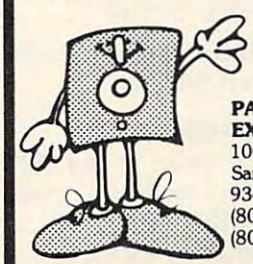

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COMPUTE! Modifications or Corrections To Previous Articles

Animator For Apple And IBM

In the August issue, eleven program lines were inadvertently omitted from the Apple version of this graphics utility (BASIC portion, Program 6, p. 58). The missing lines are as follows:

```
06 1030 E%(J,I) = 0: FOR Q = 0 T
        O 6:T = INT (O / 2): PRI
        NT CHR$ (46 + 13 * (O -
        T * 2));:O = T: NEXT : N
        EXT : IF I < 23 THEN PRI
        NT
JB 1040 NEXT : RETURN
C7 1050 POKE 242,0: CALL 32777,0
        : GOSUB 1010: CALL 32768
        ,0,206,12: RETURN
DC 1060 CALL 32768,A,206,12
2B 1070 VTAB 1: HTAB 27: PRINT "
        ONE MOMENT";
DF 1080 CALL 32774,A: FOR I = 0
        TO 23: FOR J = 0 TO 2: I
        NPUT "";E%(J,I): NEXT :
        NEXT : CALL 32780
7E 1090 HOME : FOR I = 0 TO 23:
        FOR J = 0 TO 2:O = E%(J,
        I)
92 1100 FOR Q = 0 TO 6:T = INT (
        O / 2): PRINT CHR$ (46 +
         13 * (O - T * 2));:O =
        T: NEXT : NEXT : IF I <
        23 THEN PRINT
DC 1110 NEXT : HTAB 27: VTAB 1:
        PRINT SPC( 10): RETURN
86 1120 GOSUB 560: GOSUB 700: VT
        AB 19: HTAB 10: PRINT "I
        NSERT BOX ";A;: GOSUB 11
        60: IF C = 206 THEN 1150
```

The last line of the IBM version (Program 1, p. 52) was partially obscured. It should read as follows:

```
CM 25040 A$=INKEY$:IF A$<>" " TH
        EN 25040 ELSE RETURN
```

Atari List Scroller

This utility program in the July issue (p. 68) will crash because of a line numbering problem. Line 32702 should be revised as follows:

```
32702 LNUM=PEEK(A)+PEEK(A
      +1)*256:IF LNUM>=32
      700 THEN 32704
```

Thanks to William Webb and others who pointed this out.

IBM Proofreader

A bug was uncovered in our IBM "Automatic Proofreader," published in "COMPUTE!'s Guide to Typing In Programs" since October 1984. It has been hidden until now because it appears only when the first characters following the line number in a program line are either D or E followed by a number, as is the case in lines 110 and 120 of Program 3 from "Viewports in IBM BASIC" (July issue, p. 71). In these cases, the VAL function in line 190 interprets the characters as indicating exponential notation, leading to an incorrect line number. The solution, suggested by reader Daniel Norling, is to make the following additions and changes to the Proofreader:

```
AG 190 REM
JB 205 BL=INSTR(L$," "):IF BL=0
       THEN BL$=L$:GOTO 206 ELSE
        BL$=LEFT$(L$,BL-1)
GH 206 LNUM=VAL(BL$):TEXT$=MID$(
       L$,LEN(STR$(LNUM))+1)
KA 470 WHILE NOT EOF(1):LINE INP
       UT #1,L$:BL=INSTR(L$," ")
       :BL$=LEFT$(L$,BL-1):LNUM(
       P)=VAL(BL$):L$(P)=MID$(L$
       ,LEN(STR$(VAL(BL$)))+1):P
       =P+1:WEND
```

Apple Universal INPUT

There is an error in the machine language for this INPUT enhancement routine from the June issue (p. 91), although you can use the routine with no problems most of the time. As reader Don Andrews discovered, the bug becomes apparent only when you attempt to input a string more than 76 characters long. (An LDY $00 instruction was used where an LDY #$00 was required.) The routine can be fixed by changing the 164 in line 280 to a 160:

```
280 DATA 30,3,160,0,204,3
    0,3,240
```

A review of *HomePak* in the July issue mentioned a free upgrade for those who bought the first version. (The upgraded telecommunications portion of the program now dials most Commodore modems.) However, the upgrade does require a $10 shipping and handling fee and the return of the original disk. Write to Batteries Included at 30 Mural Street, Richmond Hill, Ontario, L4B 1B5, Canada, or 17875 Sky Park North, Suite P, Irvine, CA 92714.

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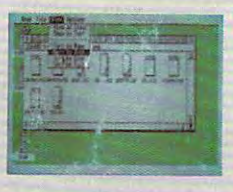

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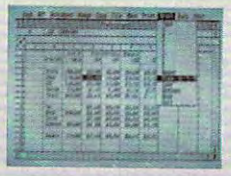

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