

A Turning Point For Atari?
Report From The Winter Consumer Electronics Show

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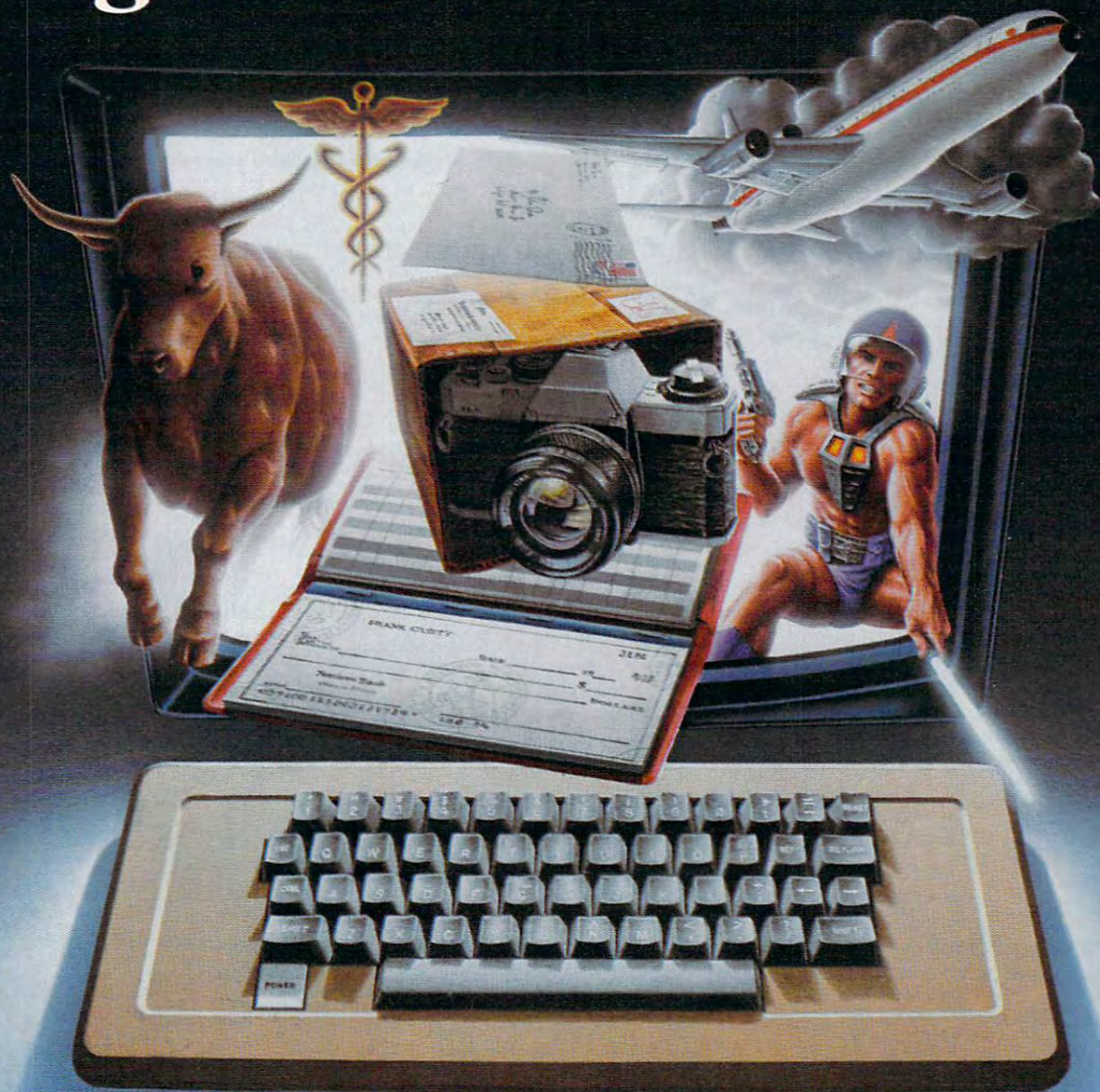
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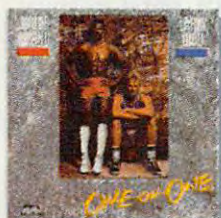
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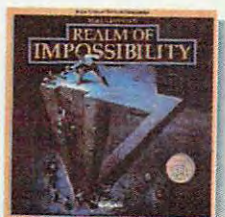
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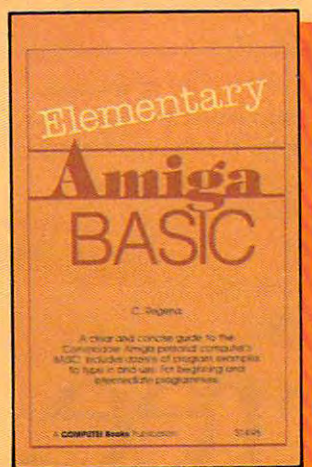
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Editor's Notes

COMPUTE! Editor Tom Halfhill contributes an editorial this month.

—Robert Lock, Editor in Chief

The latest-generation personal computers present the best evidence to date that microcomputers are evolving into desktop mainframes. Megabytes of memory, hard disk drives, high-speed processors, and multitasking operating systems are no longer limited to the monster machines locked away in the data processing departments of governments and big corporations. Now you can get these features in a personal computer that costs less than \$2,000 and fits comfortably on a desktop.

But why would you want to? After all, many people are questioning why anyone needs *any* kind of computer in their home. Are the new machines just a more blatant example of technological overkill?

Practically everyone who's ever used a computer understands the value of more memory and mass storage, high-speed processing, and faster input/output. All those things translate into more horsepower, and if the price is right, we'll welcome more horsepower. But one feature that some people are regarding with skepticism is multitasking—the ability to run more than one program at a time. Is it really practical to run a spreadsheet and a word processor simultaneously? Even if the computer can do two things at once, the user probably can't.

This criticism overlooks several advantages of multitasking: its convenience, the way it shifts busy work away from the user and onto the computer, its implications for software design, and its future applications in tomorrow's homes.

It's hard to appreciate the sheer convenience of multitasking until you've experienced it. Even if you aren't actively *using* two or more programs at once, you can keep them loaded in memory, available at the press of a key or click of a mouse button. For instance, you can type a letter with a word processor, switch to a terminal program to upload it to an electronic mail service, then switch to BASIC to finish a program you've been writing. On most home computers, that would

require rebooting the machine several times, swapping disks, running different programs, and waiting.

Multitasking can also spare you some drudgery by letting the computer do the tedious jobs. If you log onto a commercial information service to check stock quotations every evening, you can set up the computer to do this for you automatically—even while you're using the machine for something else in the meantime. Multitasking is something that's hard to do without once you've had it.

Multitasking also lets you create your own integrated software packages. You can buy whatever word processor, graphics program, spreadsheet, and terminal program you want and load them all into memory at once. If the computer supports a standardized file transfer protocol—as do the Macintosh and Amiga—you can cut and paste pictures or spreadsheet tables into documents created with the word processor and so forth, even if the programs were made by different software companies.

Finally, there are exciting possibilities for multitasking in the future. Remember that microcomputers are following the paths established by mainframes; it's a small step from multitasking to multiuser processing. If a computer can run several programs at once in windows on a single screen, why not turn those windows into separate screens and put them in different rooms? We know from our mail and readership surveys that many of you are already multicomputer households. Mom and Dad have a computer in the study, and the kids have one or two in the family room or bedroom. Someday you'll be able to buy a single personal computer with enough brute force to drive several terminals throughout your home. Each terminal will be as powerful and seemingly as independent as today's personal computers, yet the system will be economical because you'll all share the same printer, modem, hard disk drive, and CD-ROM player.

The main disadvantages of multitasking—the amounts of memory and processing time it can gobble up—are temporary annoyances. Memory chips are getting cheaper as fast as microprocessors are growing more powerful.

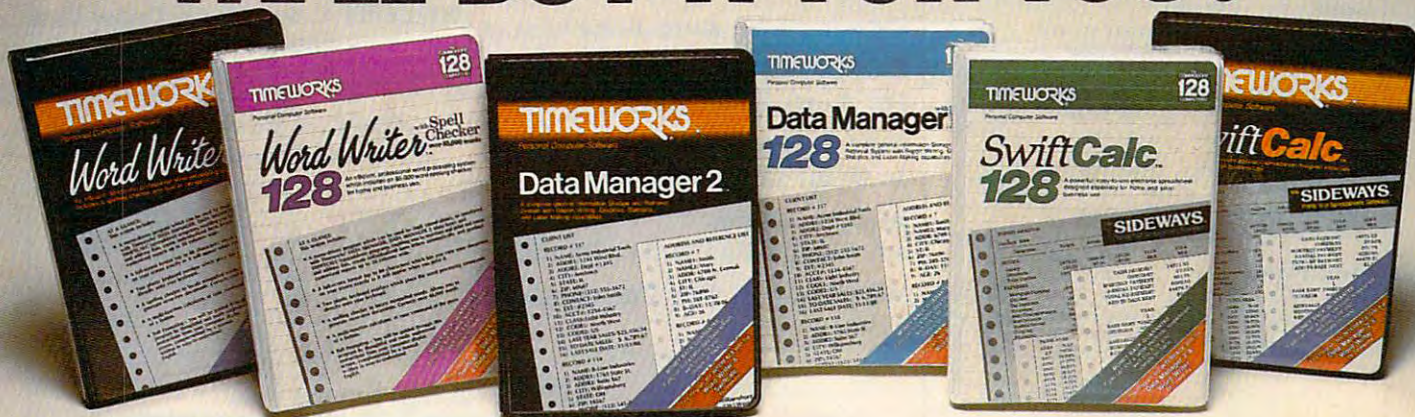
Atari recently introduced the first 1024K computer for under \$1,000, just five years after an 8K Atari 800 retailed for \$1,000. And Motorola recently announced a 20 megahertz version of its 68020 microprocessor, referred to as the "mainframe on a chip."

It seems that the only real problem to be overcome is the incredible complexity of writing and debugging a true multitasking operating system. Ask an IBM owner about all the popular *Sidick*-type, co-resident programs that compete for the attention of DOS interrupts and the keyboard. Or ask an Amiga owner about the weird things that can happen when the computer tries to do too much at once. (In fact, one of the strangest things we've seen on the Amiga is something that can be described as a "half crash." On practically any other computer, a system crash is a system crash—the machine locks up and you have no choice but to reboot. On the Amiga, we've managed to crash *part of the computer* while the other part struggles valiantly onward. You end up rebooting anyway just to play safe, but it's an interesting demonstration of multitasking.)

Essentially, multitasking gives you the near-equivalent of several computers in a single box. And if the box is priced right and meets your other requirements, why walk when you can run?

Tom R. Halfhill, Editor

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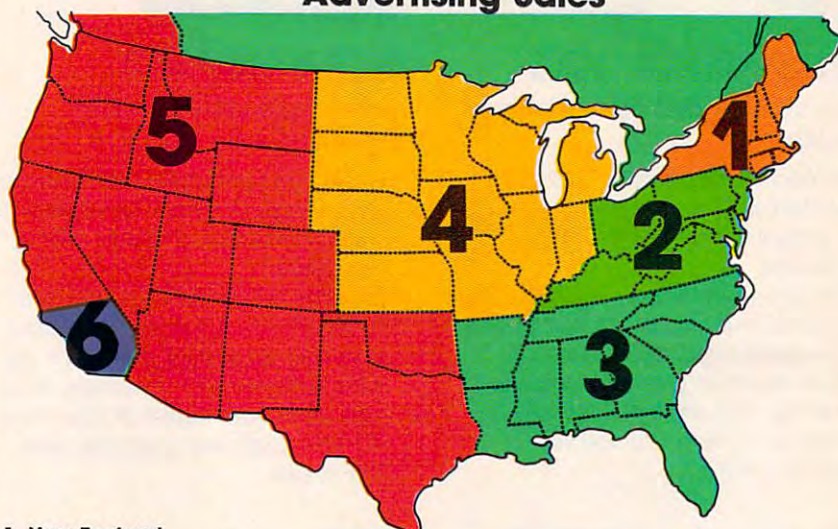
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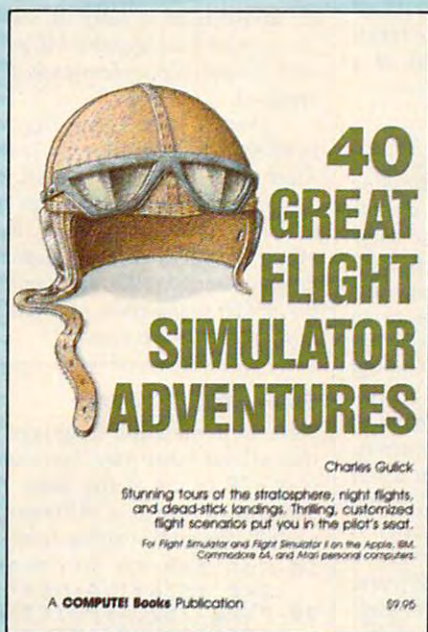
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Readers Feedback

The Editors and Readers of COMPUTE!

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Relocating Machine Language

I would like to combine two Commodore machine language programs that both reside at location 49152 (\$C000). I know that BASIC lets you relocate programs quite easily, just by moving the bottom-of-BASIC pointer upward. How is this done with ML programs?

Richard Sands

Machine language programs written for a 6502-based computer are usually quite difficult to relocate. For instance, say that you have an ML program at \$C000 which starts with these instructions:

```
LDA $C030,X
JSR $C200
JMP $C400
```

None of these instructions can be relocated unless you change the address contained in the instruction itself. The first (LDA \$C030,X) retrieves one byte of data from a table beginning at location \$C030 (note that the data lies within the program code). The JSR instruction works like GOSUB in BASIC, so JSR \$C200 goes to a subroutine located at \$C200 and then returns. JMP works like GOTO in BASIC: JMP \$C400 sends the computer straight to the segment of code located at \$C400. Now say that you move the entire program down to location \$8000. The instruction JSR \$C200 still sends the computer to \$C200, but that address isn't within the program any more. To make the code work correctly at \$8000, you'd have to change these three instructions to the following:

```
LDA $8030,X
JSR $8200
JMP $8400
```

That's not particularly difficult, and some machine language monitors even have a special command to make such adjustments automatically. However, you must be careful not to change addresses

that refer to locations outside the program:

JSR \$FFD2

This instruction calls the standard Commodore print-a-character routine, located in the computer's ROM. If you mistakenly adjust this address along with all the internal address references, the result may be disastrous. Now let's look at a more difficult case:

LDA (\$B),Y

This instruction uses the powerful and very common indirect Y addressing mode, which refers indirectly to an address held in two successive zero page addresses (locations \$FB-\$FC in this case). There's no way to tell by looking at this instruction alone whether it refers to an area inside the program (and hence requires adjustment) or something external to the program code (in which case adjustment may be a mistake). You'll have to disassemble the program in its entirety, looking for other instructions that affect the contents of locations \$FB-\$FC, either directly or indirectly. If this instruction is part of a general-purpose subroutine, you may find that it's called by many different parts of the program. Since free zero-page space is limited, you may also find that other subroutines re-use locations \$FB-\$FC for an entirely different purpose. And while it's obvious that an instruction like STA \$FB affects the contents of \$FB, what about ROR \$03,X or STA (\$B0),Y? Those instructions might just as easily change the address held in \$FB-\$FC.

Once you've sorted out all the indirect addressing, you'll need to check for self-modifying routines—code that changes its own instructions while it runs. When that's done, you'll have to interpret all the program's data and variable areas. For instance, say that you find the following hexadecimal values in a memory dump of the program code:

```
93 05 20 C4 54 0D 41 43
```

These bytes could be virtually anything—sprite shape data, characters for a printed message, part of an internal dispatch table, preset values for a bunch of unrelated variables, or even garbage that will be replaced with something meaningful when the program runs. While some programmers locate data areas at the end of the program, others sprinkle data and

variables freely throughout the code. Until you find out exactly what purpose these bytes serve, there's no way to tell whether they need adjustment. This problem, more than any other, makes it impossible to write an "automatic ML relocater" that works correctly in every case. The relocater would need to have as much intelligence as a knowledgeable ML programmer who thoroughly understands the subject program.

These problems generally don't apply to 68000-based computers like the Amiga, Atari 520ST, and Macintosh. Since the computer normally decides for itself where to load the ML code, most 68000 ML programs must be relocatable. That's no great hardship for programmers, since the 68000 instruction set includes many relocatable instructions.

128 Atari Colors

Here is a machine language program that allows your Atari computer to display 128 colors at the same time. The program displays a different color on each horizontal display line.

```
10 FOR I=0 TO 21:READ A:P
   OKE 1536+I,A: NEXT I
20 POKE 752,1:PRINT CHR$(
   125):A=USR(1536)
30 DATA 173,11,212,201,32
   ,208,249,141,10,212,14
   2,24,208,232,232,208,2
   46,142
40 DATA 24,208,240,232
```

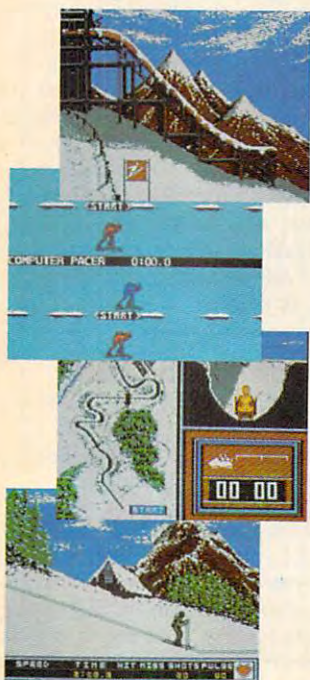
David Boyer

Thank you for the example.

Using Preview-80 With 64 SpeedCalc

I own a Commodore 64 and look forward to getting new programs from COMPUTE! each month, especially utilities. After typing in SpeedCalc (COMPUTE!, January 1985), I was pleased to find that the "Preview-80" program (COMPUTE!'s GAZETTE, November 1985) works just as well with SpeedCalc as it does with SpeedScript. This lets you preview a SpeedCalc file in 80-column format on the screen before printing it out. The procedure for using Preview-80 is the same as usual. First, load Preview-80 with LOAD "PREVIEW80",8,1. Then type NEW, and load SpeedCalc as you would normally. Instead of typing

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RUN to start *SpeedCalc*, type `SYS52000` and press RETURN. *SpeedCalc* will become active as usual. But when you press `SHIFT-CTRL-P` for printed output, and then press `S` for output to the screen, *Preview-80* takes over. All of the *Preview-80* options are available; to exit the *Preview-80* window, press `RUN/STOP` twice.

Bob Starr

Thanks for the tip.

Moving AmigaDOS Commands To RAM

Regarding your article "Introduction to AmigaDOS" (*COMPUTE!*, January 1985), I feel that it's inconvenient to have all of the AmigaDOS commands—especially often-used commands like `DIR`—stored on disk rather than in memory. Is it possible to load all or part of DOS into RAM? If so, how much memory does it take up? Can you write a batch file to make this part of the boot sequence? Will AmigaDOS become RAM-resident in the future?

Barry Silverstein

Every AmigaDOS command is disk-resident, and you're not likely to see any change in the near future. This can be inconvenient at times since, for each separate AmigaDOS command, the computer has to access the same Workbench disk that was present when you booted the system. If you have only one disk drive, this scheme creates delays and requires extra disk-swapping. Fortunately, there's a simple remedy. If you create a RAM disk, you can then `COPY` any or all of the AmigaDOS commands from floppy disk to RAM disk; the amount of memory consumed depends on how many commands you copy. Once that's done, an `ASSIGN` command tells the system to use the RAM-resident commands.

The most convenient way to move AmigaDOS commands into RAM is by editing the startup-sequence file, which is similar to an `AUTOEXEC.BAT` file in PC/DOS and MS/DOS systems. When you insert a disk in response to the Amiga's Workbench disk prompt, the computer looks in the `S` subdirectory of the currently mounted disk for a file named startup-sequence. If this file is present, the computer executes the AmigaDOS commands that it contains. Since startup-sequence is an ordinary ASCII text file, it's easy to modify with a word processor or any text editor that handles ASCII files. (Before editing this file, make sure that you have at least one copy of the Workbench disk in addition to the one that came with your computer.) If you edit this file with *Textcraft* or some other word processor, you must resave it in the form of plain ASCII text, without special formatting characters or control codes.

AmigaDOS includes two text editors of its own. The easiest one to use is called `ED`. Type this line at the CLI prompt, then press RETURN:

`ed "s/startup-sequence"`

This command activates `ED` and loads startup-sequence into the editor. An unmodified startup-sequence file looks like this:

```
ECHO "Workbench disk. Version 1.1"
ECHO ""
ECHO "Use Preferences tool to set date."
ECHO ""
LoadWb
endcli > nil:
```

You'll probably recognize the messages that appear on the screen when you boot up with that disk. The `LoadWb` command loads and activates the Workbench, and `endcli` terminates the AmigaDOS command sequence, returning you to the Workbench screen. We'll use `ED` to add some new command lines between `LoadWb` and `endcli`. `ED` is a very simple text editor: Use the cursor keys to move around in the file, and the `BACKSPACE` key to delete characters. Everything that you type is inserted at the current cursor position (you can use uppercase if you like, but lowercase works just as well and is easier to type).

While you could copy the entire command directory (named `C`) into the RAM-disk, that wastes a lot of RAM since some AmigaDOS commands are used only rarely. To save memory, we'll copy only the most commonly used commands. Place the cursor on top of the `E` in `endcli` and enter these lines, pressing RETURN at the end of each line:

```
echo "Copying AmigaDOS commands to
RAM disk..."
copy c/copy ram:c/copy
assign x: ram:c/copy
assign d: ram:c
cd sys:c
x: assign d:
x: cd d:
x: copy d:
x: delete d:
x: dir d:
x: diskcopy d:
x: echo d:
x: ed d:
x: endcli d:
x: info d:
x: list d:
x: mkdir d:
x: newcli d:
x: rename d:
x: run d:
x: type d:
cd sys:
assign c: ram:c
assign d: c:delete
```

Remember, this set of commands goes between the `LoadWb` and `endcli` lines in the normal startup-sequence file. If you change your mind and don't want to modify the file, press `ESC-Q` followed by `RE-`

`TURN`; `ED` returns you to the CLI without changing anything. To save the modified file to disk, press `ESC-X` followed by `RETURN`. After the file is resaved, `ED` returns you to the CLI prompt. To test the new startup-sequence file, reboot the computer by pressing `CTRL-Left Amiga-Right Amiga`. It takes about a minute to copy the commands shown above. Once the process is finished, all of the copied commands are instantly available in RAM (if this doesn't work, reload startup-sequence into `ED` and check for typing mistakes).

The first command line following `ECHO` copies the `COPY` command itself into RAM so the computer can copy subsequent commands without accessing the disk each time. The next three lines simplify your typing job: The first `ASSIGN` command tells the computer to substitute the characters `ram:c/copy` wherever it sees the characters `x:`. The second `ASSIGN` creates another short alias (`d:`) which stands for the pathname `ram:c`. The `CD` command changes the current directory to `SYS:C` so you won't need to specify a subdirectory for every file you want to move. These three shortcuts let you abbreviate all of the remaining `COPY` commands (the command `x: endcli d:` becomes the equivalent of `ram:c/copy sys:c/endcli ram:c`, and so on).

Thus, each line beginning with `x:` causes the computer to copy a single AmigaDOS command to the RAM disk. Of course, you can delete commands from this list, or add others if desired. The command `ASSIGN C: RAM:C` tells the computer to use the `C` directory in the RAM disk as its command directory. From this point on, the Amiga searches the RAM disk when you tell it to execute an AmigaDOS command. The final `ASSIGN` command isn't really necessary, but shows how to create a shorthand name for an often-used command. In this case, we're creating `d:` as a synonym for `DELETE`. Once this is done, you can delete the file `TEST` by typing either `DELETE TEST` or `D:TEST`. This can be done for any command, using whatever shorthand you like. The command sequence shown here is adapted from an example in *COMPUTE!'s AmigaDOS Reference Guide*, which explains this and many other AmigaDOS topics in detail.

HELP For Atari XL And XE

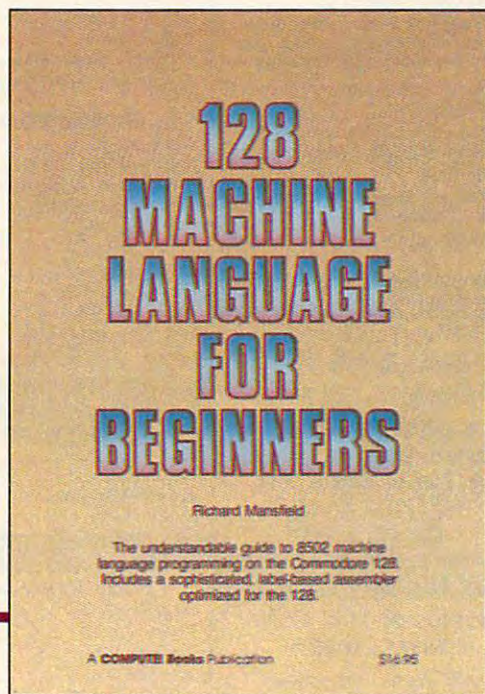
I have an Atari 800XL and would like to know how to read the HELP key.

R.E. Brock

The status of the HELP key can be determined by `PEEK`ing location 732 on the Atari XL and XE computers. If the HELP key alone is pressed, this location returns a value of 17; when `SHIFT` and `HELP` are pressed simultaneously, it contains 81.

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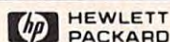
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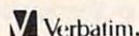
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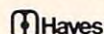
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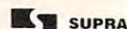
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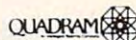
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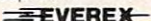
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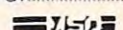
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Pressing CONTROL and HELP returns a value of 145. The statement POKE 732,0 clears location 732, so you can check for subsequent keypresses.

Apple IIc Compatibility

I'm interested in buying an Apple IIc computer. Can it use IIc hardware and software?

Carlos Aguayo

The Apple IIc computer is basically an Apple IIe that has been redesigned to take up as little space as possible. To keep the IIc small, Apple left out the IIe's expansion slots (where additional hardware can be attached), but added a built-in 5¼-inch disk drive. They also put the most common IIe expansion hardware (80-column video display, an extra 64K of memory, and two serial input/output ports) on the main board of the IIc. In addition, the IIc has some features that weren't available when the IIe appeared: an advanced 65C02 microprocessor and a character set called MouseText which contains extra characters especially for Macintosh-style icon- and menu-based programs. The newest version of the IIc (called Enhanced IIc) does have these extra features; dealers can upgrade an older IIc at a small cost.

The IIc can run almost all IIe programs, as long as no special hardware is required. For instance, some music programs can communicate with instruments through a MIDI (Musical Instrument Digital Interface) adapter. This adapter must connect to an expansion slot, which is possible only on a IIe. Other programs sometimes expect a parallel I/O interface to attach a printer. Since the IIc has only serial I/O, it can't run that type of modification. Although the IIc has no expansion slots, its peripherals (serial ports, disk drives, etc.) act like they are built into certain slots. Apple tried to select the most commonly used slot for each peripheral (printer in slot 1, disk drive in slot 6). However, not everyone puts everything in the same place, and some programs may demand an unconventional configuration. IIc owners can rearrange the cards in their slots to run such programs, but IIc owners don't have this option.

The serial ports on the IIc generate standard RS-232 signals which can be used to communicate with most modems from any manufacturer. Many of the most popular printers are also available with RS-232 interfaces. But the IIc does not have standard connectors for these ports. To save space on the back panel of the computer, DIN-type connectors are used instead; as a result, you'll need special cables (available from Apple dealers) to attach serial peripherals.

When it comes to expandability, the IIc is much more flexible than the IIe. Almost any kind of peripheral can be

attached through one of its slots, including parallel I/O ports, MIDI interfaces, hard disk drives, coprocessors, huge RAM expansion cards, and a host of other devices. However, some third-party companies have begun modifying the IIc to put in extras like additional memory and Z80 processors (to run the CP/M operating system, a popular IIe add-on). It's still more difficult than expanding a IIe, but it can be done.

IBM PUT And GET

I own a TI-99/4A and an IBM PCjr. Lately, I've been trying to convert some programs from TI to IBM. I have only one problem: the PUT and GET graphic statements in the IBM system. I really don't understand them. Could you show me a way to make an image and move it?

Billy Mobley

First, be aware that IBM BASIC has two types of GET and PUT statements: one for graphics and another for random files. The syntax for each type is different, so be sure you're using the graphics type. GET grabs the screen image within a specified rectangle and stores a copy of it in an array. PUT does just the opposite, putting the image from an array back onto the screen.

Several important rules apply to PUT and GET. Before using either command, you must be in a graphics mode (SCREEN 1, for example); neither PUT nor GET works on a text screen. The array that you GET a shape into must be a one-dimensional numeric array dimensioned to the proper size. Finally, you must GET before you can PUT.

The most difficult task is deciding what size to dimension the array. If the array is too small, it can't hold the graphics image, and the program won't work. The simplest solution is to try a large size like DIM A(500). It won't hurt to dimension it larger than necessary, but this method wastes memory. Here's a more efficient formula that tells you the minimum required size for the array:

$$\text{INT}((4 + \text{INT}((x * \text{res} + 7) / 8) * y) / \text{prec})$$

In this formula, the variable x represents the width of the image in pixels; y is the height of the image; res is 1 for high resolution and 2 for medium resolution; and prec is the precision of the array (2 for integer, 4 for single precision, and 8 for double precision).

GET must be followed by the screen coordinates of two opposite corners of the rectangular image, and the name of the array. For example, GET (0,0)-(19,29),A grabs a 20 X 30 pixel image at the top-left corner of the screen and stores it in array A. (Of course, you must first have an image on the screen. This can be done with DRAW.) With a high-resolution

screen and a single-precision array, the formula above gives 23, so the dimension statement would be DIM A(23).

PUT is followed by the coordinates of the location on the screen where the top-left corner of the image is placed, then the name of the array, and an optional parameter for special effects. Five special effects are available: PSET, PRESET, AND, OR, and XOR. If no special effect is specified, XOR is assumed.

PSET displays the image exactly as it appeared when GET was used. PRESET displays a negative image. AND displays only those parts of the image that overlap an image already on the screen. OR superimposes the image onto an image already on the screen. XOR is a combination of AND and PRESET, reversing only those parts of the image that overlap an image already on the screen. The best way to understand exactly what these special effects do is to try them yourself. Using our example, PUT (200,100),A,PSET displays the image stored in the A array in the center of the screen.

The operation of XOR may seem strange, but it's handy for animation. When you PUT using XOR twice in the same position, the screen is restored unchanged. This allows you to move an image over a background image, giving a 3-D effect. Animation with XOR is a three-step process: PUT the image on the screen with XOR, calculate the new position, PUT the image in the old position a second time to erase it. By performing these steps repeatedly, the image seems to move. The following program moves a ball across the screen.

```
10 SCREEN 1
20 DIM A(113)
30 CIRCLE (20,20),20
40 PAINT (20,20)
50 GET (0,0)-(40,40),A
60 CLS
70 FOR C=1 TO 100
80 PUT (X1,Y1),A 'display image
90 X2=X1+1:Y2=Y1+1 'calculate new position
100 PUT (X1,Y1),A 'erase image
110 X1=X2:Y1=Y2 'old=new
120 NEXT 'repeat
```

Simpler Absent Printer Test

I'm writing with regard to the "Readers' Feedback" item on absent Commodore printers, published in the December 1985 COMPUTE!. Another way to avoid a DEVICE NOT PRESENT error is to access the appropriate device (4) through the command channel (15) and check the value of the status variable ST. If ST does not equal 0, then the printer is not present. Here is a short routine to demonstrate:

```
10 OPEN 15,4,15:CLOSE 15
20 IF ST<>0 THEN 40
```


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```
30 OPEN 1,4:PRINT#1,"PRINTER I
  S ON":CLOSE 1:END
40 PRINT CHR$(147):"TURN ON PR
  INTER":GOTO 10
```

If you run this program with the printer off, it instructs you to turn the device on. Printing begins as soon as the printer is active.

Jim Plavecsky

Thanks for this compact, all-BASIC solution. In programs that open disk files or use an RS-232 device (usually a modem), you may want to perform this check at the very beginning, before you perform any other OPEN statements. The statement CLOSE 15 closes all other channels in addition to the command channel, terminating any RS-232 communications and disconnecting (but not really closing) any open disk files.

Emphasized TI Character Set

The custom character set given for the Commodore 64 on pages 108-109 of COMPUTE!'s January 1986 issue can be used on the TI-99/4A with only slight modifications. Since that character definition data is listed in hexadecimal format, it can be read as a pattern-identifier string and assigned with the CALL CHAR statement (see page II:76 in the

TI User's Reference Guide). Each line in the Commodore character set listing contains data for a single character plus a checksum value at the end of the line. To convert the data in each line to a 16-character pattern-identifier string, type in the first eight two-digit hexadecimal numbers (spaces are left out, of course). In the first line, for instance, the resulting string could be used with a CALL CHAR statement to redefine the @ character. To create the new character set, first enter this program:

```
100 FOR L=1 TO 94
110 READ C$
120 CALL CHAR(L+32,C$)
130 PRINT CHR$(L+32);
140 NEXT L
150 GOTO 150
```

Next, you must enter a series of lines containing DATA statements. Each DATA statement represents the data for one character in the form of a 16-character pattern identifier string. For example, the first DATA line would look like this:

```
500 DATA 7CC6DEDEC0C07800
```

Here is how to enter all of the DATA lines.

lines 500-800 Use data from line 7108-71F8 (defines

line 810	ASCII characters 33-63)
	Use data from line 7000 (ASCII 64)
lines 820-1070	Use data from lines 7208-72D0 (ASCII 65-90)
line 1080	Use data from line 70D8 (ASCII 91)
line 1090	Use 00C06030180C0600 as data (ASCII 92)
lines 1100-1110	Use data from lines 70E8-70F0 (ASCII 93-94)
line 1120	Use 00000000000000FF as data (ASCII 95)
line 1130	Use data from line 7200 (ASCII 96)
lines 1140-1390	Use data from lines 7008-70D0 (ASCII 97-122)
lines 1400-1420	Enter data from lines 72D8-72E8 (ASCII 123-125)
line 1430	Enter 000020745C080000 as data (ASCII 126)

The result of your effort will be an emphasized font with true lowercase.

John Hedstrom

Thank you for your suggestion.

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HOTWARE: Software Best Sellers

					Systems				
This Month	Last Month	Title	Publisher	Remarks	Apple	Atari	Commodore	IBM	Macintosh
Entertainment									
1.		<i>Jet</i>	SubLogic	Jet simulation			•		
2.	4.	<i>Silent Service</i>	MicroProse	Submarine simulation	•	•	•	•	
3.	3.	<i>Ultima IV</i>	Origin Systems, Inc.	Fantasy game	•	•	•		
4.	2.	<i>Karateka</i>	Brøderbund	Action karate game	•	•	•		
5.	1.	<i>F-15 Strike Eagle</i>	MicroProse	Air combat simulation	•	•	•	•	
Education									
1.	1.	<i>Typing Tutor III</i>	Simon & Schuster	Typing instruction program	•		•	•	•
2.	2.	<i>Math Blaster!</i>	Davidson	Introductory math program, ages 6-12	•	•	•	•	
3.	3.	<i>New Improved MasterType</i>	Scarborough	Typing instruction program	•	•	•	•	•
4.	4.	<i>Music Construction Set</i>	Electronic Arts	Music composition program	•	•	•		
5.	5.	<i>I Am The C-64</i>	Creative/Activision	Introduction to the C-64			•		
Home Management									
1.	1.	<i>Print Shop</i>	Brøderbund	Do-it-yourself print shop	•	•	•		
2.	2.	<i>The Newsroom</i>	Springboard	Do-it-yourself newspaper	•		•	•	
3.		<i>Bank Street Writer</i>	Brøderbund	Word processor	•	•	•	•	
4.	3.	<i>Print Shop Graphics Library III</i>	Brøderbund	Upgraded graphics library	•	•	•		
5.	4.	<i>Print Shop Graphics Library</i>	Brøderbund	100 additional graphics	•	•	•		

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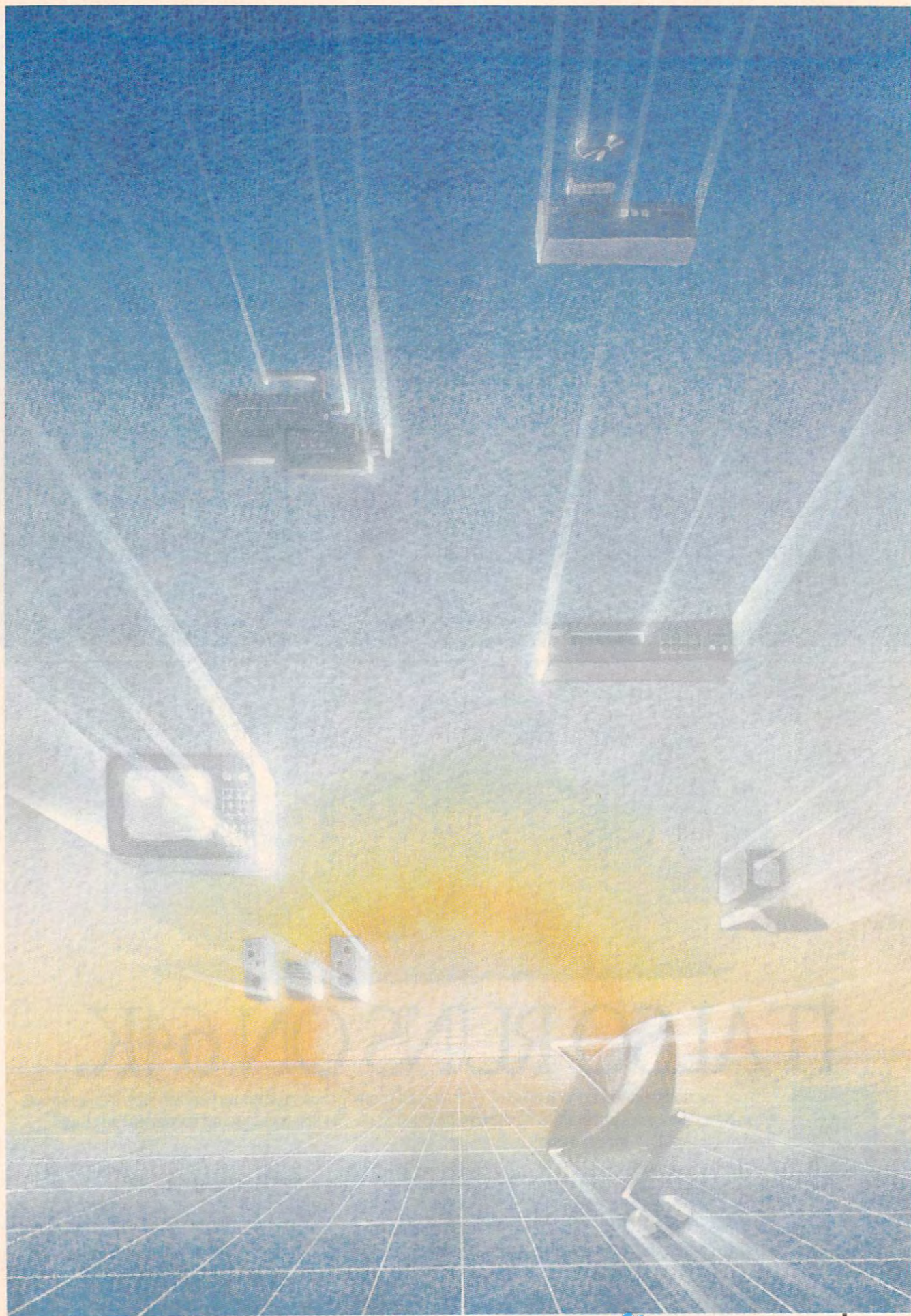
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NEW TECHNOLOGIES

The Converging Digital Universe

Selby Bateman, Features Editor

The winds of technological change have been blowing a gale for the past few years. And the forecast shows no indication of a letup. In fact, millions of consumers will begin to reap a resulting whirlwind of new high-tech products for the home, office, and classroom. Consider the following:

- A home stereo system answers your phone, takes messages, and alerts you to incoming calls.
- With the push of a button, your video film recorder captures a picture from your favorite TV show and instantly prints out a still photo for your wallet.
- Your 20-volume set of encyclopedias, contained and cross-indexed on a compact disc in a player connected to your computer, searches and prints out 37 reference sources on your selected topic in less than 30 seconds.
- The satellite dish in your backyard automatically tracks various communication satellites based on the pattern of TV programs you want to watch each night. At the same time, your computer is receiving and storing financial data that unobtrusively shares the same incoming satellite transmission to your TV.
- The digital TV in your living room displays two small windows on the screen while you watch a

The digitization of America is well under way. Thanks to a wave of new consumer electronics products, this year more people than ever will see and hear how the convergence of digital audio, video, satellite, telephone, optical, laser, television, and computer technologies is transforming the world. Yet, the phenomenon is just beginning.

program uninterrupted; one window shows the changing stock quotations, while the second window displays a program from a different channel or previews a tape from your videocassette recorder.

- The computer image recorder connected to your personal computer makes a 35 mm slide, color print, or overhead transparency of the business chart or digital painting you've just created.

Does any of this sound far-fetched? You'll be able to buy products this year that do all of these things and more. If it seems difficult to keep up with the latest news about consumer electronics, it's not your fault. Never have so many dramatic technological changes produced so many new capabilities and products in so short a time. What has become strikingly clear is that all of these innovations share a

common foundation—the digital, microprocessor-based world of computer electronics.

These changes have become so important to our lives and our pocketbooks that market researchers are now targeting a new group of consumers: Technologically Advanced Families (TAFs). Could "yuppies" eventually be surpassed in importance by "taffies," households that purchase and use the latest computers, VCRs, stereo TVs, 8 mm camcorders (camera recorders), compact disc players, satellite dishes, and dozens of other products? Consumer electronics manufacturers and retailers believe that these households are the important leading-edge market for their array of new products.

Among the catalysts sparking enthusiasm for the latest in high-tech gear, none is more important than the personal computer phenomenon of the past half-dozen years. Not only are computer owners the bedrock of the TAFs, but the new generation of 16/32-bit computers is powerful enough to work with just about any other consumer electronics product. Suddenly, devices like VCRs, compact disc players, electronic keyboards, and camcorders have become computer peripherals. As these products continue to become more sophisticated

and flexible, their technologies converge and their capabilities expand. In the world of consumer electronics, the whole has indeed become more than the sum of its parts.

The development of the microcomputer has accelerated an already rapid evolution, says David Allen, president of Boston Media Consultants and a writer specializing in TV production, computers, videodiscs, and videotape. "They come along with greater speed. That's not a function of any interactivity, that's just a curve that the computer industry and microelectronics industry are on.

"Each development feeds the next development in a serendipitous way that makes succeeding developments faster to accomplish," says Allen. "You can really say that we're now to the point at which you could almost create any technological package you could conceive of, if you don't put a price restriction on it. Nothing is technologically impossible, in a broad sense. But it has to be accompanied by some kind of way to get return on investment. And that's what slows things down more than anything else right now. It's market-driven, not technologically driven."

During the past year, a parade of new technologies has entered the computer scene. The arrival of MIDI (Musical Instrument Digital Interface) has opened the doors to a new world of computer-based music composition and performance (see "Making Music with MIDI," *COMPUTE!*, January 1986). Laser-driven compact disc technology has branched out from stereo systems to computer data storage and retrieval. Smaller, less expensive video cameras and camcorders that connect with VCRs and computers are making inroads in consumer markets.

In addition, a new family of audio/video hardware and software products has been created to take advantage of the latest computers, particularly the Commodore Amiga, Atari ST, and Apple Macintosh.

It's appropriate that in this age of video one of the most promising fields of development is computer control of video images that originate from video cameras,

VCRs, laser disc players, other computers, or TVs with video outputs—essentially any device that puts out a composite video signal. For instance, Commodore is releasing two fascinating video peripherals for the Amiga: the Genlock, which plugs into the back of the Amiga and mixes external video signals with the computer's own video output; and the Amiga LIVE digitizer (formerly known as the "frame grabber"), which captures and digitizes an external video image in the Amiga itself.



Commodore/Amiga's Genlock accessory tucks beneath the rear of the Amiga computer and permits sophisticated video image mixing.

"Genlock is external to the Amiga and externally mixes two video sources, one of them the Amiga's," explains Paul Higginbottom, an Amiga product manager at Commodore. "So you take the Amiga's video source and the external video source, and you combine them—and the audio as well. Nothing comes into the Amiga with Genlock. With Amiga LIVE, a digitized picture is brought into the Amiga. So one [Genlock] is doing superimposing, and the other [Amiga LIVE] is actually taking an image and bringing it in.

"They operate separately, but you could certainly use them together," says Higginbottom. "You may want to take a real image and put Amiga's graphics on it, and digitize those back into the Amiga again."

Immediate applications for the Genlock include on-screen titling for video presentations or home movies, "electronic chalkboard" effects similar to those used for TV sports analysis, and special video effects achieved by mixing Amiga

graphics with other video images. At the Amiga's official unveiling in New York last summer, artist Andy Warhol used a video camera, Genlock, and Amiga LIVE to digitize a picture of rock singer Deborah Harry, then used a mouse-controlled graphics program to "paint" the video image with new colors. Amiga LIVE can be used not only for special video effects such as these, but also for video databases, says Higginbottom.

"We don't just mean pretty pictures. If you're a real estate agent or an architect, or you have a parts list you want to inventory, something like that—then you can have a video inventory," he explains. "And Amiga LIVE performs in real-time, not like most digitizers you see that usually take anywhere from 8 to 30 seconds to generate the picture on the screen. This is in realtime; if you have a movie camera, you'll see the image move as you move the camera."

Both the Genlock and Amiga LIVE are expected to be available in April or May, pending final FCC approval. Each accessory will cost about \$249.95.

A different video digitizer is in the works for the Atari ST and should be available by the time you read this. Hippopotamus Software is introducing the Hippovision Video Digitizer this spring for the ST and plans to have a version available later for the Amiga. (No price announced yet.)

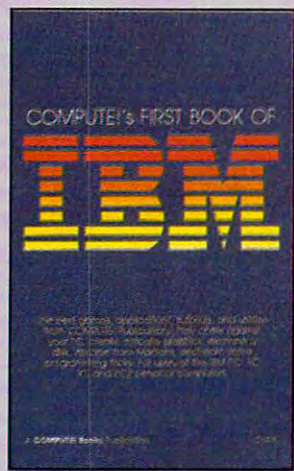
"Anything that produces video signals, you just plug into the [digitizer] box that's connected to the computer," says Clint Ballard, vice president of engineering for the Los Gatos, California firm. "You press a button when you get a picture you like, and there you have it. We'll also have image processing software with which you can change around the colors—do whatever you want with it. This really opens up the graphics world."

For the Macintosh, which has a two-year head start on the Amiga and ST, there are already several video digitizers and compatible graphics programs available. *Mac-Vision* from Koala Technologies, *Micro-Imager* from Servidyne Systems, Inc., *Thunderscan* from Thunderware, Inc., and a few others

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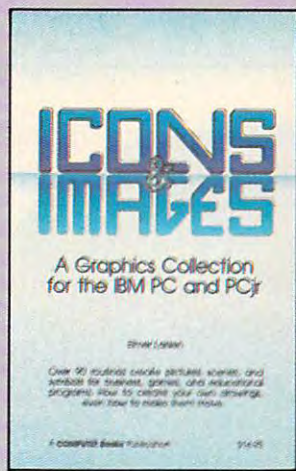
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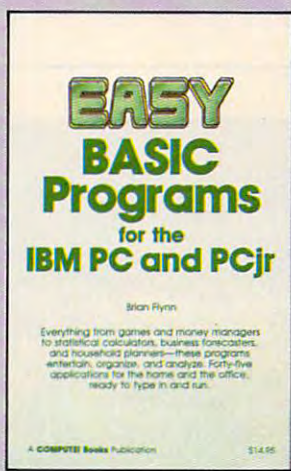
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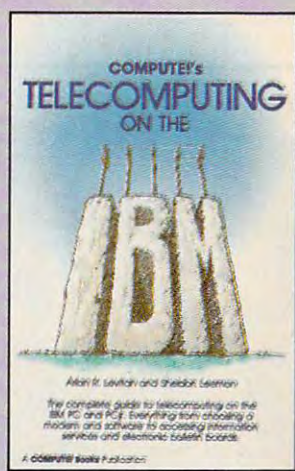
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Speed MHz	8.0	7.16	6.0	7.83	1.0
Standard RAM	1 MB	256K	256K	512K	128K
Standard ROM	192K	192K	64K	64K	16K
Number of Keys	95	89	95	59	63
Mouse	Yes	Yes	No	Yes	Optional
Screen Resolution (Non-Interlaced Mode)					
Color	640x200	640x200***	640x200	None	560x192
Monochrome	640x400	640x200***	720x350**	512x342	560x192
Color Output	Yes	Yes	Optional	None	Yes
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make excellent use of the Mac's high-resolution monochrome graphics. Since the Amiga and the ST each boast superb color graphics as well as high-resolution modes surpassing the Mac's, video digitization hardware and graphics software are becoming even more flexible and powerful.

As computers grow more capable of handling video images, other manufacturers are gearing up to take advantage of new markets expected to develop. Toshiba and Polaroid have announced products which strengthen the connections among computers, photography, and video. The two companies are jointly introducing a new instant video film recorder that produces instant color prints or slides from a TV set or monitor and has optional RGB (red-green-blue) computer input. The recorder features digital freeze-field capture, color preview capability, and accepts standard NTSC (National Television Standards Committee) signals.

The recorder captures and digitizes any image from a TV screen, whether the signal originated from a broadcast station, VCR, video camera, or any other standard video device. When equipped with the appropriate camera, the result is an instant photo print or 35 mm slide. With the push of a button, you could freeze one frame of your home movies, your favorite rock video, or a TV show, and then instantly produce a color picture. The recorder is expected to be available by midyear.

Polaroid is also introducing this year an improved version of its Palette computer image recorder. The Palette provides presentation-quality photos from computer graphics generated by a wide variety of computers, such as the Apple II series and the IBM PC family. It's capable of handling image resolutions up to 920 X 700, depending on the combination of hardware and software. Almost all presentation-graphics and graphics-editing software is compatible with the under-\$2,000 system.

Although few personal computer owners will spend several thousand dollars to buy such video systems for the home, the next few years will see

dramatic price drops as technology improves and costs decline.

For example, Kodak's Consumer Electronics Division plans to introduce a still video system that allows you to select and record individual video images. The system's player/recorder captures images in realtime from any NTSC video signal and stores up to 50 images on a tiny floppy disk. An adjunct to this system is a film-to-disk transfer station that may be installed at film processors; you could have 35 mm color negatives transferred to the floppy disk, then view the pictures at home on your TV—ordering regular prints later, if you like.

Kodak had also planned to announce a new color video imager for producing instant prints of any video image. However, a recent decision by the U.S. Supreme Court on behalf of Polaroid has forced Kodak to withdraw from the instant photography business. Although Kodak had expected initial sales of the video imager to be in commercial and industrial applications, the long-range plan was to make the product part of home computer and video centers, according to Richard D. Lorbach, vice president of Kodak's consumer division.

"We anticipate that the color video imager eventually will be used as a home entertainment center component," said Lorbach before the court decision was handed down. "Our market research indicates that there is significant consumer interest in being able to make photographs of personal images displayed on TV screens."

This type of video system presents a wide range of possibilities. For example, by capturing images from your home videos, you could make a slide show of still shots or produce prints or slides for family albums. Computer artists could take their digital paintings or images captured from a video source and create their own sequenced video show. With the appropriate computer software, text could be overlaid on any of the images.

There are hundreds of business and industrial applications for this technology. Rather than spending thousands of dollars on outside production of sales and marketing presentations, almost any business

would have access to high-quality video production. A real estate agency could take photos or videotapes of its properties, add textual information on prices and other details, and then show the resulting package to their customers. Any of the frames could be turned into glossy prints for the house-hunters to keep for reference. The ramifications are virtually limitless.

One of the most important developments in the marriage of computer and video technology is the introduction of digital TVs—TV sets that convert the incoming analog broadcast signal into digital form. Toshiba, Sony, and most of the other large consumer electronics companies have invested millions of dollars to develop digital TV. Exceptionally clear pictures are only one of the benefits of this research. Digital TVs also have what's called PIP (picture-in-picture) capability—they can partition the viewing screen by opening separate "windows" for simultaneously displaying other video signals.

An example is the 26-inch DT-2680A TV receiver/monitor from NEC Home Electronics. It can simultaneously display the picture from the station that's tuned in plus moving pictures from any of three auxiliary video inputs, or color computer graphics through the set's RGB input. You can watch two channels at once, or a channel and a videotape, or even work with your home computer while watching TV on the same screen.

The picture you'll be watching is much sharper, too. Today's conventional TVs offer approximately 250 lines of horizontal screen resolution, while the NEC digital TV is capable of resolving up to 500 lines. This is actually more resolution than is available from broadcast signals. Through special filtering, the digital TV displays a broadcast screen resolution of 336 lines—the best that's possible with today's broadcasts.

In addition, the NEC digital TV has enough microprocessor-based memory to store up to three different still video pictures at a time. By pressing a button on the remote control, you can capture any video image and display it as an 8½-inch



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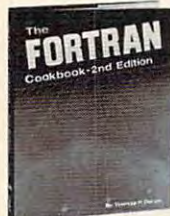
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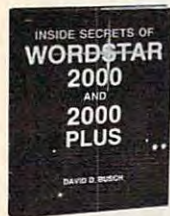
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(diagonal) window within the 26-inch screen. Meanwhile, the background video image is unaffected. You could freeze-frame a fullback plowing through the line while watching the play continue on the main screen.

As might be expected, the connection capabilities and special features of such a TV set go far beyond the few video and audio plugs found on even the better current sets. The NEC digital TV contains a stereo amplifier and stereo speakers, three sets of line video inputs for VCRs, video disc players, color cameras, and home computers, and an eight-pin RGB input. Outputs include a monitor jack that carries whatever is on the screen, a TV output that carries whatever channel is tuned, external speaker outputs, fixed audio line outputs for recording, and variable audio line outputs for volume-controlled connections to an external sound system.

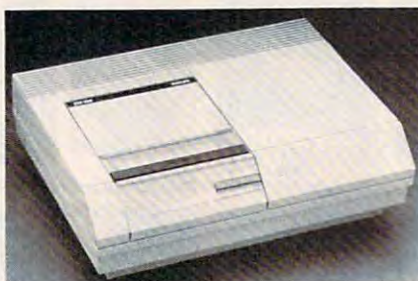
As NEC vice president Gerry Tangney says, this "is a taste of the future of home TV." The NEC digital set is expected to be introduced in May, with the price to be announced soon.

Another new technology already on the horizon is high-definition TV (HDTV), an enhanced broadcast signal that offers 1,125 scan lines of information instead of the 525 now used in conventional American TV broadcasting. This would require broadcasters to upgrade their equipment, however, and efforts to adopt an HDTV standard have reportedly been mired in international and corporate disagreements over how to bring about this doubling of screen clarity.

The growing popularity of compact disc (CD) audio players has given new impetus to the development and widespread consumer distribution of their digital data cousins, called CD-ROMs (Compact Disc-Read Only Memories). Although these laser discs are only 4.72 inches in diameter, they are capable of storing 600 megabytes of information on a single side, with an access time of seconds.

The first company out the door with CD-ROM players in the retail

market is the Subsystems and Peripherals Division of North American Philips Corporation. Its CM 100 disc player and CM 155 controller card works with the IBM PC-compatible computers (other interfaces will be announced this year). Available with the Philips CD-ROM player is Grolier's *The Electronic Encyclopedia*, the equivalent of a 20-volume reference collection on just about a quarter of one side of a CD-ROM disc. Although the initial purchase price of \$1,495 may keep initial sales out of the home market in volume, the price for CD-ROM technology is expected to drop quickly over the next couple of years.



Philips has introduced its CD-ROM drive which comes with Grolier's Electronic Encyclopedia on a compact disc. The entire package sells for \$1,495.

Technology occasionally moves in mysterious ways, and an example can be seen in new products which have taken advantage of the popularity—and intimidation—of word processors. Casio's new CW-30 Personal Typewriter blends the comforting familiarity of a typewriter with the ease of use of a computer word processor. The \$399.95 hybrid machine looks very much like a standard electric typewriter. But a quick look at the key-



This Casio computer-compatible electronic typewriter is a hybrid—part typewriter and part word processor—that can connect to a computer to serve as a printer.

board also shows a set of cursor and special function keys, plus a 15-character liquid-crystal display window for editing.

One of the most interesting features of the Casio typewriter is that it's computer-compatible. It contains both a Centronics-standard parallel interface and an RS-232 serial interface that lets the typewriter become a computer printer (plain or thermal paper). It can be hooked up to a 300 baud modem for uploading and downloading text with a computer. It has built-in pica and elite pitches, right justification, and multiple type fonts: boldface, underlining, double-wide characters, special symbols, and foreign alphabet characters. It has enough memory to store two pages of text, and with an optional memory expander, up to ten pages of text. Small removable memory cards let you save and store text. Casio obviously hopes to capture the best of both worlds, typewriters and word processors, at the same time it is attracting those who don't want to give up typewriters, but are fearful they're being left behind by word processors.



The Magnavox VideoWriter is an \$800 dedicated word processor aimed at the home market.

Magnavox has taken a different approach with its new Videowriter, a dedicated home word processor that contains its own software, printer, spelling checker, and 18-line monitor (smaller than a regular computer screen, but larger than most portable computers). The \$800 Videowriter has a memory capacity of approximately 70 pages of text, automatically stored on standard 3½-inch disks. While dedicated word processors have been used in offices for years, it's unusual to

see such a product for the home market, especially considering the number of people who buy multi-purpose computers primarily for word processing.

Computers are converging with yet another technology, too—telephones. For example, Commodore is planning to introduce its new 1100 AnswerMate, a programmable computer-controlled telephone answering machine for the Amiga. The AnswerMate connects to the Amiga's RS-232 port and to a telephone. Not only does it play back your taped greetings and record messages, but it also can respond with messages generated by the Amiga's built-in synthesized voice. And multitasking software included with the AnswerMate lets it answer phone calls while you're busy using the computer for other things. (Price to be announced.)



Commodore's AnswerMate connects to the Amiga computer to serve as a telephone answering machine that can make use of the Amiga's multiprocessing and synthesized speech capability.

There is scarcely an area of consumer electronics which is not moving either directly or indirectly toward the personal computer, either as a peripheral or as a microprocessor-based stand-alone device. Even the ways in which computer users receive their software may be undergoing change in the future.

For example, Cauzin Systems, with backing from Kodak, has developed the Softstrip system of information storage. Data is encoded on a strip of paper in a format similar to—but more compact than—the familiar bar codes found

on consumer products. One strip, which typically measures 9½ by ½ inches, can store up to 5,500 characters (about three typewritten pages). The strips can be printed on ordinary paper and are read by an electro-optical scanner. Connected to a computer, the scanner reads the coded strips and transfers the data into memory for later storage on disk.

Further examples of converging electronics technologies abound in virtually every field. The emergence of stereo TVs and VCRs, coupled with a stereo-capable computer such as the Amiga, obviously opens new possibilities for audiophiles. Interactive video, spurred by improvements in laser discs, is another rapidly evolving technology with a connection to personal computing. Radio signals relayed by satellites can carry data accessible by computer users. Use of electronic mail systems is expected to jump from less than a billion messages a year today to more than 20 billion by the end of the decade, ultimately becoming a major service as common as the telephone and the U.S. mails.

As media consultant David Allen noted earlier, technology is capable of virtually anything today; but the successful marketing of an idea is the key to its success. In the foreseeable future, neither technology nor the marketplace shows any signs of slowing down.

Attention Programmers

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Report From:

The Winter Consumer Electronics Show

A Turning Point For Atari?

Tom R. Halfhill, Editor

Following up its strong showing at the Comdex computer show in November, Atari introduced a more powerful version of its ST at the Winter Consumer Electronics Show in January. Thanks to increasing sales, growing software support, widening distribution, and hints of new enhancements to come, industry watchers are suddenly taking more notice of Atari's bid for a comeback. Meanwhile, Commodore also entered 1986 with encouraging sales and Apple is responding with an improved Macintosh and lower prices.



A year ago it seemed impossible. Commodore founder Jack Tramiel had split with his successful computer company after a management dispute, bought the debt-ridden Atari that he had nearly destroyed in price wars, installed his sons in key positions, laid off most of the work force, rushed the design of a powerful 16/32-bit machine in only six months, introduced it at an unheard-of low price, and announced he was going to resurrect Atari as a major contender in the personal computer marketplace.

Atari still isn't home free. But the house that Jack built suddenly seems a lot more solid.

Strengthened by encouraging sales of the 520ST—according to estimates, at least 100,000 units worldwide through Christmas—Atari is now attracting more attention within the industry. "Frankly, a lot of people didn't think Jack would make it this far," says one observer. "Now they're

taking him a lot more seriously."

If Atari's comeback ultimately succeeds, the six-week period between late November 1985 and early January 1986 may well become recognized as the turning point. During that period, Atari piled up sizeable holiday sales and made impressive appearances at two crucial industry trade shows: Fall Comdex and the Winter Consumer Electronics Show. Both are held annually in Las Vegas and are among the largest trade shows in the U.S., with upwards of 100,000 people at each event.

At Comdex, which is oriented toward business computing, Atari demonstrated to skeptics that its 520ST was a real machine with dozens of software packages. At CES, a show that encompasses every consumer electronics product imaginable, Atari was the only major computer manufacturer in attendance and made three important announcements: the new 1040ST, a more powerful version of the 520ST with one megabyte of memory and a built-in disk drive; price reductions of \$100 for the monochrome and color 520ST systems; and a shift to mass-market outlets such as department stores for the 520ST.

Atari's appearances at Comdex and CES seemed all the more impressive due to the conspicuous absence of its closest competitor, Commodore. People were surprised when Commodore missed Comdex because the company has been trying to position the Amiga as a business computer and Comdex was the ideal place. But there was shock when Commodore bowed out of CES because Commodore has never missed a CES since the days when wristwatches and calculators were its stock in trade.

Commodore didn't have much to say about missing the shows. However, one Commodore executive admitted he was "uneasy" about the reaction at CES—ironically, the rumors of imminent financial catastrophe that once followed Atari were now being whispered about Commodore. The rumors proved untrue, however, and Commodore says it definitely plans to attend the Summer CES in Chicago this June.

Actually, Commodore finished 1985 with heavy sales of its own. According to reliable estimates, Commodore sold about one million 64s, as many as 500,000 Commodore 128s, and at least 20,000 Amigas. Even Commodore was caught off guard by the 64 and 128 sales. In fact, insiders say Commodore tried twice during the fall to discontinue the 64, but had to restart production both times to meet sudden demand. As an indication that Amiga sales are healthy, the leading independent software supplier for the computer—Electronic Arts—says it recovered all of its 1985 Amiga development costs within two weeks after releasing its first Amiga products.

Although Atari and Commodore are still struggling financially, both have survived a rough market in 1985 and appear to be in better shape for 1986.

Since Atari was the only major computer company exhibiting at CES (IBM and Apple routinely avoid this show), most of the computer news was Atari-related. The main event was the introduction of the 1040ST, the first one-megabyte computer selling for under \$2,500. In fact, it's the first one-megabyte computer selling for under \$1,000.



The new Atari 1040ST is the first one-megabyte computer for under \$1,000. It has 1,024K of RAM and a built-in, double-sided disk drive.

The 1040ST is basically an enhanced 520ST and is fully compatible with existing ST software and hardware. The keyboard and all interfaces are identical: RS-232 serial and Centronics-standard parallel ports; in/out MIDI (Musical Instrument Digital Interface); floppy and hard disk interfaces; plus monochrome and analog RGB monitor outputs. The graphics-oriented user interface, GEM (Graphics Environment Manager), is the same.

New features on the 1040ST include one megabyte (1,024K) of Random Access Memory (RAM), twice the amount that comes with the 520ST; a built-in, double-sided 3½-inch disk drive with a capacity of 770K per disk, twice the capacity of the drive sold with the 520ST; a TV output jack; and an internal power supply for both the computer and drive, reducing the familiar clutter of external cables.

Like recent-model 520STs, the 1040ST comes with its Tramiel Operating System (TOS) in Read Only Memory (ROM) chips, freeing up more than 200K RAM that used to be required when loading TOS from disk. Also like the 520ST, the 1040ST comes with ST BASIC, the NEOchrome graphics-drawing program, and a word processor, *1st Word* (the 520ST comes with *ST Writer*). Atari says *1st Word* has GEM features such as drop-down menus and on-screen type fonts. (*ST Writer*, by contrast, is a direct translation from the *AtariWriter* word processor for eight-bit Ataris.)

There are two different 1040ST packages. With a high-resolution monochrome monitor, the suggested retail price is \$999.95. With an analog RGB color monitor, the price is \$1,199.95. Atari says the 1040ST will be sold only through computer dealers and should be available immediately.

The 520ST also underwent some minor changes. The latest models will be shipped with TOS in ROM and a TV output jack. To widen distribution, the 520ST will be sold through mass-market outlets in three different ways. A system that includes the computer, a single-sided 3½-inch disk drive (380K capacity), and hires monochrome monitor will now

be priced at \$699 suggested retail. The same system with an analog RGB color monitor instead of the monochrome screen will be priced at \$899. Both prices are \$100 lower than before. The 520ST components are also available separately: \$399 for the computer, \$199 for a single-sided drive, \$299 for a double-sided drive, \$199 for the monochrome monitor, and \$299 for the RGB monitor.

by lining up a series of computers running the now-famous Amiga bouncing ball demo. (A screen photo of this demo appears in *COMPUTE!*'s cover story on the Amiga in September 1985; it shows a red-and-white checkered globe spinning and bouncing around the screen, casting a transparent shadow on the background.) An Amiga, 520ST, Macintosh, and eight-bit Atari 130XE spent four straight



Atari's 520ST has been improved with a ROM-based operating system, a TV output jack, and a \$100 lower price. Also, for the first time, the computer and other components will be available separately in mass-market outlets.

Rumors abounded at CES about new developments for the ST line, including a better graphics chip, a bit-block transfer chip similar to the one in the Amiga, a 5¼-inch disk drive adapter for use with an IBM PC emulator, and more. Officially, Atari won't confirm or deny if it's preparing to introduce any of these products in the near future.

However, Atari is expected to announce at least one enhancement at an upcoming computer show in West Germany (about half of all ST sales are in Europe). The most likely possibility is the bit-block chip, which allows faster screen graphics. Also, it is now known that three companies outside Atari are working on PC emulators for the ST, each taking a slightly different approach. At this writing (mid-January), none of them is expected to be ready for several months.

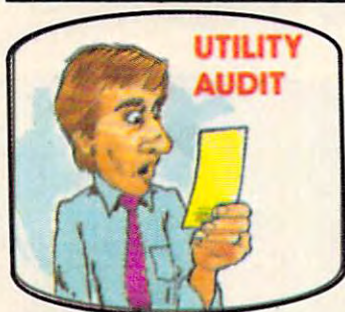
Atari's CES exhibit poked fun at the Amiga and Apple Macintosh

days dribbling checkered balls at the Atari booth. Oddly enough, the 130XE version was perhaps the most impressive of all. Not only was the 130XE bouncing a checkered ball, but also a 3-D image of the Atari logo decorated with 128 rippling colors.

Apple hasn't been oblivious to the competition, and a week after CES announced an improved version of the Macintosh and lower prices for the 512K Mac. The new Macintosh Plus has one megabyte of RAM, a double-sided disk drive that stores 800K (twice the capacity of existing Macintosh drives), a redesigned keyboard with numeric keypad and cursor keys, a faster operating system, and an extra peripheral port called the Small Computer System Interface. The suggested retail price is \$2,599. The 512K Mac was reduced from \$2,499 to \$1,999, and kits are available so owners of 128K and 512K Macs can upgrade to the Mac Plus.

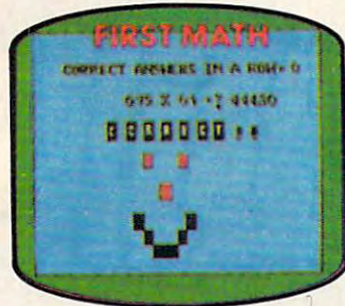
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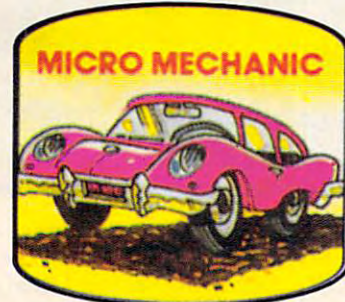
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Atari didn't ignore its older products at CES. Among other things, two new eight-bit computer packages were unveiled.

The 130XE, a 400/800/XL-compatible computer with 128K RAM that was introduced last year, will now be available in a \$399 package that includes a 1050 disk drive, 1027 printer, and five pieces of software: *AtariWriter*, *Music Painter*, *Paint*, *Star Raiders*, and *Silent Butler*. The 130XE is still available separately for \$149.

Atari's new lowest-end computer is the 65XE, a 400/800/XL-compatible machine with 64K



Relics from another age? Nope. Video-game machines are still selling so well that Atari has redesigned the nine-year-old 2600 and introduced a new model, the 7800.

RAM. It was actually announced at last year's Winter CES, but was withheld from the market until existing inventories of 800s and 800XLs were sold out. The 65XE will be sold separately for under \$100 or in a package similar to the 130XE's for \$300-\$350.

Much to everyone's surprise, Atari also came to CES with a redesigned 2600 videogame machine (formerly known as the VCS) and the new 7800 game machine. What's that, you thought videogame machines were dead? Guess again. Atari says it sold over a million 2600s in 1985. Apparently many of them are going to new markets overseas—including, we hear, the People's Republic of China.

The revamped 2600 is smaller, lighter, sleeker, has a carrying handle, and costs less than \$50. The 7800 machine was one of the last projects of the old Atari before Tramiel took over, and is now being unpacked from mothballs. Thanks to a chip named MARIA, the 7800's graphics are superior even to those of the eight-bit computers, and the machine accepts all 2600 cartridges without an adapter. It sells for less than \$80 and comes with a new version of *Pole Position*, the hit car racing game.

Computers aren't much good without software, and Winter CES demonstrated that a lot of companies are bringing out new programs for the ST and Amiga as well as popular eight-bit machines. Unfortunately, there were a lot fewer software companies at this CES than last year's. The West Hall, a large building which supplements the main Convention Center, once was filled with software publishers. This year, only a handful of them shared space with companies selling satellite dishes, videotapes, cable TV accessories, and other peripherals. The last two years have been tough, and many software developers either can't afford to exhibit at CES anymore or are out of business altogether.

Still, some fascinating products are on the way. Starting with ST and Amiga software, here's what's new:

Electronic Arts (San Mateo, California) announced several new programs for the Amiga and its first products for the Atari ST. New Amiga software slated for release this year includes *Deluxe Music*, a note-oriented composition program; *Instant Music*, a composition program for nonmusicians; *Arcticfox*, a strategic combat tank simulation; *Adventure Construction Set*, for do-it-yourself adventure games; and *Deluxe Printing Construction Set*.

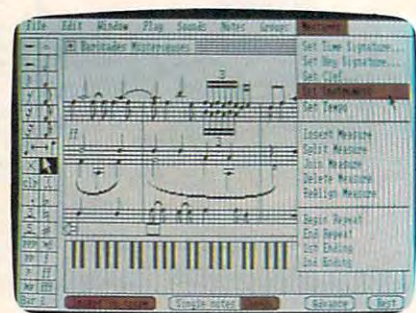
A previously announced Electronic Arts program, *Deluxe Video Construction Set*, is due for release soon. It lets you create animated sequences that can be integrated with screens created in *DeluxePaint*, a drawing program released in December. (Electronic Arts says it



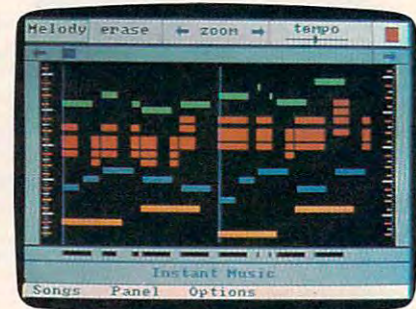
Arcticfox is a new strategic tank game for the Amiga from Electronic Arts.



This is the Amiga version of Marble Madness, but Electronic Arts is also bringing out an Atari ST version of the game.



Deluxe Music is a note-oriented composition program designed for the Amiga by Electronic Arts.



Even if you don't know much about music, you can play songs on an Amiga with Electronic Arts' Instant Music program. It has numerous built-in instrument sounds and doesn't rely on standard musical notation.

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shipped 15,000 copies of *Deluxe-Paint* the first two weeks.) Scores composed with *Deluxe Music* can also be integrated with *Deluxe Video Construction Set*.

ST software from Electronic Arts includes two programs already released for the Amiga: *Financial Cookbook*, a home financial planner, and *Marble Madness*, an arcade game. Prices for Electronic Arts' Amiga and ST software range from \$39.95 to \$79.95.

Hippopotamus Software (Los Gatos, California) is bringing out the Hippo ST Sound Digitizer and Hippovision Video Digitizer for the Atari ST. The sound digitizer plugs into the printer port and lets you sample, modify, and play back any type of sound. It includes special-effects software and a microphone for \$139.95. The video digitizer lets you capture images in 256 × 256-pixel resolution from any composite video source, such as a video camera, videocassette recorder, videodisc player, or TV tuner. Picture files are compatible with Atari's *NEOchrome* drawing program, can be printed on color printers, and can be transmitted via modem. The price was not announced.

Hippopotamus has 13 other ST programs scheduled for release soon, including *HippoWord*, an \$89.95 word processor; *HippoConcept*, an idea processor, \$89.95; *HippoSimple*, a database manager, \$49.95; *Hippo Disk Utilities*, \$49.95; *HippoBackgammon*, \$39.95; *HippoSpell*, a spelling checker with 30,000-word dictionary and user-definable terms, \$39.95; *HippoRAMdisk*, \$34.95; *Hippo Computer Almanac*, which contains over 35,000 facts on everything from area codes to sports trivia, \$34.95; *Hippo Jokes & Quotes*, with selectable PG, R, or X ratings, \$34.95; *HippoArt I*, a collection of 30 picture files compatible with *NEOchrome*, \$39.95; *Hippo EPROM Burner*, for programming your own chips, \$139.95; *HippoClean*, a disk drive cleaning kit, \$29.95; and *HippoPixel*, a utility for creating your own sprites and fonts, \$39.95.

Aegis Development (Santa Monica, California) is bringing out four graphics products for the Amiga: *Aegis Images*, a drawing program; *Aegis Draw*, a Computer-Aided Design (CAD) program; *Ae-*

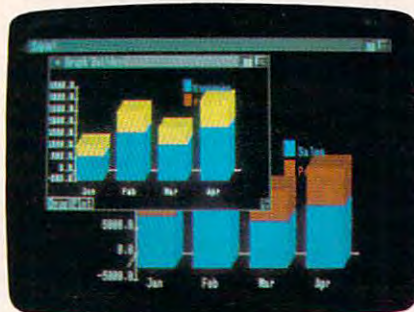


This strikingly beautiful picture was created on the Amiga's 320 × 200-pixel screen in 32 colors with *Aegis Images*, a graphics-art program demonstrated at CES.

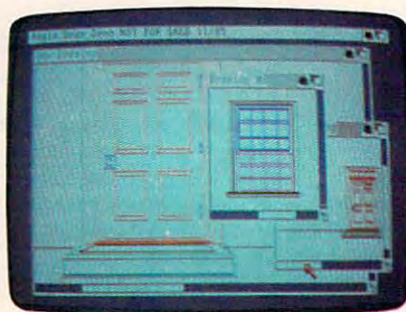
gis Animator, for creating animated sequences; and *Impact*, an executive graphics package. *Images*, *Animator*, and *Impact* were actually developed by Island Graphics of Sausalito, California. Under an agreement with Commodore, they were supposed to be released under the Amiga brand name. For instance, *Images* was originally known as *Graphicraft* or *ProPaint* (several screens created with this program appear on the Amiga's packaging and in the September 1985 issue of *COMPUTE!*). But Island Graphics and Commodore had a falling out, and the Amiga *Graphicraft* currently being sold is not the software developed by Island

Graphics. Instead, Aegis acquired the marketing rights to the Island Graphics programs, enhanced them, and renamed them *Aegis Images*, *Animator*, and *Impact*.

Images is available for \$79.95 separately, or for \$139.95 in a package with *Aegis Animator*. Using *Images* screens as a backdrop, *Animator* allows 3-D animation and rotation, metamorphic shape manipulation, storyboarding of up to nine separate sequences, and ghost-line animation. *Impact* (\$199.95) is for business presentation graphics and includes a slide show feature—charts, graphs, and pictures can be flipped in a predetermined sequence and transformed.

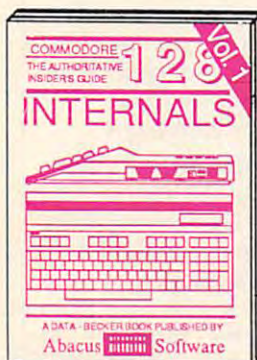


Impact, another product from Aegis Development, makes it possible to produce three-dimensional business graphics using the Amiga's 4,096 colors.



Aegis Draw is a Computer-Aided Design (CAD) program for the Amiga which is aimed at professional users.

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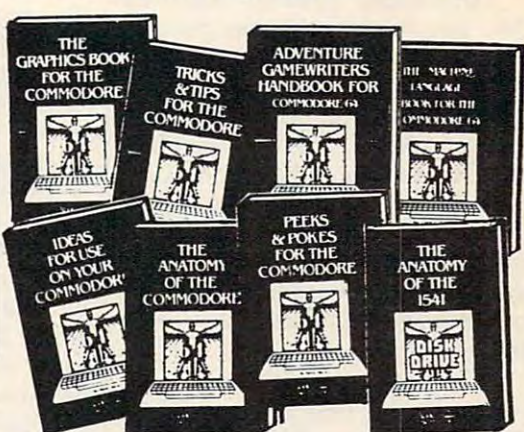
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Aegis Draw, for hobby and professional CAD work, actually consists of two programs: *Aegis Draw* and *Aegis Draw Professional*. The first version retails for \$199.95 and can be upgraded to the *Professional* version at extra cost. *Aegis Draw* has zooming, automatic scaling, selectable grids, layering, and multiple windows so you can work on several drawings simultaneously, or on different parts of the same drawing. It supports Kurta and Summagraphics digitizers, and plotters by Roland, Hewlett Packard, Houston Instruments, Epson, and Comrex. All four Aegis programs for the Amiga should be available immediately.

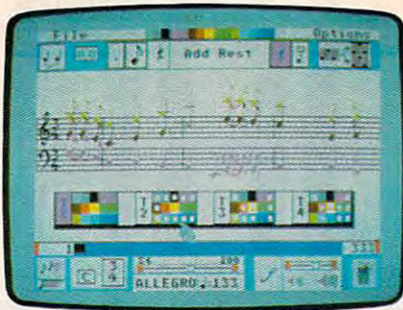
Supra Corporation (Albany, Oregon) announced a series of hard disk drives for the Atari ST with capacities of 10, 20, 40, and 80 megabytes. Prices start at \$799 for 10 megabytes. They should be available this spring.

Optimized Systems Software (San Jose, California) was demonstrating *Personal Pascal* for the ST at the Atari booth and has already started shipping. This language supports all of the ST's special features, compiles and links most programs in about a minute (even faster with a hard disk or RAM disk), and sells for \$74.95. OSS is also readying a version of the Prolog language and a set of disk utilities for the ST.

Cardco (Wichita, Kansas), known in the past for its VIC-20 and Commodore 64 add-ons, is preparing a one-megabyte memory expansion board for the Amiga. The board plugs into the expansion bus, and Cardco says it will be available this spring for about \$400.

Unison World (Berkeley, California) is converting *PrintMaster*—a printer utility similar to *The Print Shop*—to the Atari ST. It's already available for the Commodore 64, IBM, and CP/M computers.

Activision (Mountain View, California) said sales of its initial software for the ST and Amiga have been "quite strong" and that additional titles will be released this year. These include Garry Kitchen's *GameMaker: The Computer Game Design Kit* and *The Music Studio* for the Amiga and ST; and *The Activision Little Computer People Discov-*



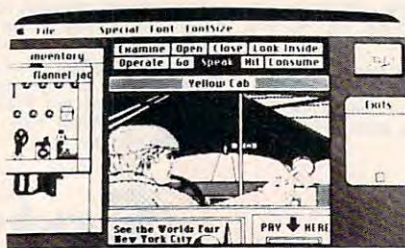
Another new music-composition program is *The Music Studio* from Activision. There are versions for the Amiga, Atari ST, and IBM PCjr/Tandy 1000 computers.

ery Kit for the Amiga. *GameMaker* lets you write videogames without learning a programming language. Finished games can be saved on a blank disk and run independently of the master program, so you can distribute copies to friends. Activision is sponsoring a *GameMaker* contest—first prize is a trip to Activision plus \$5,000.

The Music Studio is a composition tool designed by Audio Light for both amateur and professional musicians. With it, you can design instruments and create new sound effects. The Amiga version plays up to 16 simultaneous sound channels in stereo.

Accolade/FTL Games (Cupertino, California) has released *Sundog: Frozen Legacy* for the ST. Originally written for the Apple II series, *Sundog* is a graphics strategy game that has been completely redesigned to take advantage of the ST's advanced graphics. Thanks to a proprietary data-compression scheme, hundreds of different full-color screens are stored on the program disk.

Mindscape (Northbrook, Illinois) is introducing three programs



Mindscape's *Deja Vu: A Nightmare Comes True* is a 1940s-style mystery game for the Amiga and Macintosh.

for the Amiga and one for the ST. *Brataccas* (\$49.95) is a graphics adventure game for both computers that was developed by Psygnosis Limited of England. It was written specifically to take advantage of the 68000 chip inside the Amiga and ST. In *Brataccas*, you're a scientist who has invented a genetic process for creating a superbeing. With an evil government and the underworld in pursuit, you flee to a colonized asteroid, Brataccas. The object is to expose the government's corruption and clear your name. *Brataccas* is populated with nearly 60 different characters.

For the Amiga only, Mindscape is releasing *The Halley Project: A Mission in Our Solar System* (\$49.95), a realtime simulation of the solar system developed by Tom Snyder Productions with help from the Massachusetts Institute of Technology; *Deja Vu: A Nightmare Comes True* (\$54.95), a 1940s-style mystery game; and *Keyboard Cadet* (\$39.95), a typing tutor. (Incidentally, Mindscape is the company which wrote the *Amiga Tutor* supplied with the Amiga.)

Abacus Software (Grand Rapids, Michigan) is importing a professional-quality program called *PC Board Design* for the ST. When Abacus finishes translating this circuit-designing utility from German, it will sell for \$395.

Batteries Included (Richmond Hill, Ontario) was demonstrating its D.E.G.A.S. drawing program for the ST with a slideshow of screens called up in rapid sequence from a hard disk. *D.E.G.A.S.* started shipping just before CES, and it's already a hit—Batteries Included says that sales figures for the first two weeks were greater than for any other program in its history. ST and Amiga versions of the *Isgur Portfolio System*, a stock-management program, are scheduled for release later this year at \$249.95.

Q-R-S (Buffalo, New York), a company that started back in 1900 by making music rolls for player pianos, is releasing its digital music library for the Amiga and ST. This consists of a number of disks containing piano music by Joplin, Gershwin, Liberace, and other artists and composers. Each disk contains six songs and sells for \$19.95.

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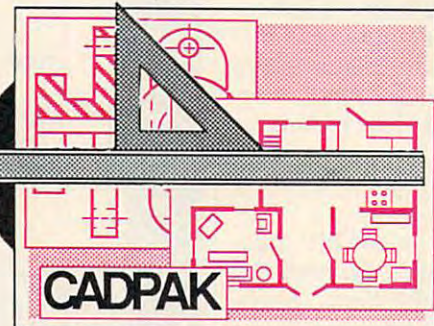


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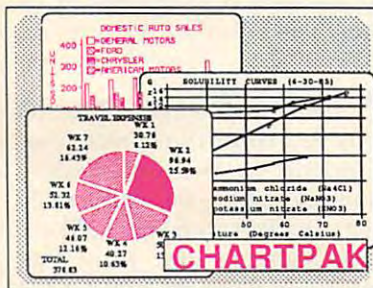
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California) has converted its series of 3-D graphics adventure games for the ST: *King's Quest I*, *King's Quest II*, and *Walt Disney's The Black Cauldron*. The *King's Quest* games have been particularly popular on IBM computers.

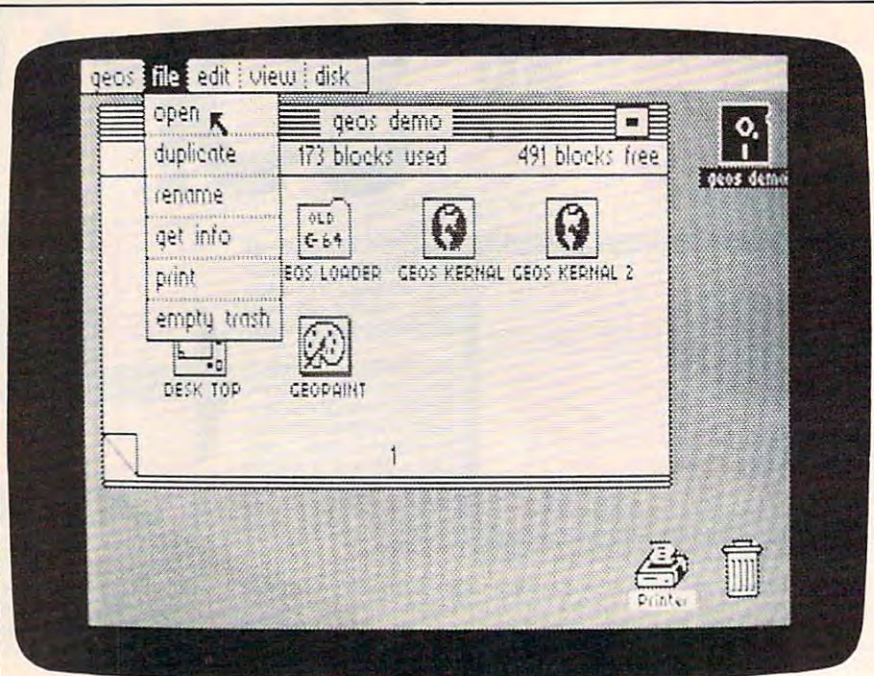
Spinnaker Software (Boston, Massachusetts) has converted *Fahrenheit 451*, *Treasure Island*, *Perry Mason*, *Nine Princes of Amber*, *Amazon*, and *Homework Helper Math* for the ST.

The popular eight-bit computers weren't ignored by software publishers, either, and some significant new programs were announced for the Commodore 64, 128, Apple, IBM PC/PCjr, and Atari. There isn't room here to list them all, but additional information can be found in this month's "News & Products" section.

One of the biggest hits at the show was a graphics-oriented operating system in final stages of development for the Commodore 64. Called *GEOS* (Graphic Environment Operating System), it's modeled after the user interface popularized by the Macintosh and adapted by the Atari ST and Amiga. *GEOS* loads from disk and replaces the 64's normal operating system. It speeds up disk access by a factor of five to seven times and displays a desktop screen with pull-down menus, icons, and windows. You manipulate these features by moving an on-screen pointer with a mouse or joystick.

Although some people were skeptical that *GEOS* could run fast enough on an eight-bit machine, even the unfinished version at CES ran surprisingly smoothly. By moving the pointer to a menu bar at the top of the screen and pressing the joystick button, you can select various options for managing files and running applications (see photo). To rename a file, for instance, you pull down the File menu and choose Rename. The new filename you enter appears on the directory or beneath the program's icon. To delete a file, you point to its icon, press the joystick button, and "drag" the icon to the trash can icon. To print a file, you drag its icon to the printer icon.

The screen would get cluttered



The desktop screen from *GEOS*, a remarkable Macintosh-like operating system for the Commodore 64. It offers pull-down menus, icons, windows, desk accessories, and custom type fonts, and also speeds up disk access five to seven times.

if the icons for every file were displayed at once, so *GEOS* lets you flip through windows as if they were pages in a book. The page number of the current window is displayed near its bottom margin. As the accompanying photo shows, *GEOS* uses the Commodore 64's high-resolution graphics screen to display a smaller-sized character set.

The desktop includes a full range of Macintosh-like desk accessories, such as a calculator, notepad, alarm clock, photo and text albums (for transferring data between applications), and a preferences window. The preferences window lets you adjust screen colors, change the shape and speed of the pointer, set the date and time, and so forth. The desk accessories can be called up while running other applications—if you're using the word processor and need to perform a calculation, for example, you can pop open the calculator, get your answer, close the calculator, and continue writing.

GEOS comes with two applications: *geoWrite*, a what-you-see-is-what-you-get word processor that lets you type on-screen with several different proportional fonts, and *geoPaint*, a graphics-drawing program with vertical and horizontal scrolling that lets you create images

as large as an 8½ × 11-inch page (80 dots per inch resolution).

The price for the entire package—*GEOS*, the desktop and desk accessories, *geoWrite* and *geoPaint*—is \$59.95. It was designed by Berkeley Softworks (Berkeley, California) and is scheduled to be available early this spring.

Timeworks (Deerfield, Illinois) is releasing three new programs for the Commodore 128 and one for the 64. *Partner 128* (\$59.95) and *Partner 64* (\$49.95) are desktop management programs similar to Borland International's *Sidekick* for the IBM PC. Both *Partner* programs include a multifunction business calculator, memo pad, appointment calendar, typewriter, address book, phone book, envelope addresser, and screen printer.

SwiftCalc 128 is a spreadsheet that takes advantage of the 128's 80-column mode. It has programmable keys, multilevel sorting, and several ways of charting data (including 3-D) that can be shown on the screen or printed out. Those who already own the original *SwiftCalc* for the Commodore 64 can upgrade to the 128 version for a nominal fee. Timeworks has also adapted *Sylvia Porter's Personal*

Financial Planner (\$69.95)* for the 128's 80-column mode.

Cardco (Wichita, Kansas) announced a *Sidekick*-style product, too. Called *Side Saddle* (Cardco is negotiating with Borland for the *Sidekick* name), it offers quick access to a calculator, appointment calendar, telephone directory/dialer, memo pad, screen printer, and disk functions. It comes on a cartridge for the Commodore 64, with a 128 version to follow. Another interesting Cardco program is *Freeze Frame*, a screen printer that Cardco claims can capture any 64 screen on paper, even with commercial software. It works with any printer that emulates the Commodore 1525, and all Epson- and Okidata-compatibles. A 128 version of *Freeze Frame* is also planned.

The Commodore 128 got another boost when Cardco announced its Personal Productivity Series for the 128's CP/M mode. The first three products in the series are *Personal Accountant*, a financial manager for home or small business; *Personal Inventory*, for figuring your net worth; and *Personal Time Manager*, which can handle up to 26 events for as many as 240 people. Each program sells for \$39.95.

In addition to software, Cardco announced three hard disk drives for the 64 and 128. Available in late March for the 64 and shortly afterward for the 128, the drives will come in 5-, 10-, and 20-megabyte capacities for \$599.95, \$899.95, and \$1,299.95, respectively. They're capable of loading a full-function spreadsheet program in 2½ seconds.

Access Software (Salt Lake City, Utah) is releasing a number of products for the Commodore 64, 128, Atari, and Apple. The *Mach 128 Enhancement Package* is a cartridge and disk for the 64 and 128. When the cartridge is plugged in, it senses whether a 1541 or 1571 disk drive is connected and—in the case of the 128—which mode is active. Then it engages or disengages disk speed-up routines as appropriate. Typically there's a fivefold increase in loading speed with either the 1541 or 1571. The cartridge also has a system reset switch. In addition, the *Mach 128* disk includes a disk organizer utility, two machine language monitors, and a program that

expands BASIC workspace by 4K. The price is \$49.95.

The Development System (\$79.95) is a professional macro assembler and text editor for the Commodore 128 (128 or 64 mode) and 64. It includes *Spritemaster*, a utility for creating and animating sprites with machine language programs.

Leader Board, The Pro Golf Simulator is a 3-D game that offers a perspective view of the golf course. It's one of the most detailed sports simulations we've ever seen, with multiple 18-hole courses, handicapping, a wide range of clubs, and numerous other variables. The Commodore 64 version should be available immediately for \$39.95. *Inside Story—The Anatomy Learning System* is an educational program with 50 high-resolution graphics screens that let you explore the inner workings of the human body. For the Commodore 64, the price is \$34.95.

For the Atari 400/800, XL, XE, and Apple II series, Access Software is releasing *Raid Over Moscow* and *Beach-Head II: The Dictator Strikes Back*, popular games previously available for the Commodore 64 and 128. In *Raid Over Moscow*, the Soviets have launched a nuclear attack on North America; your job is to deploy stealth bombers from an orbiting space station to destroy the warheads before they hit. It requires at least 48K RAM and sells for \$34.95. *Beach-Head II* is the sequel to *Beach-Head* and features speech synthesis, multiple screens, and the choice of playing another person or the computer. It requires at least 48K RAM and sells for \$39.95.

Access has signed an agreement with Multibotics, Inc. (Woods Cross, Utah) to market its line of robotic construction sets. The sets—for youngsters and adults—contain snap-together connectors, gears, shafts, clutches, wheels, electric motors, and other parts that make it possible to build all sorts of motorized contraptions that can be controlled by a personal computer. You can also experiment with digitized speech or temporarily turn a computer into a voltmeter or oscilloscope. Four different Multibot sets are available from \$59.95 to \$199.95. Interfaces are ready for the Commodore 64 and 128, and Access is working on interfaces for Atari, Apple, Amiga, and IBM computers.

If you've got a good memory, you might recall reading some reviews about a year ago of a Commodore 64 word processor called *SkiWriter*. Although the reviews were good, marketing problems kept the program from appearing on store shelves. Now it's been acquired by a British company, Mastertronic (U.S. offices in Frederick, Maryland). Two changes were made—the built-in telecommunications feature was dropped, and the program is being sold on disk instead of cartridge—but the price has been chopped from \$69.95 to \$15. There's also a Commodore 128 and Apple II version. At the same time, Mastertronic is introducing two more programs for the Commodore 64: *Busicalc 3*, a spreadsheet, and *Instant Recall*, a filer that stores up to 30,000 characters of data. Both of these products sell for \$15, too.

Mindscape (Northbrook, Illinois) is bringing out *The Lischer Profile* (Apple, Commodore 64, IBM PC, and Mac), which constructs a psychological profile based on a person's reactions to colors and shapes; *The American Challenge: A Sailing Simulation* (Apple and IBM), an unusual America's Cup simulation that can be played by two people in remote locations using computers and modems; *Dick Francis' High Stakes* (Apple and IBM), an interactive text adventure that puts you in the role of a wealthy English horse owner; a talking Macintosh version of *Racter*, the AI (artificial insanity) program that holds bizarre conversations with humans; and *Stephen King's The Mist* and *James Bond: A View To A Kill* (Apple, IBM, and Mac), text adventures based on popular thrillers. All of these programs are \$39.95, except for *Racter*, which is \$44.95.

And finally, if you can spare \$39.95, you can now indulge any Rambo fantasies you might have with a Mindscape program called *Rambo: First Blood Part II*. But *Rambo* isn't the shoot-em-up action game you might expect—it's a text adventure. One of its features is a sophisticated parser that lets you communicate in plain English (which is more than the movie character Rambo can do). It runs on the Apple, IBM, and Macintosh. ©

Tug-A-War

Mark Tuttle, Submissions Reviewer

Don't be fooled by the apparent simplicity of this two-player strategy game. It looks easy on the surface, but it's a stiff test of your concentration and ability to think ahead. The original version was written for the Commodore 64. We've added new versions for the Atari 400/800, XL, and XE, Apple II-series computers, Atari 520ST, Amiga, IBM PC/PCjr, and the TI-99/4A. Since the game is based on colors, every version requires a color monitor or TV. The IBM version requires BASICA and a color/graphics adapter for the PC or Cartridge BASIC for the PCjr. The Atari version requires at least 16K of RAM, and the Amiga version requires at least 512K.

Nearly everyone has played tug of war at one time or another. The traditional game pits two players or teams at opposite ends of a rope. At the middle of the rope is a flag, and each side tries to pull the flag into its territory. "Tug-a-War" is based on a similar concept. In this version, the flag is replaced with a round ball shape, and each player tries to maneuver the ball onto his or her side of the screen. Like many two-player games, the difficulty of Tug-a-War depends somewhat on the intelligence of your opponent. But even at the simplest level, you'll find that skill and foresight are essential to success.

Type in and save the appropriate program below. The rules are the same for every version (except Atari 520ST—see special instructions).

Battle Of The Colors

When you run Tug-a-War, two sets of colored boxes appear, one above the other. The lower, longer series of squares is the playing field. Near the middle of the playfield area is a

round ball; the outermost boxes at each end of the playfield represent each player's home position. The players alternate turns, each trying to move the ball in their own direction, until it reaches one of the home squares.

So far, so good—but how do you move the ball? It's done not by pulling a rope, but by changing the colors of boxes in the playfield. The color of the square under the ball determines which direction it moves and how far it travels. On any given turn, the ball can move either one or two squares to the left, or one or two squares to the right. At the top of the screen are four boxes that show you which colors are linked to which directions. For instance, the leftmost box shows you which color makes the ball move one square to the left. The next box to the right shows you which color makes it move *two* squares to the left. The second pair of boxes show you which colors make the ball move in the opposite direction, to the right. By changing the color of the box where the ball is currently located, you can make it move toward your home square.

The playfield contains 11 boxes (9 in the TI version, 10 in the Atari ST version). When the game begins, each of these boxes is randomly given one of the four colors shown at the top of the screen. On each turn, you may change the color of one, several, or all of the boxes (however, you must always change at least one box). Below each box is a number which represents its distance from the home position of the player whose turn it is. For instance, if you are the player on the left, then on your turn the boxes are numbered 1, 2, 3, etc., from left to right (the tenth box is marked with a 0, and the eleventh

with an A). When it's the right player's turn, the numbering is reversed (the rightmost box is 1, etc.).

To take a turn, you must select a number that corresponds to the numbers shown below the boxes in the playfield. This is done by pressing a single key. Press a number key from 1-0 to select one of the first ten values, or press the A key to choose the eleventh box. The number you choose determines how many boxes change color. For instance, if you press 1, only one box (the one nearest your home square) changes color. If you press 2, the two boxes nearest your home box change, and so on.

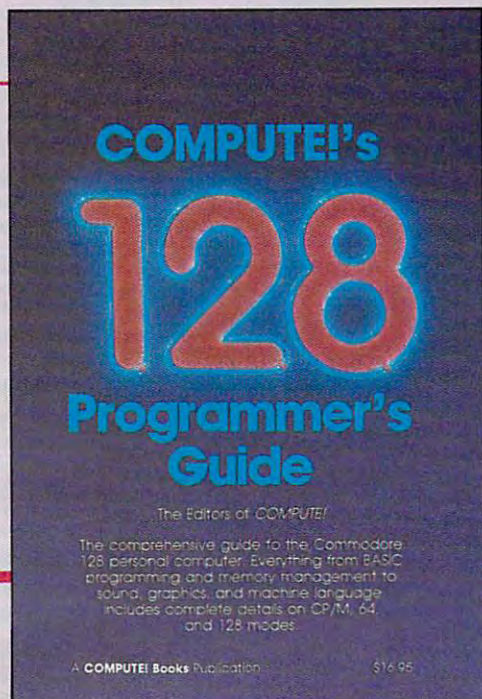
Where do the new colors come from? Every box cycles through the same series of four colors shown in the uppermost set of boxes, going from left to right. For example, if the colors shown there are white-blue-red-purple (the exact colors may be different on your computer), then a white square always changes to blue; a blue square always changes to red; a purple square changes to white, and so on. In other words, the box's current color determines which color it gets after the next color change.

Though every turn involves at least one color change, the ball doesn't necessarily move on every turn. It only moves when you change all the boxes between your home position and the current position of the ball. For example, if the ball is three boxes away from your home square, then you must change the color of at least three boxes in order to move it at all.

Foresight Rewarded

As you can see, there's much more to this game than appears on the surface. At first you might be tempted to try to move the ball as

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often as possible. But that's usually a losing strategy. Remember, the *direction* the ball moves depends on the color of its square before you take the turn.

In many cases, you'll want to move the ball only if it's on a color that moves it toward your goal. But like other games of strategy, Tug-a-War rewards the player who looks beyond the current move and tries to set things up for future moves; sometimes it's wise to make a small, temporary sacrifice in order to benefit later in the game. Because the boxes change colors in the same sequence, the effect of your own move is always completely predictable. However, since a single turn can change the color of many boxes, dramatic changes of fortune are also possible.

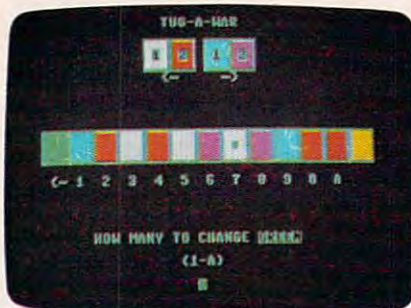
Amiga And 520ST Versions

Since the mouse is an integral system feature on both the Amiga and ST, both of these versions substitute mouse input for keyboard input. To select a square, simply move the mouse pointer to the desired box and press the left mouse button. Because keyboard prompts are unnecessary, no numbers are displayed below the playfield boxes.

Before entering BASIC to load the ST version, you should switch to the low-resolution graphics mode (use the Set Preferences option in the desktop's Options menu). Also, if your ST has 512K and a disk-based operating system, before running the program you should turn off buffered graphics (controlled by the Buffer Grph option in the Settings menu; it's off when no check appears beside the option in the menu). The standard 520ST leaves only about 5K free for BASIC programs, so Tug-a-War won't fit into memory unless the buffered graphics option is turned off. The program fits with buffered graphics switched on only if you have a 1040ST, or a 520ST with memory expansion, or a 520ST that has been upgraded with the TOS operating system in ROM chips (Read Only Memory).

The Amiga version uses the computer's built-in speech feature to announce the players' turns. In other respects, these games work exactly like the others.

For instructions on entering these listings, please refer to "COMPUTE!'s Guide to Typing in Programs" in this issue of COMPUTE!.



"Tug-a-War" for the Commodore 64 and 128 is a game that looks simple, but demands good concentration and foresight.

Program 1: Tug-A-War For Commodore 64/128

```

JJ 100 POKE53280,0:PRINT"CLR"
      :BC=53281:POKEBC,5:PC
      (1)=5:PC(2)=7:PS=6:CR=1
      :PL=1:X=20
CE 110 B=55715:AS="O{Y}P{DOWN}
      {3 LEFT}{H}{N}{DOWN}
      {3 LEFT}{L}{P}{0}":PS(1)="G
      REEN{RVS}{BLK}{OFF}
      {LEFT}":PS(2)="YELLOW":
      B$="2 UP"
DM 120 TMS$="HOME}{9 DOWN}":QS
      ="{RVS}{BLK}{34 SPACES}
      ":DIMCL(11)
QG 130 FORI=0TO23:PRINT"{RVS}
      {BLK}{39 SPACES}"
KE 140 POKE1063+(40*I),160:POK
      E55335+(40*I),0:NEXT
AQ 150 PRINT"{RVS}{39 SPACES}
      {HOME}":POKE2023,160:PO
      KE56295,0
DG 160 PRINT"{HOME}"SPC(15)"
      {RVS}TUG-A-WAR":PRINTSP
      C(13)"{DOWN}{RVS}{WHT}"
      ASB$"{RED}"ASB$"{BLK}
      {CYN}"ASB$"{PUR}"ASB$
RS 170 PRINTSPC(14)"{BLK}1"SPC
      (2)"2"SPC(3)"1"SPC(2)"2
      {DOWN}":PRINTSPC(15)"
      {RVS}<C"SPC(5)"C">
HK 180 GOSUB620:PRINTTMS$
      {DOWN}{RVS}{GRN}"ASB$
      :FORZ=1TO11:Y=INT(4*RND
      (1))+1:CL(Z)=Y:POKE646,
      Y
FQ 190 PRINT"{RVS}"ASB$;NEXTZ
      :PRINT"{YEL}{RVS}"AS
CB 210 POKE646,PEEK(B)AND15:PR
      INTTMS$"{2 DOWN}"SPC(X)"
      {RVS}Q":POKEBC,PC(PL)
SF 220 PRINTTMS$"{14 DOWN}"SPC
      (18)"{RVS}{BLK}
      {3 SPACES}"
HR 230 AN=0:PRINTTMS$SPC(7)"
      {10 DOWN}{BLK}{RVS}HOW
      {SPACE}MANY TO CHANGE
      {OFF}"PS(PL)
MA 240 PRINTSPC(17)"{DOWN}
      {RVS}(1-A){2 DOWN}
      {3 LEFT}{I}{LEFT}";
BR 250 POKE204,0:POKE198,0:WAI
      T198,1:GETMT$
RB 260 IFASC(MT$)<48ORASC(MT$)
      >65ANDASC(MT$)>57THEN2
      50
XR 270 POKE204,1:IFMT$="A"THEN
      AN=11:MT$="{LEFT}"ALL":G

```

```

OTO300
CR 280 IFMT$="0"THENAN=10:MT$=
      "10":GOTO300
HC 290 AN=VAL(MT$)
KM 300 PRINT"{2 LEFT}
      {5 SPACES}{3 LEFT}"MT$
7FS 310 IFAN<1ORAN>11THEN220
FF 320 IFPL=2THENAN=12-AN:GOTO
      440
HE 330 IFAN<PSTHENCK=1
KQ 340 FORQ=1TOAN:IFCL(Q)=4THE
      NCL(Q)=1:GOTO360
GE 350 CL(Q)=CL(Q)+1
KJ 360 NEXTQ:PRINTTMS$:PRINT"
      {BLK}{RVS}{GRN}"ASB$;
      FORZ=1TO11:POKE646,CL(Z
      ):PRINT"{RVS}"ASB$;
QD 370 NEXTZ:PRINT"{YEL}{RVS}"
      AS:POKE646,PEEK(B)AND15
      :PRINT"{HOME}{11 DOWN}"
      SPC(X)"{RVS}"
FH 380 IFCK=1THENCK=0:GOTO400
MH 390 ONPEEK(B)AND15GOSUB490,
      500,510,520
BF 400 IFPS<1THENPL=1:WC=5:B=5
      5698:X=2:GOTO530
DP 410 IFPS>11THENPL=2:WC=7:B=
      55734:X=38:GOTO530
KD 420 IFPL=1THENPL=2:GOSUB640
      :GOSUB630:GOTO210
HE 430 PL=1:GOSUB640:PRINT"
      {10 UP}":GOSUB620:GOTO2
      10
XH 440 FORQ=ANTO11
DH 450 IFAN<1ORAN>11THEN220
BD 460 IFAN>PSTHENCK=1
GJ 470 IFCL(Q)=4THENCL(Q)=1:GO
      TO360
HB 480 CL(Q)=CL(Q)+1:GOTO360
JX 490 B=B+6:X=X+6:PS=PS+2:RET
      URN
PA 500 B=B-3:X=X-3:PS=PS-1:RET
      URN
XM 510 B=B-6:X=X-6:PS=PS-2:RET
      URN
BE 520 B=B+3:X=X+3:PS=PS+1:RET
      URN
FF 530 POKE646,PEEK(B)AND15:PR
      INT"{HOME}{11 DOWN}"SPC
      (X)"{RVS}Q":PRINTTMS$
      "{10 DOWN}";
PG 540 FORE=1TO5:PRINTQS:NEXT:
      GOSUB640:GOSUB640
FM 550 PRINT"{HOME}{11 DOWN}"S
      PC(11)PS(PL)"IS THE WI
      NNER":Z=WC:FORI=1TO11:P
      OKEBC,Z
CP 560 IFZ=0THENZ=WC:GOSUB610:
      NEXT
SJ 570 Z=0:GOSUB610:NEXT
BP 580 POKEBC,15:PRINTTMS$SPC(1
      1)"{10 DOWN}{RVS}LIKE T
      O PLAY AGAIN{2 DOWN}
      {11 LEFT}{RVS}Y/N"
RA 590 POKE198,0:WAIT198,1:GET
      MT$:IFMT$<"N"THENRUN
JC 600 POKE198,0:SYS198
QC 610 FORP=1TO200:NEXTP:RETUR
      N
CG 620 PRINTTMS$"{5 DOWN}{RVS}
      {BLK}{2 SPACES}<C 1
      {2 SPACES}2{2 SPACES}3
      {2 SPACES}4{2 SPACES}5
      {2 SPACES}6{2 SPACES}7
      {2 SPACES}8{2 SPACES}9
      {2 SPACES}0{2 SPACES}A"
      :RETURN
AA 630 PRINTTMS$"{5 DOWN}{RVS}
      {BLK}{5 SPACES}A
      {2 SPACES}0{2 SPACES}9
      {2 SPACES}8{2 SPACES}7
      {2 SPACES}6{2 SPACES}5

```


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```

[2 SPACES]4[2 SPACES]3
[2 SPACES]2[2 SPACES]1
[SPACE]C>":RETURN
AQ 640 PRINTM$[5 DOWN]{RVS}
{BLK}[39 SPACES]":RETUR
N

```



This version of "Tug-a-War" runs on all Atari 400, 800, XL, and XE computers.

Program 2: Tug-A-War For Atari 400/800, XL, XE

Version by Kevin Mykytyn, Editorial Programmer

```

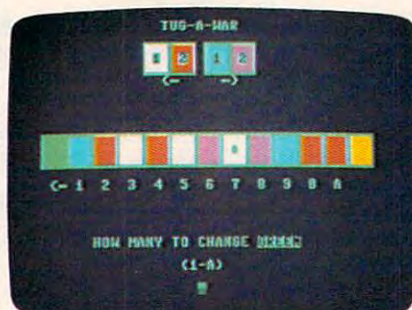
OC 10 CB=PEEK(106)-8:POKE 10
6,CB-4:GRAPHICS 18:DIM
C$(4),COL(11),MOV(4),
K$(1):C$="Z z z z"
BI 20 MOV(1)=-1:MOV(2)=-2:MO
V(3)=1:MOV(4)=2:OPEN #
1,4,8,"K":GOSUB 190:G
OSUB 250
KL 30 BP=6:PL=0
AP 40 PL=(PL=0):GOSUB 290:PO
KE 53248,72+8*BP
NK 50 GET #1,K:K$=CHR$(K):IF
K$="A" THEN SP=11:GOT
O 90
GB 60 IF K$="0" THEN SP=10:G
OTO 90
HF 70 IF K$<"1" OR K$>"9" TH
EN 50
OL 80 SP=VAL(K$)
CK 90 IF (PL=0 AND 12-SP>BP)
OR (PL=1 AND SP<BP) T
HEN 120
HO 100 BP=BP+MOV(COL(BP)):IF
BP>12 THEN BP=12
HM 110 IF BP=-1 THEN BP=0
KI 120 GOSUB 320
LK 130 IF BP>0 AND BP<12 THE
N 40
MG 140 POKE 53248,72+8*BP:PO
SITION 4,9
EN 150 IF BP=0 THEN PRINT #6
;" BLUE WINS! ":GOTO
170
DJ 160 PRINT #6;" RED WINS!
"
CI 170 POSITION 0,11:PRINT #
6;"{3 SPACES}press an
y key{3 SPACES}"
BK 180 GET #1,K:GOTO 30
JH 190 NS=CB*256:POSITION 5,
5:PRINT #6;"PLEASE WA
IT"
NF 200 FOR A=0 TO 1023:POKE
NS+A,PEEK(57344+A):NE
XT A
FC 210 POKE 756,CB:FOR A=NS+
464 TO NS+471:POKE A,
126:NEXT A
CO 220 FOR A=NS+1536 TO NS+1
920:POKE A,0:NEXT A:F
OR A=NS+1576 TO NS+16
03:POKE A+256,126:POK
E A+128,126:NEXT A

```

```

BI 230 POKE 559,46:POKE 623,
1:POKE 53250,72:POKE
53249,168:POKE 53277,
3:POKE 54279,CB+4:POK
E 704,15:POKE 705,52
JB 240 FOR A=NS+1598 TO NS+1
601:READ B:POKE A,B:N
EXT A:POKE 706,132:RE
TURN :DATA 24,60,60,2
4
FP 250 PRINT #6;"{CLEAR}":PO
SITION 6,0:PRINT #6;"
1 2 1 2":POSITION 6,1
:PRINT #6;"Z z z z":P
OSITION 7,2:PRINT #6;
"K z z z"
DJ 260 GB=PEEK(560)+256*PEEK
(561):POKE GB+10,6:PO
KE GB+16,6
KL 270 POSITION 4,6:FOR A=1
TO 11:Q=INT(RND(1)*4+
1):COL(A)=Q:PRINT #6;
C$(Q,Q):NEXT A
IM 280 POSITION 0,11:PRINT #
6;"6-9 OR 'A' FOR R
I":RETURN
KJ 290 POSITION 4,9
FG 300 IF PL=1 THEN PRINT #6
;"BLUE'S TURN":POSITI
ON 4,5:FOR A=1 TO 9:P
RINT #6,A;:NEXT A:PRI
NT #6;"0A":RETURN
BH 310 PRINT #6;"RED'S TURN
":POSITION 4,5:PRINT
#6;"A0":FOR A=9 TO 1
STEP -1:PRINT #6,A;:
NEXT A:RETURN
PD 320 IF PL=0 THEN 340
JI 330 FOR A=1 TO SP:GOSUB 3
50:NEXT A:RETURN
PE 340 FOR A=11 TO 12-SP STE
P -1:GOSUB 350:NEXT A
:RETURN
LH 350 COL(A)=COL(A)+1-4*(CO
L(A)=4):POSITION 3+A,
6:PRINT #6,C$(COL(A),
COL(A)):RETURN

```



"Tug-a-War" for the IBM PC and PCjr.

Program 3: Tug-A-War For IBM PC/PCjr

Version by Kevin Mykytyn, Editorial Programmer

```

GE 10 GOTO 30
GN 20 FOR ROW=0 TO 2:LOCATE Y+RO
W,PS*3+X:PRINT B$:NEXT:RET
URN
NO 30 KEY OFF:SCREEN 0,0:WIDTH 4
0:B$=CHR$(222)+CHR$(219)+C
HR$(221)+CHR$(31)
HP 40 DIM COL(11):BP=6:C(1)=2:C
(2)=6:C(3)=3:C(4)=5:PL=0:RA
NDOMIZE TIMER
LA 50 MOV(1)=-1:MOV(2)=-2:MOV(3)
=1:MOV(4)=2
LP 60 GOSUB 190

```

```

CI 70 PL=(PL=0):GOSUB 230:GOSUB
240:GOSUB 180
LA 80 K$=INKEY$:IF K$="a" OR K$=
"A" THEN SP=11:GOTO 110
DJ 90 IF K$="0" THEN SP=10:GOTO
110
HE 100 IF K$<"1" OR K$>"9" THEN
80 ELSE SP=VAL(K$)
HG 110 IF (PL=0 AND 12-SP>BP) OR
(PL=-1 AND SP<BP) THEN 1
30
NL 120 BP=BP+MOV(COL(BP)):IF BP>
12 THEN BP=12 ELSE IF BP=
-1 THEN BP=0
ND 130 GOSUB 260:IF BP>0 AND BP<
12 THEN 70
LJ 140 GOSUB 230:LOCATE 20,15:CO
LOR 9:IF BP=0 THEN PRINT
" Blue Wins! ":GOTO 160
GL 150 COLOR 4:PRINT " Red Wins!
"
FA 160 LOCATE 23,8:COLOR 14:PRIN
T "Press any key to play
again":GOSUB 180
GJ 170 A$=INKEY$:IF A$="" THEN 1
70 ELSE RUN
FF 180 DEF SEG=0:POKE 1050,PEEK
(1052):RETURN
BE 190 CLS:Y=3:X=0:FOR A=1 TO 4:
PS=4+A:COLOR C(A):GOSUB 2
0:NEXT
FE 200 COLOR 14:PRINT SPC(15)CHR
$(17)" "STRING$(2,17)" "
CHR$(16)" " "STRING$(2,16)
EI 210 Y=13:X=1:COLOR 9:PS=0:GOS
UB 20:FOR A=1 TO 11:Q=INT
(RND(1)*4+1):COL(A)=Q:COL
OR C(Q):PS=A:GOSUB 20:NEX
T:COLOR 4:PS=12:GOSUB 20
IL 220 LOCATE 23,8:COLOR 10:PR
INT "Press (0-9) or 'A' f
or all":RETURN
GF 230 COLOR 15:LOCATE 14,BP*3+2
:PRINT CHR$(219):RETURN
BG 240 LOCATE 20,15:IF PL=0 THEN
COLOR 4:PRINT "Red's Tur
n ":LOCATE 11,5:PRINT "A
0 ";:FOR A=9 TO 1 STEP-1
:PRINT A;:NEXT:RETURN
IF 250 COLOR 9:PRINT "Blue's Tur
n":LOCATE 11,4:FOR A=1 TO
9:PRINT A;:NEXT:PRINT "
0 A":RETURN
HI 260 IF PL=0 THEN 280
BO 270 FOR A=1 TO SP:GOSUB 290:N
EXT:RETURN
FM 280 FOR A=11 TO 12-SP STEP-1:
GOSUB 290:NEXT:RETURN
DE 290 COL(A)=COL(A)+1-4*(COL(A)
=4):COLOR C(COL(A)):PS=A:
GOSUB 20:RETURN

```

Program 4: Tug-A-War For Apple

Version by Tim Victor, Editorial Programmer

```

JB 100 GOSUB 400
BA 110 HGR : HOME
SC 120 HCOLOR=3: FOR TD = - 1 T
O 1 STEP 2: FOR TN = 0 TO
1: FOR TX = - 1 TO TN ST
EP 2: GOSUB 500: NEXT : N
EXT : NEXT
DC 130 VP = 40
AI 140 FOR I = 0 TO 3:HC = CT(I)
:PS = 4.5 + I: GOSUB 430:
NEXT
EB 150 VP = 146:HC = 1:PS = 0: G
OSUB 430: GOSUB 460
AE 160 FOR I = 0 TO 10:BC(I) = I
NT ( RND (1) * 4):HC = CT
(BC(I)):PS = I + 1: GOSUB
430: NEXT

```


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Apple "Tug-a-War," a challenging strategy game.

```

C9 170 HC = 6:PS = 12: GOSUB 430
    : GOSUB 460
F9 180 BP = 5: GOSUB 470
69 190 VTAB 21: FOR I = 1 TO 11:
    HTAB I * 3 + 2: IF I < 1
    THEN PRINT CHR$(48 + I
    );
89 200 IF I = 10 THEN PRINT "0";
15 210 IF I = 11 THEN PRINT "A";
E4 220 NEXT : VTAB 23: HTAB 1: P
    RINT "GREEN'S MOVE:";
46 230 GOSUB 520:A = A - 1: IF (
    BP < = A) THEN BP = BP +
    JT(BC(BP))
97 240 FOR I = 0 TO A:BC(I) = BC
    (I) + 1 - 4 * (BC(I) = 3)
    :HC = CT(BC(I)):PS = I +
    1: GOSUB 430: NEXT
54 250 GOSUB 470
16 260 IF BP < 0 OR BP > 10 THEN
    360
67 270 VTAB 21: FOR I = 1 TO 11:
    HTAB (12 - I) * 3 + 2: I
    F I < 10 THEN PRINT CHR$
    (48 + I);
99 280 IF I = 10 THEN PRINT "0";
25 290 IF I = 11 THEN PRINT "A";
88 300 NEXT : VTAB 23: HTAB 1: P
    RINT "BLUE'S MOVE:";
1F 310 GOSUB 520:A = 11 - A: IF
    (BP > = A) THEN BP = BP +
    JT(BC(BP))
5A 320 FOR I = 10 TO A STEP - 1:
    BC(I) = BC(I) + 1 - 4 * (
    BC(I) = 3):HC = CT(BC(I))
    :PS = I + 1: GOSUB 430: N
    EXT
51 330 GOSUB 470
13 340 IF BP < 0 OR BP > 10 THEN
    360
9F 350 GOTO 190
92 360 PS = 12 * (BP > 0) - 1: H
    COLOR= 4 * (BP > 0): GOSU
    B 470
33 370 VTAB 23: HTAB 1: IF BP <
    0 THEN PRINT "GREEN WINS
    ": GOTO 390
6C 380 IF BP > 10 THEN PRINT "BL
    UE WINS "
8A 390 GET A$: GOTO 110
DE 400 FOR I = 0 TO 3: READ CT(I
    ): NEXT
38 410 FOR I = 0 TO 3: READ JT(I
    ): NEXT : RETURN
84 420 DATA 3,5,6,2,-1,-2,1,2
8C 430 HCOLOR= HC: FOR YP = VP T
    O VP + 10
9A 440 HPLT PS * 21 + 1,YP TO P
    S * 21 + 17,YP: NEXT
1E 450 RETURN
AB 460 HCOLOR= 3: FOR YP = VP +
    1 TO VP + 9 STEP 2: HPLT
    PS * 21 + 1,YP TO PS * 2
    1 + 17,YP: NEXT : RETURN
52 470 IF BP < 0 OR BP > 10 THEN
    RETURN

```

```

19 480 HCOLOR= 4 * (CT(BC(BP)) >
    3):PS = BP
74 490 FOR YP = VP + 3 TO VP + 7
    : HPLT PS * 21 + 27,YP T
    O PS * 21 + 32,YP: NEXT :
    RETURN
DF 500 TP = 124 + (TD + TN) * 21
    + TN * TX * 4:TL = TP +
    TD * 3:TR = TP - TD * 3
E5 510 HPLT TR,60 TO TL,57 TO T
    R,54: RETURN
86 520 POKE 49168,0: GET A$: IF
    A$ = CHR$(3) THEN END
89 530 IF A$ = CHR$(3) THEN END
CB 540 IF A$ < "A" AND A$ < "
    "a" AND (A$ < "0" OR A$ <
    "9") THEN 520
36 550 IF A$ = "A" OR A$ = "a" T
    HEN A$ = CHR$(59)
38 560 IF A$ = "0" THEN A$ = CHR
    $(58)
51 570 A = ASC (A$) - 48: RETURN

```

Program 5: Tug-A-War For Atari ST

Version by Kevin Mykytyn, Editorial Programmer

```

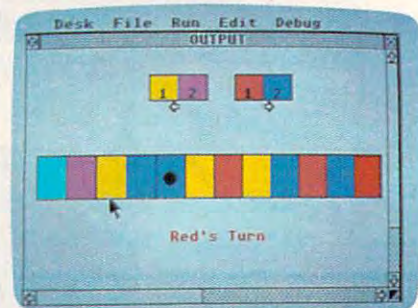
10 fullw 2:clearw 2:color 1,1,1
20 bp=6:c(1)=6:c(2)=7:c(3)=10:c(4)=12:pl
    =0
30 mov(1)=-1:mov(2)=-2:mov(3)=1:mov(
    4)=2
40 gosub 170:gosub 270
50 pl=(pl=0):gosub drawball:gosub play
    er
60 gosub readmouse:if y<98 or y>127 o
    r x<34 or x>273 then 60
70 sp=int((x-11)/24)
80 if (pl=0 and sp>bp) or (pl=-1 and sp
    <bp) then 110
90 t=c(col(bp)):color 1,t:tpcircle bp*24+2
    2,91,6
100 bp=bp+mov(col(bp)):if bp>11 the
    n bp=11 else if bp=-1 then bp=0
110 gosub colchange
120 gosub drawball:if bp>0 and bp<11 th
    en 50
130 gotoxy 13,14:if bp=0 then color 5:pri
    nt "Blue Wins!":goto 150
140 color 2:print "Red Wins!"
150 gotoxy 10,16:color 1:print "Press Mou
    se Button":gosub readmouse:clear: go
    to 10
160 drawball: color 1,1,1:pcircle bp*24+2
    2,91,6:return
170 for a=75 to 105 step 30:linef 10,a,298,
    a:next
180 for a=10 to 298 step 24:linef a,75,a,10
    5:next
190 color 1,5:fill 12,77:color 1,2:fill 296,77
200 gotoxy 12,3:print "1 2 1 2"
210 for a=100 to 220 step 24:linef a,19,a,3
    7:next
220 for a=19 to 37 step 18:linef 100,a,148,
    a:linef 172,a,220,a:next
230 color 1,6:fill 101,20:color 1,7:fill 125,20
240 color 1,10:fill 173,20:color 1,12:fill 197,
    20
250 gotoxy 13,4:print chr$(4);" ";chr$(3)
260 return
270 for a=1 to 10:q=int(rnd(1)*4+1):col(a
    )=q:color 1,c(q):fill 25+a*24,77
280 next:return
290 readmouse: poke contrl,124
300 poke contrl+2,0:poke contrl+6,0
310 vdisys(0):if peek(intout)=0 then 310
320 x=peek(ptsout):y=peek(ptsout+2)
330 return

```

```

340 colchange: if pl=0 then 360
350 for a=1 to sp:gosub 370:next:return
360 for a=10 to sp step 1:gosub 370:next:r
    eturn
370 col(a)=col(a)+1+4*(col(a)=4)
380 color 1,c(col(a)):fill 25+a*24,77
390 return
400 player: gotoxy 13,14:if pl=0 then colo
    r 2:print "Red's Turn":return
410 color 5:print "Blue's Turn":return

```



Use the mouse to play the Atari ST version of "Tug-a-War."

Program 6: Tug-A-War For TI-99/4A

Version by Patrick Parrish, Programming Supervisor

```

100 GOTO 150
110 FOR I=1 TO LEN(A$)
120 CALL HCHAR(R,C+I,ASC(SE
    G$(A$,I,1)))
130 NEXT I
140 RETURN
150 RANDOMIZE
160 CALL COLOR(14,1,7)
170 CALL SCREEN(2)
180 PC(0)=5
190 PC(1)=7
200 P$(0)="BLUE"
210 P$(1)="RED"
220 Y$(0)="- 1 2 3 4 5
    6 7 8 9 "
230 Y$(1)=" 9 8 7 6 5
    4 3 2 1 ->"
240 KHAR(0)=0
250 KHAR(10)=5
260 FOR I=96 TO 136 STEP 8
270 CALL CHAR(I,"0000000000
    000000")
280 CALL CHAR(I+1,"0F0F0F0F
    0F0F0F0F")
290 CALL CHAR(I+2,"3078FCFC
    FC7830")
300 CALL CHAR(I+3,"00103010
    10101030")
310 CALL CHAR(I+4,"00384404
    0810207C")
320 NEXT I
330 PS=5
340 PL=0
350 BP=17
360 CALL CLEAR
370 GOSUB 1000
380 PRINT TAB(11);"TUG-A-WA
    R"
390 PRINT :
400 B$=CHR$(128)&CHR$(128)&
    CHR$(129)
410 PRINT TAB(9);"hhippq xx
    y";B$
420 PRINT TAB(9);"hkptqx<
    y";CHR$(128);CHR$(132);
    CHR$(129)
430 PRINT TAB(9);"hhippq xx
    y";B$

```


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```

440 PRINT
450 PRINT TAB(11); "<-"; TAB(
18); "->"
460 FOR I=1 TO 15
470 PRINT
480 NEXT I
490 FOR I=1 TO 9
500 RANDOMIZE
510 KHAR(I)=INT(4*RND)+1
520 NEXT I
530 FOR R=13 TO 15
540 CALL HCHAR(R,2,96,2)
550 FOR I=1 TO 9
560 KH=96+KHAR(I)*8
570 CALL HCHAR(R,I*3+1,KH)
580 CALL HCHAR(R,I*3+2,KH)
590 CALL HCHAR(R,I*3+3,KH+1
)
600 NEXT I
610 CALL HCHAR(R,31,136,2)
620 NEXT R
630 CALL HCHAR(14,BP,96+KHA
R(PS)*8+2)
640 IF (PS=0)+(PS=10) THEN 1
180
650 A$=Y$(PL)
660 R=17
670 C=1
680 GOSUB 110
690 CALL HCHAR(24,17,32)
700 A$=P$(PL)&"'S TURN "
710 R=20
720 C=11
730 GOSUB 110
740 R=22
750 C=14
760 A$="(1-9)"
770 GOSUB 110
780 GOSUB 1020
790 CALL KEY(0,K,H)
800 IF H=0 THEN 790
810 IF (K<49)+(K>57) THEN 79
0
820 AN=K-48
830 CALL HCHAR(24,17,K)
840 IF PL=0 THEN 890
850 AN=10-AN
860 S=AN

870 E=9
880 GOTO 910
890 S=1
900 E=AN
910 GOSUB 1100
920 FOR Q=S TO E
930 IF KHAR(Q)>4 THEN 960
940 KHAR(Q)=1
950 GOTO 970
960 KHAR(Q)=KHAR(Q)+1
970 NEXT Q
980 PL=-(PL=0)
990 GOTO 530
1000 CALL COLOR(9,1,5)
1010 CALL COLOR(14,1,7)
1020 FOR I=1 TO 8
1030 CALL COLOR(I,PC(PL),2)
1040 NEXT I

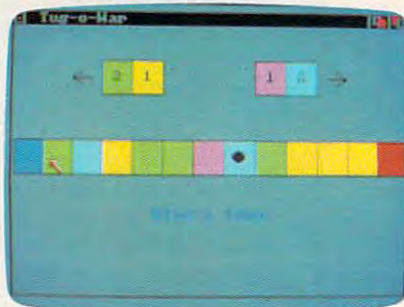
1050 CALL COLOR(10,PC(PL),1
6)
1060 CALL COLOR(11,PC(PL),1
1)
1070 CALL COLOR(12,PC(PL),8
)
1080 CALL COLOR(13,PC(PL),1
4)
1090 RETURN
1100 IF ((AN<PS)*(PL=0))+(A
N>PS)*(PL=1) THEN 1170
1110 A=(KHAR(PS)=1)+(KHAR(P
S)=2)*2-(KHAR(PS)=3)-(
KHAR(PS)=4)*2
1120 BP=BP+A*3
1130 PS=PS+A
1140 IF (PS>0)*(PS<10) THEN
1170
1150 PS=-(PS=-1)+(PS=11)+PS

```

```

1160 BP=-(BP<5)*3-(BP>29)*3
1
1170 RETURN
1180 R=14
1190 C=7
1200 A$=P$(-(PS=10))&" IS T
HE WINNER!"
1210 GOSUB 110
1220 A$="LIKE TO PLAY AGAIN
(Y/N)?"
1230 R=24
1240 C=4
1250 GOSUB 110
1260 CALL KEY(0,K,H)
1270 IF H=0 THEN 1260
1280 IF (K<>78)*(K<>89) THEN
1260
1290 IF K=89 THEN 330

```



This version of "Tug-a-War" uses several of the Amiga's 4,096 different color shades.

Program 7: Tug-A-War For Amiga

Version by John Krause, Assistant Technical Editor

```

SAY TRANSLATE$("")-
SCREEN 2,320,200,3,1-
WINDOW 2," Tug-A-War ",12,2-
FOR i=0 TO 7-
  READ r,g,b-
  PALETTE i,r,g,b-
NEXT-
RANDOMIZE TIMER-
DIM a(11)-
FOR i=1 TO 11-
  a(i)=INT(RND(1)*4)+4-
NEXT-
row=3-
col=3:colr=4:GOSUB frame:GOSUB squ
are-
col=4:colr=5:GOSUB frame:GOSUB squ
are-
col=8:colr=6:GOSUB frame:GOSUB squ
are-
col=9:colr=7:GOSUB frame:GOSUB squ
are-
row=10-
LOCATE 5,11:COLOR 1,4:PRINT "2"-
LOCATE 5,14:COLOR 1,5:PRINT "1"-
LOCATE 5,26:COLOR 1,6:PRINT "1"-
LOCATE 5,29:COLOR 1,7:PRINT "2"-
LINE (64,36)-STEP(16,0),1-
LINE -STEP(8,4),1-
LINE (48,36)-STEP(8,4),1-
LINE (248,36)-STEP(16,0),1-
LINE -STEP(-8,4),1-
LINE (264,36)-STEP(-8,4),1-
FOR col=0 TO 12-
  GOSUB frame-
NEXT-
col=0:colr=3:GOSUB square-
col=12:colr=2:GOSUB square-

```

```

dot=6:GOSUB update-
SAY TRANSLATE$("welcome to tugowa
r.")-
main:-
LOCATE 17,15-
IF red THEN-
  COLOR 2,0:PRINT "Red's turn "-
  SAY TRANSLATE$("reds turn.")-
ELSE-
  COLOR 3,0:PRINT "Blue's turn"-
  SAY TRANSLATE$("blues turn.")-
END IF-
WHILE MOUSE(0)<>1 OR MOUSE(4)<8
0 OR MOUSE(4)>104 OR MOUSE(3)<2
3 OR MOUSE(3)>276-
WEND-
click=INT(MOUSE(3)/24)-
IF (red AND click<=dot) OR (red=0 AN
D click>=dot) THEN -
  temp=dot-
  IF a(temp)=4 THEN dot=dot-2-
  IF a(temp)=5 THEN dot=dot-1-
  IF a(temp)=6 THEN dot=dot+1-
  IF a(temp)=7 THEN dot=dot+2-
END IF-
IF red THEN-
  FOR i=click TO 11-
    a(i)=a(i)+1-
    IF a(i)=8 THEN a(i)=4-
  NEXT-
ELSE-
  FOR i=1 TO click-
    a(i)=a(i)+1-
    IF a(i)=8 THEN a(i)=4-
  NEXT-
END IF-
IF dot>11 THEN-
  dot=12:GOSUB update-
  LOCATE 17,15:COLOR 2,0:PRINT " Re
d wins! "-
  SAY TRANSLATE$("red wins.")-
  GOTO quit-
END IF-
IF dot<1 THEN-
  dot=0:GOSUB update-
  LOCATE 17,15:COLOR 3,0:PRINT "Blu
e wins! "-
  SAY TRANSLATE$("blue wins.")-
  GOTO quit-
END IF-
GOSUB update-
red=1-red-
GOTO main-
frame:-
x=24:IF 24*col>280 THEN x=23-
LINE (24*col,8*row)-STEP(x,24),1,b-
RETURN-
square:-
x=22:IF 24*col+1>280 THEN x=21-
LINE (24*col+1,8*row+1)-STEP(x,22),c
olr,bf-
RETURN-
update:-
FOR col=1 TO 11-
  colr=a(col):GOSUB square-
NEXT-
CIRCLE (24*dot+11,91),5,1-
PAINT (24*dot+11,91),1-
RETURN -
quit:-
LOCATE 19,7:COLOR 1,0:PRINT "Clic
k mouse to play again."-
SAY TRANSLATE$("click mouse to pla
y again.")-
WHILE MOUSE(0)=0:WEND-
RUN-
DATA .5,.5,.5,0,0,0,1,0,0,0,1,0,1,0,1,1,
0,1,0,1,0,1,1-

```


Silent Service

Neil Randall

Requirements: Commodore 64 or 128 (in 64 mode); Apple II-series computer with at least 64K RAM; Atari 400/800, XL, or XE with at least 48K RAM; IBM PC with color/graphics adapter; or an IBM PCjr. A disk drive is also required, and a joystick is recommended. The Commodore version was reviewed.

Silent Service, from Microprose Software, is one of a new type of computer war game. A cross between arcade action games and traditional strategy war games, these new games put you on the battlefield in command of a plane, tank, or submarine. Microprose's *F-15 Strike Eagle* placed you in a modern jet fighter. In *Silent Service*, you're the captain of a U.S. submarine in the Pacific during World War II. Your mission is to sink Japanese cargo, troop, and oil shipping. The game includes several scenarios based on actual engagements.

Silent Service employs several graphics screens to relay the information needed to command the sub. The Patrol Navigation Map shows a 150,000 square-mile area of the Pacific Ocean from Midway Island to China (east to west), and Australia to the U.S.S.R. (south to north). This is the strategic map on which you move your sub to find Japanese shipping lanes. Once you've found a convoy, the tactical map kicks in.

The tactical map is actually a series of three differently scaled maps. The Patrol Area Map is described above. You can zoom to the Navigation Map, which shows an area of 2,400 square miles around your sub, and zooming further yields the Attack Plot, a 40-square-mile area. The detail of land masses and enemy ships changes with the zoom. The Attack Plot displays the wake of each ship, to show which direction it is going. You use the Patrol Area Map to find the enemy convoy, the Navigation Map to close in on it, and the Attack Plot to position your sub for attack.

Superb Graphics

Once you've located your prey, you shift to a view of the conning tower, the captain's station. Using the joystick (the game is joystick- or keyboard-controlled), you either use the peri-

scope or move the captain to one of the other stations: instruments and gauges, maps and charts, damage reports, quartermaster's log, or the bridge. Like the map screens, each battle station screen is graphically superb and very detailed.

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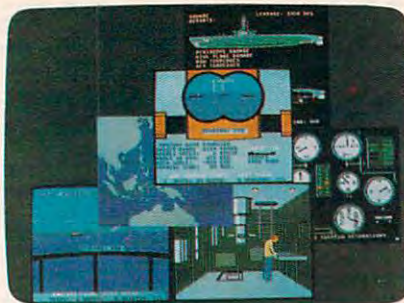
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If the sub is surfaced, you can climb to the bridge. From here you can look around to spot the enemy ships, using your naked eyes or binoculars. The view includes the Japanese ships (several varieties, each graphically different) and the land on the horizon. The landforms correspond exactly to where you are in the Pacific; if you patrol to the coast of New Guinea, you will see the coast of New Guinea. Given the amount of territory covered in the game, the mapping system is obviously very sophisticated.

The binoculars and periscope screens include all the details necessary for firing at the ships: target type, target range and speed, and such data as angle-on-bow. You may fire the deck guns or torpedoes, but only torpedoes are consistently effective.

These screens are the heart of the action, but to keep the sub running you must pay strict attention to your vessel's instruments and gauges. They display information about the battery, the depth of the sub and of the ocean floor beneath you, fuel levels, the status of hull openings, and so on. For instance, the battery allows restricted underwater maneuvering, depending on your speed, and then must be recharged on the surface.



This assortment of screens from *Silent Service* shows the diversity of the program's graphics.

Attention To Detail

Other facets of the game are equally realistic. If your sub hits the ocean bottom, you hear a scraping sound and the hull may be damaged. You can cruise at four speeds or cut the engines for silent running. More esoterically, once per mission you can get rid of your emergency tanks to stop a fatal dive, or release debris to the surface to fool the Japanese destroyers into thinking you've been sunk. Sound effects range from sonar pings—telling you that destroyers are closing in—to the ominous explosions of nearby depth charges. The sub's hull even creaks if you dive deeper than it was tested for, and you hear a grinding metallic sound if you're

rammed by an enemy ship. *Silent Service's* detail is astonishing.

But the most impressive part of the detail is that it does not impede play. Detail in the more traditional type of war game frequently hinders understanding and lengthens the game considerably, but *Silent Service* plays quite easily after only a half-hour or so of practice. Once you learn how to steer the sub and fire torpedoes at a target, you can try a mission. You can learn the rest, such as diving and running silent at the approach of a Japanese destroyer, as the situation demands. At any time, you can pause the game to allow you time to think.

Like *F-15 Strike Eagle*, *Silent Service* is both intriguing and addicting. Also like *F-15*, it is highly educational, but there is nothing tedious about the lessons. The excellent manual describes the submarine war in the Pacific, the background to the scenarios, and the tactics used by sub captains. By playing the game, you'll quickly find that these captains knew what they were doing. *Silent Service* is a superior product.

Silent Service
MicroProse Software Inc.
120 Lakefront Drive
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DeluxePaint For Amiga

Lee Noel, Assistant Editor, Art & Design

Requirements: Amiga with at least 256K RAM (512K recommended). Printer optional.

Whenever a new computer appears on the market, some of the most important factors affecting its success are the quality and diversity of its software. In the case of the long-awaited and innovative Amiga, questions concerning software support become even more important. Is this computer the powerhouse it's said to be, and can programs be written to take full advantage of its capabilities?

Electronic Arts, a software publisher widely considered to be at the forefront of personal computing, said yes to both questions and threw its considerable weight squarely behind the Amiga. *DeluxePaint*, by Dan Silva, is one of the first results. Not surprisingly—considering the Amiga's selling point as a computer for those who want a "creative edge"—*DeluxePaint* is a visual arts program of immense scope and flexibility.

In fact, *DeluxePaint* is really three different programs of immense scope

and flexibility. Due to differing memory requirements, *DeluxePaint* includes a separate program for each of the Amiga's three major screen modes: 320 pixels across by 200 down with 32 simultaneous colors; 640 × 200 with 16 colors; and 640 × 400 with 16 colors. The number of simultaneous colors in each mode can be selected from a palette of 4,096 possible colors. You can also customize *DeluxePaint* by restricting it to a smaller palette.

After booting up the program disk, you must type in a command to call up whatever incarnation of *DeluxePaint* you want. This may sound confusing to nontechnical artists hoping to use the Amiga for their first experiments in computer graphics, but loading the program is fairly straightforward. First you turn on the Amiga and insert the usual Kickstart disk. When the prompt asking for the Workbench disk appears, you insert the *DeluxePaint* disk instead. AmigaDOS comes up next with its 1> prompt, and then you type the appropriate command. For instance, you'd enter *dpaint* and press RETURN to work in the 320 × 200 mode.

Best For 320 × 200

DeluxePaint works best by far in the 320 × 200 mode. In the 640 × 200 mode, pixels are three times as high as they are wide, and the program slows down considerably. In 640 × 400, the slowdown is drastic. So much memory is consumed that there's not enough room in a 512K machine for both the entire program and a screen. Instead, the program is broken into modules that are constantly swapped in and out from disk. (*DeluxePaint* works this way in all modes on a 256K Amiga.)

Also, the 640 × 400 mode suffers from a jittering screen display. The jittering varies depending on the color combinations, and high-contrast combinations are worse. This isn't *DeluxePaint's* fault—the monitor simply cannot refresh the 256,000 pixels in this mode fast enough to display a stable picture. (Other computers with similar modes get around this problem by using special monochrome monitors driven at higher refresh rates.)

Since *DeluxePaint's* features are the same in all modes, we'll describe what's available in the 320 × 200 mode. This is the most color-rich screen, and the program's documentation and all of the sample pictures on the disk are slanted toward it.

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Tons Of Tools

Like virtually all Amiga software, *DeluxePaint* is a mouse-driven, icon-based program, similar in some ways to *MacPaint* for the Macintosh. An array of drawing tools is represented by icons on the computer's display (the tools can be hidden when the picture is finished). Tools are selected by moving a pointer to the appropriate icon with the mouse. A click of the mouse button activates the tool, which can then be used in the drawing area.

DeluxePaint has practically all of the tools that have become standard in graphics-design programs. You can draw straight lines and a multiplicity of outlined or filled shapes, paint with different-sized brushes or an "air-brush," print text on the screen, and lots more. But *DeluxePaint* really shines because it offers unique new tools and novel extensions to the old standbys.

First and foremost, *DeluxePaint* recognizes the importance of color to the artist. The program has a special palette window where any of the Amiga's thousands of colors can be mixed and used in design work. The palette appears from the program's title bar as a pull-down menu (the menu selections have alternate keyboard commands as well.)



This picture of a paint can and brush— included on the DeluxePaint disk— shows the fine shading possible with 32 simultaneous colors chosen from a palette of 4,096.

Within the palette is an almost bewildering number of options. For instance, there are two ways to make color adjustments. The first method has three slide controls—manipulated with the mouse—that alter the percentages of red, green, and blue in any color (these are the primary colors for a video display). Another set of three sliders allows changes to the hue, saturation, and value of any selected color. The latter system is much like the tint, color, and contrast controls on a normal color TV. As a result, novice users of *Deluxe-*

Paint may find this system reassuringly familiar.

If that's not enough flexibility, the artist can also move the palette window to any convenient location, and the relocation will be "remembered" for the rest of the current session.

Flowing Colors

Colors are selected simply by pointing and clicking with the mouse; selection is verified by a highlighted box. Color changes are instantly reflected in the palette window and in the picture. As a consequence, it's delightfully easy to adjust colors relative to each other. The program disk includes two good examples of the effects made possible by this precise control over a diverse palette. "KingTut" displays the hard, gleaming gold coffin mask of the Egyptian boy-king Tutankhamen. In contrast, "Venus" faithfully reproduces the soft, almost pearly hues of Botticelli's "Birth of Venus."

Some really amazing special effects are also built into *DeluxePaint's* palette, such as animated color cycling. This allows the artist to establish three sets of colors that will cycle through a certain range. Each range can be narrow or wide, can include harmonious or clashing colors, and can overlap the

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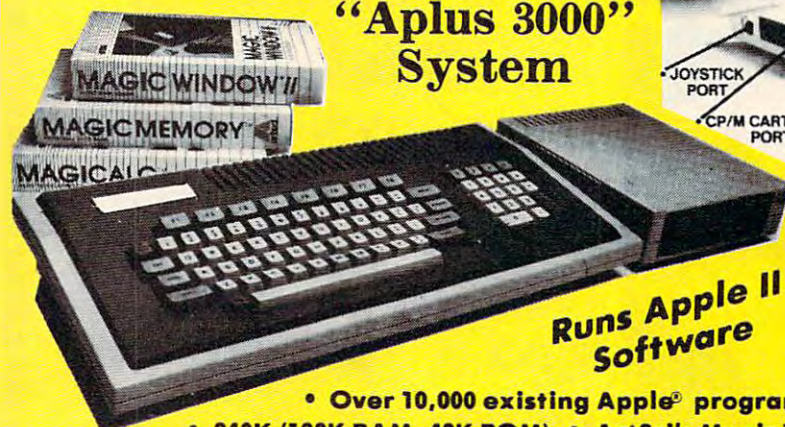
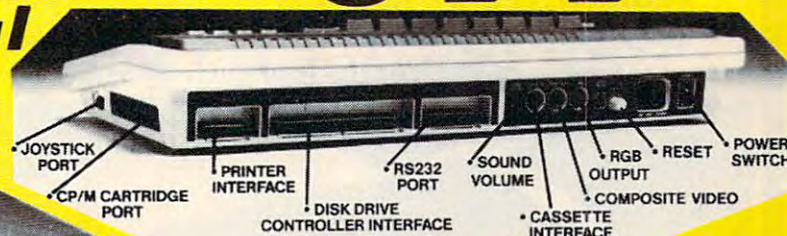
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ranges for the other two cycles. Once activated, a cycle runs through all the colors in its range in a smooth sequence. The speed of each cycle can be individually controlled with the mouse and a slider. Color cycling is what makes the disk's sample waterfall picture seem to flow. With thought and care, you can create effects otherwise impossible in two-dimensional art.

Closer to traditional art media are tools which smear, shade, and blend. Smearing enables an artist to use the *DeluxePaint* brush to smudge colors already painted on the display. The effect is similar to running a brush through fresh oil paints. Shading and blending work on a defined color range, like the ranges for color cycling. Both operate best on a range of closely related shades and affect only the colors in the selected range.

The action of shading is difficult to explain in print, but blending does pretty much what it describes—it produces smooth gradations like those found in watercolor washes or airbrushing. There are also tools for exchanging colors and an undo feature to recover from mistakes.

Anything Is A Brush

All that's fine for the colors, but what of the brushes that apply them? Once again, *DeluxePaint* offers abundant options. There are, of course, some built-in brushes. These are various useful shapes, and they can all be adjusted in size with one of the program's easy-to-use tools. But, as might be expected, other brush manipulations range into some wild and unexplored regions.

The essence of *DeluxePaint* brushes is this: Anything can be a brush, so you can paint with a single pixel, a pictorial element, a whole screen, or anything in-between. And if that's not enough, the artist can grab the brush, resize it, rotate it to any angle, flip it, or drag it into a completely new shape. This last feature allows a brush that looks flat to be made to appear three-dimensional. To get an idea of the effect, imagine a flag lying flat on a table. Suddenly, it's bent into a stiff billow and paints in an arc across the sky—stars and stripes and colors and all.

Brushes, like complete pictures, can be saved to previously prepared data disks. There are also some esoteric possibilities involving the exchange of transparent and solid colors within a brush, plus a different way to "hold" the current brush, and a way to speed up response time to certain types of brushes. Analogies are hard to come by for these features, but they open up fascinating possibilities not available to



Another sample picture on the *DeluxePaint* disk is this reproduction of Botticelli's "Birth of Venus."



This photo demonstrates a zoom window, just one of the many features in *DeluxePaint*.

artists working in traditional media.

The basis for all the brush transformations is the designer's ability to reach out and capture any area of the screen with a special brush selection tool. This is much like the copy, cut, and paste functions found in other graphics programs, and it can be used for those purposes as well as brush design.

Room To Zoom

A full description of *DeluxePaint*'s myriad features would run on for many pages (the manual is 31 pages long), but highlights of some of the major ones not covered so far bear mentioning.

DeluxePaint has a special magnification tool that allows the artist to zoom closer and closer to the area under inspection, and then back away in similar increments. Great mobility within the magnify mode is provided with the cursor keys.

There's fairly complete printer support, plus the ability to add text to designs and manipulate it in numerous ways. A skewing feature even lets you turn ordinary text into italics.

For precision design work, one option gives a constantly updated display of the cursor's screen coordinates, another provides a grid that can be modified, and still another allows unusual mirror-like symmetry effects.

Virtually anything that anyone ever wanted in a personal computer graphics program is included in *DeluxePaint*—and it's all easy to use and easy to learn. It's fortunate that the program is fairly intuitive because the documentation is not. The basic tone of the manual is that experimentation and playfulness are the best methods for coming to grips with the program. A step-by-step approach might have been more helpful. And, ironically, the manual's graphics are almost nonexistent.

Another problem with the manual is that it lacks completeness. *DeluxePaint* cannot create data disks by itself, so the artist must refer to Chapter 4 of the *Amiga User's Guide* for the information. Also, hardly any program commands are summarized in *DeluxePaint*'s command summary.

On the other hand, in the few places where you might get really stuck, the documentation comes through with some solid tutorials.

Bottom line: Will *DeluxePaint* and an Amiga give you that creative edge? That depends—in the end, it's still the artist that has to pull the rabbit out of the hat.

DeluxePaint
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S'More For Commodore 64

Art Hunkins

Requirements: Commodore 64 or a Commodore 128 in 64 mode.

Commodore 64 owners who wish to upgrade their computers have two main options: Buy a Commodore 128 or install a *S'more* cartridge from Cardco. Each choice has its advantages. If money is no object (and you aren't overly attached to your 64), you might consider the 128. But the choice isn't that clear-cut. For those who write their own BASIC programs, *S'more* has some significant advantages of its own. Frankly, it's difficult to know which to compare *S'more* to—the 64 without *S'more*, or the 128.

Of course, the 128 does have some things going for it: twice the available user memory (122,365 bytes) as the 64; BASIC 7.0, with powerful commands for graphics, sprites, sound, and windowing; and a FAST mode for double-speed operation. So if it's raw computer

power and extra memory you want, the 128 is hard to beat.

On the other hand, *S'more* BASIC is more comprehensive than BASIC 7.0 in its utilities; it defaults to disk LOAD, offers a greater variety of input options as well as more flexible screen formatting, and includes varied reset options. The built-in utilities are a real boon: MERGE, AUTO, HEX, DEC, FIND, CHANGE, reNUMBER, DUMP, and OLD—all familiar to BASIC AID users. The LIST command can scroll up and down, not true of BASIC 7.0. On the 128, only AUTO, reNUMBER, and a disk file APPEND are implemented.

Compared to the unenhanced 64, *S'more* frees up 57 percent more user memory—61,183 bytes instead of 38,911 bytes. The memory is contiguous and can be used in any way you desire. (As we'll see, there are other protected locations where machine language routines up to 512 bytes long may be stored.)

Improved Disk Commands

S'more BASIC and BASIC 7.0 come out about even when it comes to disk commands (a notable weakness with the unexpanded 64); only the approach is different. Whereas 7.0 gives a wealth of specific commands, *S'more* uses only one—DISK, an all-purpose "wedge" followed by the traditional disk access symbols. Both BASICs also offer numerous enhancements of standard commands (such as a RUN that LOADs and RUNs a BASIC program from disk). Both permit the SHIFT-RUN key combination to LOAD/RUN the first program on disk.

Both BASICs offer about the same range of programming structures (DO-LOOP, WHILE-UNTIL, IF-THEN-ELSE). Both implement error-trapping and HELP, and both have programmable function keys, though 7.0 sets aside almost twice the buffer (246 bytes versus 128) for key definitions.

S'more is also handy in that its LOAD and SAVE commands default to disk (there is no DLOAD or DSAVE), and that it includes a disk CATALOG/directory option. In fact, due to the way the disk default option works, you can display the CATALOG, cursor to the program you want, type LOAD (or RUN), and hit RETURN—without worrying about what is displayed after the program name.

ML Limitations

For BASIC programs, *S'more* is superb. But let's look at ML applications. Here the picture is not so clear.

Although *S'more* has a MONITOR command, it doesn't have a built-in monitor; MONITOR just links you to a

monitor if you've loaded one into memory. *S'more* comes with a disk of software that includes a version of Micromon called *Smon*. (Other programs on the disk illustrate applications of the more noteworthy *S'more* BASIC extensions.)

Cardco's manual is thorough, clear, instructive, and particularly forthright when it describes *S'more*'s limitations with memory addressing and machine language. Here's the catch: To make so much contiguous BASIC memory available, Cardco had to change a lot of memory locations and reconfigure memory. Cardco did what it could to maintain compatibility with Commodore 64 BASIC (BASIC 2.0), but there were limits on what was possible.

It's remarkable that low memory with *S'more* is so highly compatible with BASIC 2.0. Only two differences will be noticed by the average programmer. First, and most importantly, the cassette buffer has been moved. ML programs designed to reside there will have to be transported to the new location. Also, some of the previously free bytes (which you may have used for flags or temporary data storage) are free no longer (zero page 251-254 remain available, however). There is a bonus, though—a 512-byte RS-232 input/output buffer, protected from BASIC, which can be utilized for ML routines in most cases.

The most critical low memory locations for the BASIC programmer, the keyboard buffer and its corresponding character counter, remain intact. As the manual clearly states, however, ML routines that access ROM are in for major rewrites. The only ROM routines that are safe to use are the Kernal routines when they are accessed through the vectors in low memory (these vectors are unchanged in location). You cannot access ROM subroutines directly. This is a problem particularly with the SID, VIC, and CIA chips—that is, when working directly with screen, sound, and input/output peripherals.

The *S'more* Solution

To get around these limitations, the manual suggests that perhaps most ML routines are best written in *S'more* BASIC, then compiled with the (not-yet-released) *S'more* BASIC Compiler. This suggestion indicates the degree of potential difficulty in converting most ML programs for use with *S'more*.

But there's another alternative, too. *S'more* establishes a set of CIA, VIC, and SID reserved variables (DIMensioned arrays). Each variable corresponds to a CIA, VIC, or SID chip location you might wish to PEEK or POKE. To POKE the location, just assign the variable the

desired value; presto, the POKE is done. To PEEK the location, just use the reserved variable in an expression. It works fine and is simpler than actually PEEKing and POKEing. For sound and the SID chip, for example, it is not too far from the convenience of using BASIC 7.0's new sound commands (PLAY, FILTER, ENVELOPE, etc.)

Of course, this technique works only from BASIC, not machine language. There are times when, for speed and efficiency, ML is required. Although conversion of ML routines accessing the support chips is possible, it is apparently far from trivial. (The manual does not attempt to explain; it only hints that RAM/ROM bank-switching is involved, and that the banking system is similar to that of the Commodore Plus/4.)

There is but one other limitation I've noticed with *S'more*. When writing or editing a BASIC program, the enhanced BASIC often responds slowly, particularly with long programs. The cursor can take 1.5 to 2.5 seconds to reappear after you hit RETURN to enter a new line; it takes longer toward the beginning than at the end of a program. On the other hand, garbage collection purportedly is speeded up dramatically over 2.0 BASIC.

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Works With 128, Too

These are the only problems I've experienced working with the *S'more* cartridge. Overall, *S'more* maintains a high degree of compatibility with BASIC 2.0 (and its associated memory configuration), offers more than 50 percent additional memory accessible to BASIC, and a greatly enhanced language. It makes working with the screen and sound a simpler task for BASIC programmers.

In short, *S'more* is a cost-effective alternative to a Commodore 128 upgrade. (Cardco's literature describing *S'more* as a "bridge to the 128" is on target.) And even if you do decide later to acquire a 128, *S'more* works identically on the 128 in 64 mode.

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Heart Of Africa

Neil Randall

Requirements: Commodore 64 or 128 in 64 mode; Apple II-series computer with at least 64K RAM; or an Atari 400/800/XL/XE with at least 48K RAM. Disk only.

One of the truths in the entertainment industry is that anything popular will spawn many imitators. The field of computer games is certainly no exception. The first hits were *Space Invaders*, then *Pac-Man*, and then *Donkey Kong*. Each of these games begat a host of imitations, few of which approached the quality of the original. Imitations are rarely as good as the things they imitate.

Still, for every imitator trying to capitalize on the popularity of someone else's game, there's a designer trying to improve upon his own original design. This is not imitation—at least not what we normally think of as imitation. Instead, the designer is making an honest effort to improve on a game concept. Much like an artist, who chooses a medium and produces work after work trying to perfect his use of that medium, the game designer invents a system, then produces game after game to develop the system to its fullest. As long as the system keeps improving, the enterprise is justified.

Such is the case with Ozark Software's *Heart of Africa*, published by Electronic Arts. *Heart of Africa* is an extension of the system pioneered in Ozark's own *Seven Cities of Gold* (re-

viewed in the September 1984 issue of *COMPUTE!*). Far from an imitation, it improves on the original game and offers a fresh approach to a system that many people considered near-perfect already. Both games deal with exploration, but *Heart of Africa* gives us something more: a quest.

In Search Of A Tomb

Your quest in *Heart of Africa* is to find the lost tomb of Ankh Ankh, somewhere in the middle of the Dark Continent. You travel alone, buying supplies and tools wherever you can. As you cross the continent, you make discoveries and try to obtain clues about the lost tomb from tribal chiefs. It's not hard to get information, but it's very hard to get useful information, and just as hard to stay alive. The perils are constant, from dying of thirst in the Sahara Desert to suffering a fatal bite by a poisonous snake.

Like *Seven Cities of Gold*, *Heart of Africa* is entirely joystick-driven. You can put your feet up, lean back in your easy chair, and play the game without touching the keyboard. For further playability, the game offers a diary that continually updates itself. The diary is a graphically attractive series of pages that records special events. On the surface, it seems only a nice addition to the game, but in play it greatly eases record-keeping. Any exploration game, be it a text or graphics adventure, demands some keeping of records: map-making, recording conversations, jotting down clues. But *Heart of Africa* takes most of these out of your hands. The map is produced for you on the screen, and your observations, even conversations, are recorded in the diary. You can read the diary at any point simply by loading it from disk. It makes the game extremely playable, especially for those who loathe keeping records.

The *Heart of Africa* game screen shows a solitary figure marching across the map. As you walk, the map scrolls north, south, east, or west, shedding light on more and more of the Dark Continent. The map is constantly updated, and you can check it at any point during the game to see what you've already discovered. As you travel, you discover villages, mountain ranges, rivers, lakes, and, of course, if you work hard enough, the source of the Nile.

Random events are sometimes positive, such as finding valuable caches left behind by previous explorers, as well as negative, such as encounters with crocodiles, poisonous snakes, or rhinoceri. If you're equipped with the right weapons, you can normally stave off an attack, but you may become ill, fatigued, or very thirsty. You

can paddle a canoe along the rivers and lakes, and you can even go over waterfalls. The entire continent is yours to discover.

Tribal Relations

Perhaps the most impressive part of the game is the interaction with the tribes. As in *Seven Cities of Gold*, where cooperating with the natives established your reputation, working with the tribes in *Heart of Africa* is difficult. Each tribe is different and each chief reacts differently to you. For some tribes, a few gifts will yield helpful information. For others, all the gold in the world seems insufficient. You can steal supplies by wielding your gun, but your reputation will suffer. Or worse, you may catch a blow dart. The only way you can know how a tribe will react is to visit each village. If you do well and reward the chief, he'll tell you what else you might bring for more information. If you do poorly, you'll be drummed out of the village.

The *Heart of Africa* manual consists primarily of the notes written by your predecessor, the person sending you on this mission. It describes each of the areas of Africa and the tribes therein. An impressive document for its sheer information, it is also vital for gaining clues about where you should go. It gives, for instance, translations of the tribal names for geographical points. To the natives, after all, Victoria Falls is not Victoria Falls.

There is nothing easy about the game, but the difficulty comes from the situation, not in trying to learn the system. It is extremely easy to get across Africa, buying things, finding things, and giving things away, but it is very hard to gain useful information. Still, this is the game's strength. A poor game is difficult to learn and offers few rewards. A good game is easy to learn and offers endless rewards. *Heart of Africa*, in this sense, is a very good game.

Like *Seven Cities of Gold*, *Heart of Africa* is professional in every way. An excellent program, filled with surprises, the game is even more addicting than its predecessor. In *Seven Cities of Gold*, your rewards were the excitement of discovery and the favors of your monarch. *Heart of Africa* duplicates the excitement of discovery, but adds a desperate search for a lost tomb. This quest makes *Heart of Africa* an adventure as well as a simulation.

Only One World To Explore

One of the superb features of *Seven Cities of Gold* was its ability to create new worlds to explore. Players could never exhaust the game because the

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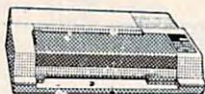
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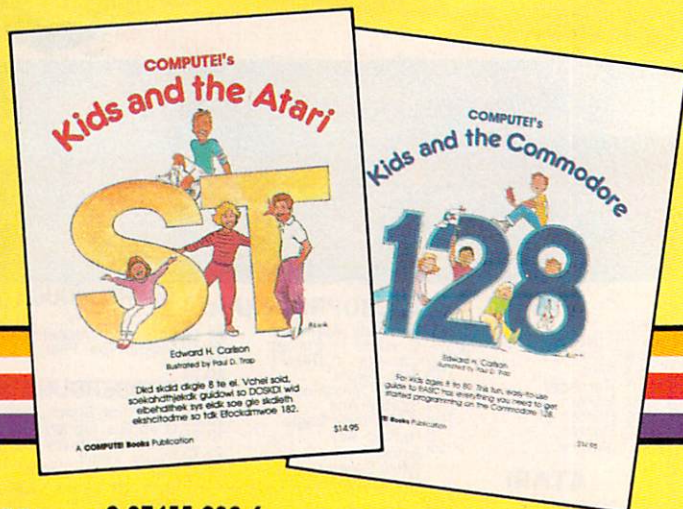
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program could make the world different each time. Surprisingly, *Heart of Africa* offers no such option. There are very good reasons for this—the time limit, and the quest itself—but perhaps the game would be even more complete if each Africa could be a new one. Discoveries are less exciting when you know about them beforehand. Furthermore, the desperate feeling of being hopelessly lost, which *Seven Cities of Gold* presented so well, cannot happen here. If the game has a flaw, this is it.

But the flaw is easily overcome. The romance of uncovering the Dark Continent captures the imagination today as much as ever, perhaps because there remain no large, unexplored land masses anywhere in the world. *Heart of Africa* lets you canoe down the Congo, meet a Zulu chief, and even get caught in a whirlpool near Stanley Falls. Khar-toum, Timbuktu, the Zambesi, Lake Tanganyika, Tangier—they're all there, waiting for you, ready to throw you many surprises.

An almost flawless development of an already excellent game system, *Heart of Africa* should excite anyone who found *Seven Cities of Gold* even remotely interesting. Now, if only I could find Dr. Livingstone.

Heart of Africa
Electronic Arts
2755 Campus Drive
San Mateo, CA 94403
\$32.95

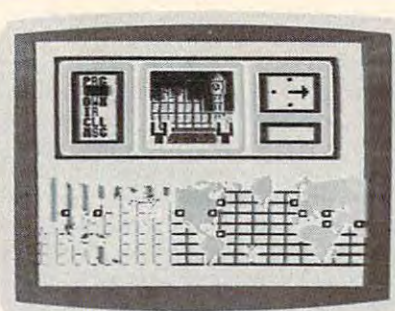
Hacker

Todd Heimarck, Assistant Editor

Requirements: Commodore 64 or 128; Apple II-series computer with at least 64K RAM; Atari 400/800, XL, or XE with at least 48K RAM; IBM PC/PCjr with at least 128K RAM; Atari ST; Amiga; or Apple Macintosh. Disk only.

When the first thing you see is the prompt LOGON PLEASE:, you want to reach for the rule book. But apart from a card that tells you how to load and run this game, there are no instructions. None at all.

The premise behind *Hacker* is that you have stumbled across a telecommunications system about which you know nothing. Being a good hacker (if that's not an oxymoron), you feel the urge to break in and explore. Try a few passwords; unless you're very lucky, none of them will work. After several failures, the system logs you off and the game ends. Or does it? Some random characters appear on the screen, and



On the trail of corporate skullduggery in Activision's *Hacker* (Commodore 64 version).

the computer indicates that a security malfunction has occurred. You're in.

The logon sequence is very realistic. Once, at the beginning of a game, someone walked into the room and watched me guess at a few passwords. Hearing that we were trying to get into an unknown system, which might be a government computer, and then seeing the security malfunction message, he got worried and reminded us that it's illegal to do what we were doing. That's the great appeal of *Hacker*, the feeling that you're doing something wrong and that you might get caught. Who knows, the FBI might even show up at your door and confiscate your computer.

After you enter the system, the game becomes less realistic. On an actual telecommunications system, everything would be straight text. The author of *Hacker*, in the interests of playability, has inserted some high-resolution graphics—unlike anything you'd see on a true bulletin board system or information service. However, the graphics do add a lot to the game.

Remote-Control Robots

You soon discover that you've come across a company involved in some sort of top-secret illegal project. This makes you feel less guilty about breaking into someone's system; you can seek out more information about this project and bring the culprits to justice.

The company owns a vast network of subterranean tunnels, and their computer (to which you've gained access) controls robots that travel through the tunnels. By using the robot to explore the tunnel network and occasionally coming to the surface, you can accumulate more details about the project. I'll say no more about the most effective techniques for winning because an important part of the game is figuring out what's going on.

The game play is almost identical in the versions I tried on the Commodore 64, Atari 520ST, and Amiga. The newer 16-bit machines (Amiga and ST) displayed slightly better graphics than

the 64 because their screens have higher resolution and more colors. The ST version works on both monochrome and color monitors.

All things considered, *Hacker* is a worthy addition to your software collection, especially if you enjoy adventure games that require a bit of thought and an investment of time.

Hacker
Activision, Inc.
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MasterType's Writer For Apple

Stephen Levy, Book Editor

Requirements: Apple IIc or Apple IIe with 128K RAM and a printer. A Commodore 64/128 version is scheduled for release this spring.

Does the world really need another word processor? After all, *MasterType's Writer* does all the things most word processors do. Using direct commands or on-screen menus, you can write, edit, save, search, move, change, find and replace, and print just as you can with most full-featured word processing programs.

So what makes *MasterType's Writer* special? If you're using it with an Apple IIc/IIe and an Imagewriter or Imagewriter II printer, and if you need multiple fonts—including some very large print styles—*Writer* is worth a closer look, even if you already have a word processor. With an Imagewriter or Imagewriter II, *Writer* can dump an exact copy of what's on the screen to the printer. *Writer* comes with eight fonts which can be loaded from disk and saved with your text. Among the styles are fonts that print very large type to the screen, quite suitable for use by young children just learning to read; proportionally spaced fonts of various sizes; and a style that is quite suitable for use on a monochrome monitor.

Each font can be edited, so you can modify those provided or design your own completely new font. And once created, you can use the screen dump feature to duplicate text written with the new font on paper.

If you have an Imagewriter II with a color ribbon, it's a simple matter to print text in color—simply underline

the text to be printed in green with a green line, blue text with the blue line, and so on. Again, you get an exact copy on paper.

Some Nice Touches

In addition to the fancy printing features, *MasterType's Writer* includes a few other extras. For example, the on-disk tutorial is well done and is a good introduction to using the program. Many people will return to the tutorial a second or third time even after they've started creating documents.

With *Writer's* dual windows, you can work on two documents at the same time. You can have an outline in one window and the text you're writing in the other. If you've never used this kind of feature before, you might not miss it; but once you've tried it, you'll wonder how you got along without it. *Writer's* dual windows have the added advantage of allowing you to decide how much of the screen each window will occupy at any time.

The manual is arranged in alphabetical order with entries for most of the terms you're likely to look up. Usually a term refers you to the appropriate instructions. If you're the type who likes to jump right in, you may find the manual a bit frustrating. But if you've tried the on-disk tutorial, you'll find the manual easy to use. And once you've been using *Writer* for awhile, an alphabetically arranged manual makes locating information a snap.

Another powerful feature of *MasterType's Writer* is keyboard macros—you can recall a series of instructions with one or two keystrokes. Macros are especially handy for storing a series of often-used words. If you're writing a book report, for example, you might need to type the author's name or the book's title many times throughout the report. By defining these phrases as macros, you can type them simply by pressing two keys.

Since macros can include program commands as well as ordinary characters, you can create macros for such purposes as saving your document on disk. Then, whenever you want to save the current copy of your work, you just press two keys.

Ease Of Use

MasterType's Writer gives you the choice of using direct commands—usually accessed by pressing CONTROL and one other key—or menus. Moving through the menus is easy and fast and saves you the trouble of memorizing commands. The menus are ideal for those new to word processing. Direct commands are faster for some functions, but for others save little more than one or two keystrokes. Most people will probably use a

combination of both menus and direct commands.

If you revise text often, one aspect of *MasterType's Writer* you may find annoying is its text entry and editing line. *Writer* doesn't allow full-screen editing; all text must be entered and edited on the bottom line of the current window. That means you must press the cursor keys to move the line you wish to edit to the bottom of the window. This isn't a problem when first entering text, but later, when editing, you can't see what comes immediately after the line you're trying to alter without continuously moving the text up and down.

For whom is *MasterType's Writer* most suitable? It should be strongly considered by those who have never used a word processor, teachers or students who plan to use it in schools, Apple users with an Imagewriter printer, or anyone who is unhappy with their current word processing program.

MasterType's Writer
Scarborough Systems, Inc.
55 South Broadway
Tarrytown, NY 10591
\$69.95

HabaWriter For The Atari ST

George Miller
Assistant Technical Editor

Requirements: Atari ST with at least 512K RAM and a compatible printer.

If you've been using *ST Writer*, the free word processor from Atari, but have been wishing for a program that supports the drop-down menus and windows of GEM, then *HabaWriter* is for you.



HabaWriter takes advantage of the GEM environment and includes all the features we've come to expect in a good word processor. Even more important, *HabaWriter* is easy to use. The instruction manual isn't very long—only 46 pages. If you're accustomed to other word processors, this may seem strange. Many programs have entire books devoted to their use, and sometimes it's necessary to enroll in special classes to become really proficient. Even though the size of the *HabaWriter* manual is small, all the information you'll need is there.

When you start up *HabaWriter*, you see a menu bar at the top of the screen with seven headings: Desk, File, Edit, Search, Format, Style, and Print. Just as on the GEM desktop, each menu instantly drops down when you point to it with the mouse. A click of the mouse button picks any selection on the current menu. Happily, *HabaWriter* is an intuitive program—the way you want to do something is probably the way *HabaWriter* requires you to do it. And the commands on the menus allow you to do just about everything you can think of.

If you prefer not to use the mouse, the ST's ten special function keys let you access most of *HabaWriter's* features. If you can't remember which key

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does what, just press the Help key. A window opens on the screen to display a convenient chart of the function key commands.

You can even use the Style menu to change the on-screen typeface from plain text to boldface or underline. Underlined text, however, is displayed with true underlining only on the monochrome monitor in high-resolution mode; it won't be underlined on the color monitor in medium resolution. But when you print your document, the text is underlined. (If you're using a printer that's capable of underlining, of course.)

Multiple Windows

HabaWriter lets you use the mouse for most functions that would require special commands with other word processors. For instance, you can define a block of text simply by dragging the mouse cursor over it. To delete the block, you would then select the Cut option from the Edit menu. Even though the text is erased off the screen, it's still kept temporarily in a clipboard and may be pasted back into the document wherever you wish.

HabaWriter uses screen windows for other purposes, too. You can open up to six windows to display more than one document at a time. Moving text between the windows is as easy as moving text within a document. And the size of the windows can be changed, just as with any GEM window. Files can even be combined, allowing you to work with longer documents by using the Paste Document option.

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Loading And Linking Commodore Programs

Part 2

Jim Butterfield, Associate Editor

Are you running out of memory for your programs? You don't necessarily have to buy a bigger computer. This month's installment shows how a technique called chaining lets you break up a large program into smaller parts to work on a common task. The technique applies to all Commodore computers, with either disk or tape.

There are three major ways of connecting programs together. *Chaining* allows several programs to perform a job, each program continuing the work that a previous program has started. *Load linking* lets one program load another program, with the new program starting fresh on a new task. *Overlaying* lets a main program call in additional subroutines, data tables, or graphics information. This month we'll discuss chaining.

When one of a series of programs has completed its share of the work, it may chain to a following program to continue processing the data. In effect, several programs group together to create a bigger program. On Commodore computers, chaining works with disk or tape. It's more common with disk because the various programs can be brought in more quickly. If used with tape, you can arrange the programs sequentially on the cassette so little time is lost in searching for the next program. We'll use disk for the following examples, but they can be readily converted to tape.

Why Chaining?

The most obvious reason to chain programs is to save memory space. On small computers, there isn't enough room for big jobs. So the program is broken up into "chunks." Each chunk is small enough to fit into memory, each does a specific task, and together they do the whole job. Even on computers that seem to have lots of memory, you may need to resort to chaining to relieve congestion. For instance, even though the Commodore 64 begins with 38,911 bytes of free memory, arrays of data can quickly fill up much of this work area.

Sometimes program flow is an important reason for chaining. If a statistical program has been processing some data, it might ask the user to choose from several options (draw a graph, print the data, etc.). Depending on which option is chosen, it may be convenient to call in a selected program to do the next job. In this way, the original program needn't be cluttered with code to cover all the possible options; instead, the options are handled by programs called in as required.

Likewise, it's possible to write a program that starts up in several different ways. In one case, it might collect the data it needs from DATA statements. Another time, it might require input from the keyboard. On still other occasions, it might compute the data, read it from a file, or detect it by external sensors. No matter. We'll start up whatever "acquisition" program is appropriate, and when the data is ready to be

processed, the computer can chain to a common processing program.

Chaining is also a worthwhile exercise which can force you to break your programs into well thought-out modules. Your program can't leap about at will, since it can only reach whatever is in the current module; and you must tie up loose ends before you go to the next unit. Each time you chain, FOR-NEXT loops are scrapped, subroutine RETURNS are canceled, and the DATA pointer is RESTORED. You must make sure that these program areas are tidy before you chain, since they will otherwise be lost.

Program Architecture

A major advantage of chaining is that you don't lose variables between programs. Values, strings, and arrays that have been worked out by a previous program are carried through to the next program segment. This is useful, but it also calls for careful handling—we don't want to mash these values inadvertently.

Figure 1 shows how programs, variables, and arrays lie in memory. The point marked start-of-BASIC is where the program starts in memory. Behind the program is a point called start-of-variables; beyond this point the computer stores variables and arrays.

You usually don't need to know the exact addresses of these memory points; the computer takes care of the housekeeping for you. String variables go into this area, too—although not the strings themselves, just three-byte descriptors

that say where the strings are located and how long they are. (More on this later.)

Suppose you have a large program that chains to a smaller program. Figure 2 shows this happening.

The variables don't move; behind the second program is wasted space that isn't used. This creates no problem when you run the program. However, after this kind of chaining has taken place, you should not SAVE the second program or you'll save the wasted area too (SAVE always stores from the start-of-BASIC point to just before start-of-variables).

Here comes the problem. Let's take the reverse situation: a small program that chains to a larger one. Figure 3 shows the difficulty that results.

The big program overwrites and destroys the variables created by the first, smaller program. To keep this from happening, our first program must be the biggest of the two, or at least the same size.

If several programs are chained together, this rule always applies. The first program must be as big or bigger than any other program. It sets the start-of-variables point, and it must set it high enough so that all following programs won't run into trouble (for more information on this point, see "Commodore Program Chaining," *COMPUTE!*, December 1985). The Commodore 128 in 128 mode doesn't need to worry about this problem. Since it keeps variables in a separate memory bank, loading a new BASIC program can't harm them.

Strings And Descriptors

As noted earlier, the variable and array area holds string information (the descriptors), but not the strings themselves. There are two places where the actual strings might be, and it's important to know about them. Say that your program contains a line like this:

```
370 A$="GORILLA"
```

When this line executes, the computer makes an entry in the variable table showing that there is now a variable called A\$, that its length is seven characters, and that it is located at its present position in the program text itself. Except on the 128, the string is used from where it lies within the program. The computer decides that there's no point in making an extra copy of GORILLA; when it needs this string, it takes it from the BASIC program line. This type of string is called *static* because it never moves from its original location. Static strings can mean trouble if you chain programs: Since chaining replaces the original program text with a second program, all static strings—which exist only in the first program's text—are destroyed.

There's a second kind of string, and that's the one we must use here. If a program contains a statement like INPUT A\$, the string which is typed by the user must be stored somewhere. This is called a *dynamic* string; the computer stores it in a safe place where it won't be disturbed by chaining.

Dynamic strings are created in two ways: by INPUT or GET statements and by string manipulations (LEFT\$, RIGHT\$, STR\$, concatenation, and so on). It's simple to change a static string into a dynamic one. The statement A\$="GORILLA" + "" concatenates (adds together) the strings "GORILLA" and "". Since "" is a null (empty) string, this statement really means "add nothing to the string GORILLA." Though the contents of the string don't change, the computer is convinced that we now have a new string which must be stored elsewhere in memory.

Again, the Commodore 128 in 128 mode doesn't need to worry about this problem. Strings are kept in a separate memory bank, and

Figure 1. BASIC program storage

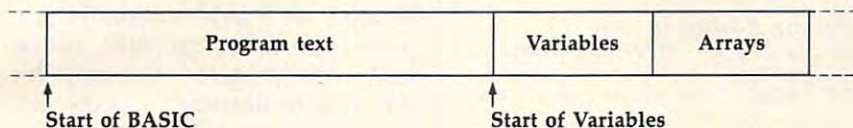


Figure 2. Chaining a smaller program from a large one.

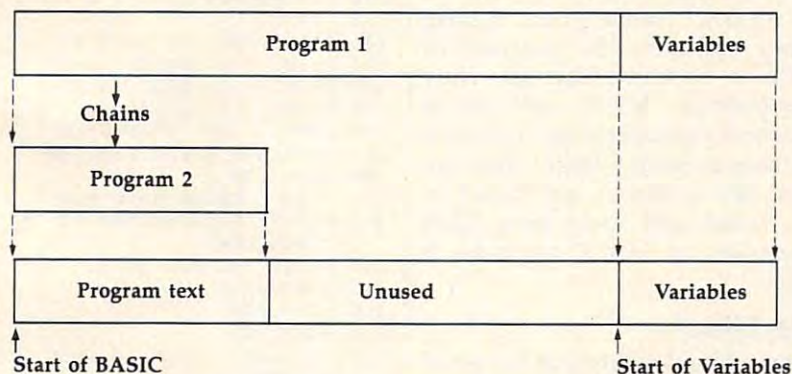
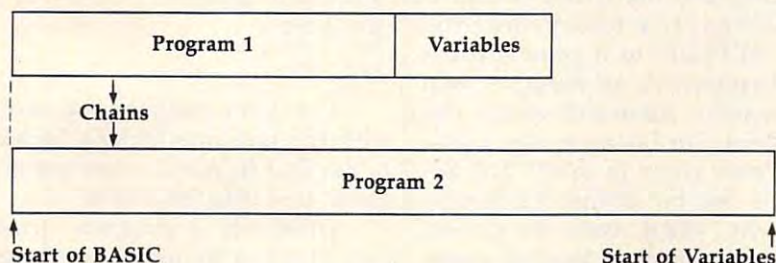


Figure 3. Chaining a larger program from a smaller one.



Chaining a longer program destroys the original program's variables.

there's no such thing as a static string in 128 mode.

Chaining Rules

Let's summarize the rules for well-chained programs:

- The first program in the chain must be as big or bigger than all subsequent programs.

- Any strings you need to pass from program to program must be dynamic, not static.

- If you use DEF FN definitions, redefine them in each program.

- Arrays should be DIMensioned only once, preferably in the first program.

A Short Example

Let's write a small series of programs to demonstrate how this works. Our first program is called MAIN:

```
100 IF N>0 GOTO 200
```

The variable N can only be zero when we start, so we won't jump ahead. But if we ever chain back to this program, we'll take the branch to line 200.

```
110 PRINT "SIMPLE GRADEBOOK DEMO"
120 DIM N$(15),M(15)
130 N=8
```

For simplicity, we'll assume eight students. When the program runs, you can invent their names and numeric grades.

```
140 FOR J=1 TO N
150 PRINT "STUDENT";J;
160 INPUT "NAME";N$(J)
170 INPUT "GRADE";M(J)
180 NEXT J
```

Running the program at this point gives you data on eight students. If you ever chain back to this original program, it will branch to line 200 (remember the IF test in line 100).

```
200 PRINT
210 PRINT "DO YOU WANT TO--"
220 PRINT "1. CALCULATE AVERAGE"
230 PRINT "2. CALCULATE HIGH/LOW SCORES"
240 PRINT "3. QUIT"
250 PRINT
260 INPUT "YOUR CHOICE (1-3)";C
270 ON C GOTO 300,310,320
280 GOTO 260
300 LOAD "C.AVG",8
310 LOAD "C.HIL",8
320 END
```

Note that line 300 will not run

into line 310, nor 310 into 320. The moment you perform LOAD within a program, the new program loads and runs immediately. Type this program and then save it as MAIN (don't save it under any other filename). Now type NEW and enter program C.AVG as follows:

```
100 PRINT
110 A=0
120 FOR J=1 TO N
130 A=A+M(J)
140 NEXT J
150 PRINT "AVERAGE SCORE,";N;" STUDENTS=";A/N
160 PRINT
170 LOAD "MAIN",8
```

That's it. Check it closely and save it as C.AVG (again, the filename is important; don't change it). Now type NEW and enter program C.HIL as follows:

```
100 PRINT
110 H=M(1);L=M(1)
120 FOR J=1 TO N
130 IF H<M(J) THEN H=M(J)
140 IF L>M(J) THEN L=M(J)
150 NEXT J
160 PRINT "HIGH SCORE:";H;" BY ..."
170 FOR J=1 TO N
180 IF H=M(J) THEN PRINT N$(J)
190 NEXT J
200 PRINT "LOW SCORE:";L;" BY ..."
210 FOR J=1 TO N
220 IF L=M(J) THEN PRINT N$(J)
230 NEXT J
240 PRINT
250 LOAD "MAIN",8
```

Again, check your typing closely and save the program as C.HIL to complete the set. Now load program MAIN and you're ready to try out chaining. Note that MAIN is definitely larger than the other two. If there's any doubt in your mind, add some extra REM statements to MAIN to make it bigger.

Side Effects

We mentioned earlier that the act of chaining causes certain things to happen. FOR-NEXT loops are scrapped, subroutine RETURNS are canceled, and the DATA pointer is RESTORED. That makes sense: You can't RETURN to a program that has disappeared, for example. And occasionally, these side effects can be useful. For instance, can a program ever chain to itself? The answer is yes, but at first it's hard to see why you'd want to do so. What's the point of loading a program that's already there? The answer lies in these side effects.

Sometimes a program gets stuck deep in a subroutine and can't find its way out. With good programming, this should never happen. All subroutines should RETURN neatly, and if there's an error or similar anomaly, the information should be logged into a flag and detected at the appropriate program level. It's easy to give that sort of advice—but sometimes a program is deep within several nested levels of subroutines when the user commands, "Forget all this and take me back to the menu." Sensible programmers know that you can't jump directly out of these subroutines back to the main menu, and it's a long, long trail to back-track the whole way.

In case of emergency, you can chain the program to itself. As it loads itself back in, it shakes off all the FOR-NEXT loops and subroutine levels and surfaces cleanly—with all variables in place—at the first statement. Just to show it can be done, we'll write a dreadful program that does just that. Please don't write programs this way: It's here just to illustrate a point. Remember to type NEW before entering this program.

```
100 IF N>0 GOTO 130
110 PRINT "NAME LIST"
120 DIM N$(50)
130 PRINT
140 PRINT "DO YOU WANT TO --"
150 PRINT "1. ENTER NAMES"
160 PRINT "2. LIST NAMES"
170 PRINT "3. QUIT"
180 INPUT "YOUR CHOICE";C
190 ON C GOSUB 210,310,350
200 GOTO 130
210 PRINT "ENTER EACH NAME"
220 PRINT "FOLLOWED BY AN '*' CHARACTER"
230 PRINT "TO END ENTRY"
240 GOSUB 260
250 GOTO 240
260 INPUT N$
270 IF N$="" OR N=50 THEN LOAD "DEMO",8
280 N=N+1
290 N$(N)=N$
300 RETURN
310 FOR J=1 TO N
320 PRINT N$(J)
330 NEXT J
340 RETURN
350 END
```

Check the program and save it with the filename DEMO; be sure to use that filename, since the program uses it to load itself.

DEMO is a program turned bad, and you should try *not* to get yourself into a similar problem. By the time this program reaches line

210, it's in a subroutine; at line 260, it's nested within a second subroutine. When line 270 discovers that the user wants to exit, the poor programmer doesn't know how to get out. GOTO 130 would be a very bad solution: Jumping out of the routine with GOTO instead of RETURN leaves unprocessed subroutine information on the computer's stack (which can eventually cause an OUT OF MEMORY error). What to do?

The second-best solution (shown here) is to clean up the program with a chain to itself. The best solution is not to get yourself into this kind of mess in the first place.

Chaining can be a useful and powerful technique. There are some rules to remember—especially that of making sure the first program is the biggest—but in general it works quite well. Don't confuse chaining with loading, where one program loads and starts another. In this case, there's no passing of variables; the new program starts clean. We'll talk about loading in next month's installment. ©

Adding System Power To ST BASIC

Part 1

Kevin Mykytyn, Editorial Programmer

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Atari ST BASIC lacks commands for certain operations such as reading the mouse pointer, but it's possible to fill in these gaps by calling system routines with the VDISYS command. In Part 1 of this series, we'll examine the basics of calling VDI routines from BASIC and demonstrate a useful graphics routine. Part 2 will show how to read the mouse pointer with VDISYS and present a program for creating your own custom mouse pointers.

If you own an Atari ST, you've probably heard at least two of the three-letter acronyms associated with the computer: TOS stands for Tramiel Operating System—a huge system program which, at the most fundamental level, allows the computer to function. And GEM stands for Graphics Environment Manager, a separate system program that handles the ST's graphics-oriented desktop. GEM, in turn, consists of three separate parts: the VDI (Virtu-

al Device Interface), a low-level graphics interface that also handles mouse input; the AES (Application Environment Services), which uses the VDI to manage data and the desktop; and GEMDOS, which handles disk operations.

Interesting, you may say, but what's the point? For most BASIC programming, you needn't worry about TOS, GEM, VDI, AES, or GEMDOS, any more than the average driver needs to know exactly how an auto engine works. These system programs are the invisible machinery that makes everything else happen.

However, as you may have discovered, ST BASIC lacks commands to do certain tasks, such as drawing a circle or sensing the position of the mouse pointer. That's what makes one of these strange-sounding programs—the VDI—an invaluable asset for the BASIC programmer. The VDI holds a treasure trove of system routines which can do everything from drawing boxes

and circles to rotating character fonts and manipulating raster blocks. With ST BASIC's VDISYS command, you can access all of these routines—which compensates in large part for the missing ST BASIC commands.

VDISYS To The Rescue

In simplest terms, the VDISYS command calls (activates) a VDI system routine to do a task that would be difficult or impossible to perform in BASIC. Furthermore, these system routines execute very quickly—a real plus when you're working with graphics. Whether executed in immediate or program mode, the VDISYS command always takes this general form:

VDISYS(x)

In this example a simple variable named *x* appears in the parentheses. It doesn't matter what value this variable represents; it's a *dummy* parameter, needed only to satisfy the syntax of the command. Don't try to enter this command yet—if you do, there's a good chance you'll see the mushroom cloud symbol that signals a system crash. A certain amount of preparation is always needed before you execute VDISYS.

When a VDISYS command is executed, control passes from your BASIC program to an internal VDI handler, which eventually passes control to the VDI routine itself. But first the VDI handler looks at certain sections of the computer's memory, called *parameter blocks*. The data in the parameter blocks tells the handler which particular VDI routine you want to execute. There's also other information that the VDI routine itself will need. If you don't supply all the information needed to call a routine, the VDI handler can't carry out your request.

VDI Opcodes

The first thing you must tell the computer is which VDI routine you want to call. Each VDI routine is identified by a unique *opcode number*. For instance, the VDI routine used in the program below has the opcode 11. This is a generalized shape-drawing routine. (There are hundreds of VDI opcodes and associated parameters, so we don't have

room in this article for a listing. But you can find a 42-page list of selected VDI opcodes in *COMPUTE!'s ST Programmer's Guide*, available from COMPUTE! Publications.)

Once you know a VDI routine's opcode number, that value must be POKed into a special place in memory defined by the reserved variable **CONTRL**. Try typing **PRINT CONTRL** in immediate mode; even if you haven't given this variable any value, the computer prints a number on the screen. ST BASIC always predefines **CONTRL** along with several similar variables. The **CONTRL** variable represents an actual location in memory.

Since the system automatically substitutes this location for the keyword **CONTRL**, you don't have to memorize a series of numbers or worry about where this parameter block really resides. To select VDI routine 11, for instance, you simply execute **POKE CONTRL,11**.

How Many Corners?

Once you've POKed the VDI opcode 11 into **CONTRL**, you must tell the computer how many vertices (corners) are needed to define the graphic shape you want to draw. Regular geometric shapes require different numbers of vertices. A triangle, for instance, requires a minimum of three corners. A rectangle, on the other hand, can be defined with only two—the upper left corner and the lower right one. Of course, a rectangle has a total of four corners, but the total is not what we're looking for. The computer cares only about the *minimum* number of vertices it takes to draw the shape in question. After you determine how many vertices are needed, that value is POKed into the location defined by **CONTRL + 2**. For example, in line 30 of the program below, the statement **POKE CONTRL+2,2** tells the computer that you want to draw a rectangle (defined by only two corners).

Notice that the second POK is directed two bytes higher in memory than the first. Now you can see the parameter block begin to take shape: It's simply a segment of memory where you place a collection of values. The first byte of the

parameter block is defined by **CONTRL**, and the remaining locations are defined as even-numbered offsets above that starting spot (**CONTRL+2**, **CONTRL+4**, and so forth).

The particular routine used in this program (termed a *generalized drawing primitive*) contains several subroutines (also called *subfunctions*), each of which performs a different drawing task. To choose a subroutine, you must POK its identifying number (called the *primitive ID*) into the location defined by **CONTRL+10**. In this case we want to use the bar-drawing subroutine, whose primitive ID happens to be 1. So in line 40 of the program, we POK **CONTRL+10,1**.

PTSIN And INTIN

The next step is to tell the VDI handler where to place the graphic shape. Recall that you told the computer earlier how many vertices it takes to define the shape. To position the shape on the screen, you must now tell VDI where to put each vertex. This is done by POKing horizontal (X) and vertical (Y) coordinate values into a second parameter block area.

The second parameter block begins at a memory location defined by the reserved variable **PTSIN** (*Points Input*). Again, you don't need to know the actual memory locations involved, since the computer keeps track of them for you. All you need to do is POK the correct numbers into **PTSIN** (and even-numbered adjacent locations, in some cases).

Lines 50–80 of the example program perform this job by POKing the bar's X and Y coordinates into memory. The X coordinate of the first point is POKed into **PTSIN**; the first point's Y coordinate goes into **PTSIN+2**; the X coordinate of the second point goes into **PTSIN+4**, and so on. Keep in mind that you must supply a *pair* of coordinate values for every point that you defined in **CONTRL+2**.

A third parameter block, beginning at the address defined by the reserved variable **INTIN**, is used to pass *attribute values*, if any are required by the current subroutine. The term *attribute* is a catch-all that can include many different pa-

rameters—colors, rotation values, a style index, or whatever—depending on which subroutine is called. Since the subroutine used in this program requires no attributes, we don't need to POKE any values in this segment of memory. As a signal to the VDI handler that no attributes are involved, we must also POKE a zero into location CONTRL+6; this location tells the system how many attribute values to read from the INTIN parameter block.

After all of the required values have been POKED into memory, line 90 of the example program executes the VDISYS command, which calls the VDI routine and draws a bar on the screen. This may seem like an enormous amount of preparation for such a simple task (which some other computers can do with a single BASIC statement). On the other hand, it's better than not being able to draw a bar at all. You can cut down on the bulkiness of the code by writing setup subroutines that contain all the necessary overhead.

Bar Drawing

```
10 fullw 2:clearw 2:color 2,2,2
20 poke contrl,11 'VDI opcode
30 poke contrl+2,2 'number of vertices
35 poke contrl+6,0 'number of attributes
40 poke contrl+10,1 'primitive ID of bar
   command
50 poke ptsin,50 'x coordinate of top left
   corner
60 poke ptsin+2,50 'y coordinate of top
   left corner
70 poke ptsin+4,100 'x coordinate of
   bottom right corner
80 poke ptsin+6,100 'y coordinate of
   bottom right corner
90 vdisys (0)
```

General Drawing Routine

Though every VDI call requires several preparatory steps, each individual step is easy to perform. As should be apparent by now, there's nothing mystical about the process—all you need to do is leave the right pieces of information in places where the computer can find them, then signal that you want the job done. The real work is done by the system itself.

Though the general procedure is the same in every case, each VDI routine requires different types and amounts of information. One of the

most useful VDI routines is the generalized drawing primitive used in the example program. Table 1 summarizes the POKES you need to call this routine.

Table 1: Generalized Drawing Primitive

```
POKE CONTRL, 11
POKE CONTRL+2, number of vertices
POKE CONTRL+6, number of attributes
POKE CONTRL+10, subfunction number
                    (primitive ID)
```

Again, CONTRL receives the opcode number of the VDI routine; CONTRL+2 the number of vertices in the desired shape; CONTRL+6 the number of attributes (if any); and CONTRL+10 the primitive ID for the subroutine you want. This particular VDI routine is extremely versatile and can draw pie-shaped segments, ellipses, filled or empty rounded rectangles, and other graphic images, including text. Table 2 lists the primitive IDs for each of this routine's subroutines.

Table 2: Drawing Subroutines

Primitive ID	Subroutine
1	bar
2	circle
3	arc
4	pie
5	ellipse
6	elliptical arc
7	elliptical pie
8	rounded rectangle
9	filled rounded rectangle
10	justified graphics text

To select a specific subroutine, find its primitive ID in the leftmost column of Table 2, then POKE that value into location CONTRL+10. Table 3 summarizes the POKES needed to set up the second and third parameter blocks (PTSIN and INTIN). Remember, the value POKED into CONTRL+2 (number of vertices) determines how many X-Y coordinate pairs you must POKE into the PTSIN parameter block. The X and Y coordinates for the first vertex go into PTSIN and PTSIN+2; the second X-Y coordinate pair goes into PTSIN+4 and PTSIN+6, and so forth.

Table 3: PTSIN And INTIN Parameter Blocks

```
POKE PTSIN, X coordinate of first vertex
                    (rectangle)
                    X coordinate of center
                    (circle, ellipse)
POKE PTSIN+2, Y coordinate of first
                    vertex (rectangle)
                    Y coordinate of center
                    (circle, ellipse)
POKE PTSIN+4, X coordinate of second
                    vertex (rectangle)
                    X radius for ellipse
POKE PTSIN+6, Y coordinate of second
                    vertex (rectangle)
POKE PTSIN+8, radius (circle only)
POKE PTSIN+12, radius (circular arc or
                    pie only)

POKE INTIN, start angle for arcs and pies
POKE INTIN+2, end angle for arcs and
                    pies
```

To draw a circle, ellipse, arc, or pie-shape segment, POKE X and Y coordinates for the shape's center point into PTSIN and PTSIN+2. A simple circle requires a radius value in PTSIN+8; arcs and pie shapes built from a part of a circle require a radius value in PTSIN+12. To draw an ellipse, or an arc or pie shape built from part of an ellipse, POKE the shape's X radius in PTSIN+4 and its Y radius into PTSIN+6.

Most of these subfunctions don't require any attribute values. To draw arcs or pie shapes, however, you must POKE two attribute values into INTIN and INTIN+2 to define starting and ending angles, respectively. Since the angle values are specified in tenths of a degree, not in whole degrees, these parameters can range from 0-3600. The starting angle specifies where you want the rounded portion of the arc or pie segment to begin, and the ending angle shows where that portion should stop. The statement POKE CONTRL+6,2 signals that you're passing two attribute values to the VDI.

As you'll learn from experimenting with these routines, VDISYS opens the gateway to a wide variety of graphics capabilities. Once you become familiar with the setup process, you'll probably find yourself using VDISYS more and more. In part 2 of this article, we'll look at VDISYS in more detail, and present a program that lets you create a custom shape for your ST's mouse pointer. ©

Mousify Your Applesoft Programs

Part 2

Lee Swoboda

Part 1 of this series (COMPUTE!, March 1985) provided an Applesoft program allowing an AppleMouse, joystick, or game paddles to point to text on the screen. This month, Part 2 demonstrates more advanced mouse operations such as defining a text area and deleting, copying, or restoring the defined text. The example programs run with either DOS 3.3 or ProDOS. Although a mouse works best, you can substitute a joystick or game paddles.

Mouse-controlled programs must perform a number of functions in addition to simple pointing. The programs following this article provide several of these important capabilities:

- **Define Text.** Use the mouse to highlight a block of text, which can then be copied or deleted (typical word processing operations).
- **Copy Text.** Copy highlighted text to a buffer without deleting it from the screen.
- **Delete Text.** Delete highlighted text and save it in a buffer.
- **Insert Text.** Restore previously copied or deleted text at a new point on the screen.
- **Cancel.** Undo highlighting if you wish to abort a copy or delete operation.
- **Delete a Character.** Delete the character under the cursor.
- **Delete to End of Line.** Delete text from the cursor to the end of the line.
- **Find Mouse.** Locate the mouse interface.

Getting Started

Enter and save Program 1, which is an expanded and modified version

of the program published in Part 1. It works in either DOS 3.3 or ProDOS; if you're using ProDOS, change line 115 as shown here:

115 HIMEM: 36352

Program 2 creates a binary file named MOUSEY which contains machine language routines used by Program 1. The MOUSEY file created by Program 2 must be present on disk whenever you run Program 1. (It's not necessary to have Program 2 itself on the disk with Program 1, just a copy of the binary file created by Program 2.) Be sure to save a copy of Program 2 so you'll be able to create new copies of MOUSEY whenever needed.

Program 3 creates a short text file which we'll use in the following example. If you're using a joystick instead of a mouse, refer to the additional instructions under "Joystick Modifications" below. When you are ready to proceed, your disk should contain a copy of Program 1, a file named MOUSEY (created by Program 2), and a file named TEXT (created by Program 3).

When you run Program 1, the screen looks like this:

ENTER INFORMATION

FIRST NAME COMPUTE!
LAST NAME READER SERVICE
ADDRESS P.O. BOX 50950
CITY DES MOINES
STATE IA 50950
ZIP
TELEPHONE 1-800-346-6767

COPY DELETE INSERT CANCEL
ERASE QUIT DONE HELP

This screen simulates what you might see in a simple address book program. We have introduced an intentional error by putting the zip code entry on the same line as the

state entry. Let's correct the error for a quick demonstration of a few mouse features. Move the mouse cursor to the first number in the zip code, then press and *hold* the mouse button down while moving the mouse to the right. The computer highlights the zip code in inverse video. Keep moving the mouse until all the numbers in the zip code are highlighted, then release the mouse button.

At this point, the highlighted text area has been defined. Now move the mouse pointer to the word DELETE in the strip menu at the bottom of the screen and press the mouse button. The computer erases the highlighted zip code from the screen. Don't worry—the information hasn't been lost. Whenever you delete text, the program stores it in a temporary memory buffer.

Now let's put the zip code data back where it belongs. Move the mouse pointer to the beginning of the next screen line (directly under the I in IA), then press the mouse button. The computer moves the cursor to that line. Next, move the mouse pointer to the word INSERT and press the button again. The zip code data reappears in the desired screen area.

Mouse Editing Functions

Here is a more detailed description of the mouse-editing functions demonstrated in Program 1:

Mouse pointer and text cursor. The rapidly blinking caret symbol (") is the mouse pointer, which you can move around the text screen with the mouse. When the pointer passes over a character, the character blinks rapidly. The flashing rect-

angle shows the position of the text cursor. When the cursor passes over a character, the character changes temporarily to flashing uppercase. There are three different ways to move the text cursor:

- Move the mouse pointer to the spot where you want the text cursor to go, then press the mouse button.
- Use the arrow keys as you would in Applesoft BASIC (the Apple II uses CTRL-J and CTRL-K to move up and down, respectively).
- Press RETURN to move the cursor to the beginning of the next screen line. If the cursor is already on the bottom line, it moves to the top. Pressing RETURN does not erase the text to the right of the cursor.

Enter text. Text is entered as usual, by pressing any letter, number, or punctuation key. Lowercase letters are automatically converted to uppercase.

Define text. Before text can be copied or deleted, you must define it. Move the mouse pointer to the upper-left corner of the text you want to define, then press and hold the mouse button. While pressing the button down, drag the mouse pointer to the lower-right corner of the desired area. The computer marks the defined area by highlighting every character with inverse video. Now release the button: The area is defined, and you may proceed to the Cancel, Delete, or Copy options.

Delete text. To delete a text area that you previously defined, move the mouse pointer to DELETE in the strip menu at the bottom of the text screen, then press the button. The computer blanks out the highlighted portion of the screen and stores the first 200 characters of the defined area in a temporary buffer for later use.

Copy text. To copy a text area that you have previously defined, move the pointer to COPY in the strip menu, then press the button. The computer stores the first 200 characters of the defined area in a temporary buffer. Unlike the Delete operation, Copy does not blank out the defined area.

Insert text. To insert text that you previously copied or deleted, move

the pointer to the spot where you want to insert text, then press the button to locate the cursor at that spot. Now move the pointer to INSERT in the strip menu and press the button again. The computer inserts the text, using the text cursor position as a starting point. Note that the inserted text overwrites whatever else was in the affected area. You can insert only the most recently copied or deleted text.

Cancel. If you define a block of text and then decide not to copy or delete it, move the pointer to CANCEL in the strip menu and press the button. The highlighting disappears, and the text is no longer defined.

Editing keys. Press CTRL-D (or DELETE on the Apple IIc and IIe) to delete the character under the cursor. The remaining characters in that line move one space to the left. You can also press CTRL-X to delete every character from the present cursor position to the end of the line.

Try out the various editing functions. When you've tried everything, move the mouse pointer to DONE in the strip menu and press the button. The demonstration program ends with a routine that reads the current data directly from the video screen.

Since the Copy, Delete, Insert, and Cancel commands are written in BASIC, they may take a second or two to complete if you define a large text area. Though BASIC can't perform such operations very fast, these routines are far easier for you to customize than if they had been written in machine language. If the slowness bothers you, just imagine how long it would take to delete the same amount of text with your trusty pink eraser.

Joystick Modifications

If you don't own a mouse, you can substitute a joystick. Delete lines 120, 130, 10001-10090, 10200, 20220, and 44000-44050 from Program 1; then add or modify the lines in Program 4. The joystick moves the mouse pointer around the screen, and the joystick button substitutes for the mouse button.

Since the joystick was designed for a different purpose, its

performance doesn't equal that of a mouse. But it costs a lot less.

How The Program Works

The machine language routine contained in the MOUSEY file simply highlights text by changing every character between the text cursor and mouse pointer to inverse video. All the other functions are carried out by the BASIC routines in Program 1.

After you define a block of text, lines 35000-44050 act on the highlighted area. The Copy routine (36000-36180) converts each character in the defined area to normal video and stores it in a temporary text buffer. This buffer lies in locations 775-1000 (\$307-\$3E8), a normally unused region.

The Delete routine (37000-37180) is similar to Copy and uses the same temporary buffer, but replaces each character in the defined area with a blank space.

The Insert routine (38000-38100) moves text from the temporary buffer back to the video screen, beginning at the current location of the text cursor.

Lines 39000-40000 contain the Cancel routine, which aborts copy or delete operations. You can also cancel a definition by pressing any key.

The routine at lines 41000-41070 deletes a single character; lines 42000-42060 erase all or part of the current line.

Here are some other useful entry points in the program (note that each of these routines ends with a GOTO rather than GOSUB):

Line	Purpose
10120	read mouse
10300	position mouse pointer
10420	keyboard input
10570	position cursor

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

Program 1: Advanced Mousification

```
B1 115 HIMEM: 37375
DF 120 GOSUB 44010
D7 130 MI = 20: REM MOUSE SENSIT
    IVITY
5A 140 D$ = CHR$ (4)
E8 145 PRINT D$"BLOAD MOUSEY"
8C 150 REM
07 160 REM READ DATA FILE
98 170 REM
CB 180 PRINT D$"OPEN TEXT"
```



```

32 190 PRINT D$"READ TEXT"
60 200 INPUT NF$,NL$,AD$,CI$,ST$,
    ZI$,TE$
C0 210 PRINT D$"CLOSE TEXT"
87 220 REM
25 230 REM DATA ENTRY SCREEN
88 240 REM
4F 250 HOME
40 260 Y1 = 4:X1 = 15:C0 = 160
35 270 INVERSE
D7 280 PRINT "          ENTER
    INFORMATION          "
24 285 VTAB 23: PRINT "          COP
    Y DELETE INSERT CANCEL
    "
98 290 VTAB 24: PRINT "          E
    RASE QUIT DONE HELP
    "
C6 300 NORMAL
31 310 VTAB 4: HTAB 1
F4 320 PRINT "FIRST NAME ..."
C6 330 PRINT "LAST NAME ..."
3C 340 PRINT "STREET ..."
D6 350 PRINT "CITY ..."
1F 360 PRINT "STATE ..."
36 370 PRINT "ZIP ..."
17 380 PRINT "TELEPHONE ..."
3A 390 VTAB 19: HTAB 10: INVERSE
    : PRINT "^";: NORMAL
81 400 PRINT " IS MOUSE POINTER"
3C 410 VTAB 21: HTAB 14: INVERSE
    : PRINT " ";: NORMAL
38 420 PRINT " IS CURSOR"
26 430 VTAB 4
5E 440 HTAB 15: PRINT NF$
66 450 HTAB 15: PRINT NL$
D9 460 HTAB 15: PRINT AD$
E1 470 HTAB 15: PRINT CI$
F6 480 HTAB 15: PRINT ST$
71 490 HTAB 15: PRINT ZI$
59 500 HTAB 15: PRINT TE$
73 9999 REM #10000
19 10000 REM
E6 10001 REM -----
29 10010 REM MOUSE ROUTINES
E6 10020 REM -----
3F 10040 REM
A4 10050 REM TURN MOUSE "ON"
49 10060 REM
A8 10070 PRINT D$"PR#":S0: PRINT
    CHR$(1)
C8 10080 PRINT D$"PR#0"
09 10090 PRINT D$"IN#":S0
17 10100 GOTO 10590
25 10110 REM
65 10120 REM DETERMINE POSITION
91 10130 REM OF MOUSE
3D 10140 REM
1C 10150 VTAB 1: HTAB 40
77 10160 INPUT "":X0,Y0,B0
7D 10170 IF B0 < 0 THEN 10440: R
    EM KEY PRESSED?
D0 10180 Y0 = INT (Y0 / MI) + 1
78 10190 IF Y0 > 24 THEN Y0 = 24
64 10200 X0 = INT (X0 / MI) + 1
75 10210 IF X0 > 40 THEN X0 = 40
6A 10215 IF B0 = 2 AND X0 > 20 A
    ND X0 < 27 AND Y0 = 23
    THEN 38010
6D 10216 IF B0 = 2 AND SW = 0 TH
    EN X2 = X0:Y2 = Y0: POK
    E 768,Y2: POKE 769,X2:X
    3 = X0:Y3 = Y0
9B 10217 IF B0 = 3 AND SW = 2 TH
    EN SW = 3
31 10218 ON SW GOTO 35010,35020,
    10315
08 10220 IF B0 > 1 THEN 10320: R
    EM BUTTON PRESSED?
D9 10225 IF X2 < > X0 OR Y2 < >
    Y0 THEN SW = 1: GOTO 35
    010
89 10230 IF Y0 = 24 THEN 20030

```

```

63 10240 Y1 = Y0:X1 = X0
78 10250 POKE V0,C0
E8 10255 IF C0 < 128 THEN POKE V
    0,C0 + 128
48 10260 C0 = C2
F2 10270 GOSUB 10800
F2 10280 GOTO 10620
69 10290 REM
E0 10300 REM POSITION MOUSE POIN
    TER
2D 10310 REM
D0 10315 IF B0 = 2 AND Y0 = 23 T
    HEN 20081
86 10320 IF V0 = V1 THEN C2 = C1
58 10330 POKE V1,C2
A2 10340 V1 = 1023 + 128 * (Y0 -
    1) + X0
3F 10350 IF Y0 > 8 THEN V1 = V1
    - 984
9C 10360 IF Y0 > 16 THEN V1 = V1
    - 984
27 10370 C2 = PEEK (V1)
64 10380 POKE V1,160
8A 10390 IF C2 = 160 THEN POKE V
    1,30
C2 10400 GOTO 10150
31 10410 REM
01 10420 REM KEYBOARD INPUT
41 10430 REM
F9 10440 C3 = PEEK ( - 16384)
77 10450 POKE - 16368,0
DC 10455 IF C3 > 223 THEN C3 = C
    3 - 32: REM CONVERT TO
    UPPER CASE
7C 10460 IF SW > 0 THEN GOSUB 39
    010
48 10460 IF C3 > 159 THEN 10710
63 10465 IF C3 = 132 OR C3 = 225
    THEN IF X1 > 14 AND Y1
    > 3 AND Y1 < 11 THEN G
    OSUB 41010
0A 10466 IF C3 = 152 THEN IF X1
    > 14 AND Y1 > 3 AND Y1
    < 11 THEN GOSUB 42010
C0 10470 IF C3 = 141 THEN X1 = 1
    5:Y1 = Y1 + 1: IF Y1 >
    10 THEN Y1 = 4: REM RET
    URN KEY
59 10480 IF C3 = 138 THEN Y1 = Y
    1 + 1: REM DOWN ARROW
C2 10490 IF C3 = 139 THEN Y1 = Y
    1 - 1: REM UP ARROW
8F 10500 IF C3 = 149 THEN X1 = X
    1 + 1: REM RIGHT ARROW
71 10510 IF C3 = 136 THEN X1 = X
    1 - 1: REM LEFT ARROW
56 10520 IF Y1 > 24 THEN Y1 = 24
DC 10530 IF Y1 < 1 THEN Y1 = 1
9C 10540 IF X1 > 40 THEN X1 = 40
EB 10550 IF X1 < 1 THEN X1 = 1
5D 10560 REM
06 10570 REM POSITION CURSOR
6D 10580 REM
A4 10590 POKE V0,C0
CA 10600 GOSUB 10800
42 10610 C0 = PEEK (V0)
9E 10620 IF V0 = V1 THEN C0 = C2
44 10630 REM CHANGE TO FLASHING
    CHARACTER
87 10640 C1 = C0
23 10650 IF C1 > 127 THEN C1 = C
    1 - 64
7F 10660 IF C1 > 64 THEN C1 = C1
    - 64
D9 10670 IF C1 > 95 THEN C1 = C1
    - 32
4B 10680 IF C1 < 64 THEN C1 = C1
    + 64
C8 10690 POKE V0,C1
CE 10700 GOTO 10150
68 10710 IF X1 < 15 OR Y1 < 4 OR
    Y1 > 10 THEN 10150
DE 10720 GOSUB 10800

```

```

DC 10730 POKE V0,C3
51 10740 C0 = C3
CE 10750 IF V0 = V1 THEN C2 = C3
8C 10760 X1 = X1 + 1: IF X1 > 39
    THEN X1 = 39
67 10770 GOTO 10590
16 10780 REM CALCULATE V0
6E 10790 REM (VIDEO BUFFER ADDRE
    SS)
68 10800 V0 = 1023 + 128 * (Y1 -
    1) + X1
2B 10810 IF Y1 > 8 THEN V0 = V0
    - 984
7F 10820 IF Y1 > 16 THEN V0 = V0
    - 984
88 10830 RETURN
9A 19999 REM #20000
1A 20000 REM
AE 20010 REM STRIP MENU
2A 20020 REM
C2 20030 PRINT D$"IN#0"
C8 20040 IF X0 > 8 AND X0 < 14 T
    HEN NF$ = "":NL$ = "":A
    D$ = "":CI$ = "":ST$ =
    "":ZI$ = "":TE$ = "": G
    OTO 250
1F 20050 IF X0 > 15 AND X0 < 20
    THEN HOME : END
73 20060 IF X0 > 21 AND X0 < 26
    THEN 30030
7A 20070 IF X0 > 27 AND X0 < 32
    THEN 20100
71 20080 VTAB 1: HTAB 40: PRINT
    D$"IN#":S0: GOTO 10150
5C 20081 IF X0 > 6 AND X0 < 11 T
    HEN GOSUB 36010: GOTO 1
    0590
82 20082 IF X0 > 12 AND X0 < 19
    THEN GOSUB 37010: GOTO
    10590
5F 20083 IF X0 > 28 AND X0 < 35
    THEN GOSUB 39010: GOTO
    10590
34 20084 GOTO 10150
17 20090 REM HELP TEXT
C0 20100 VTAB 12: HTAB 1
8A 20110 PRINT "THE FLASHING REF
    LEX (^) IS THE MOUSE"
75 20120 PRINT "POINTER AND THE
    FLASHING RECTANGLE IS"
48 20130 PRINT "THE CURSOR. TO
    MOVE THE CURSOR TO THE"
36 20140 PRINT "ENTRY YOU WANT T
    O CHANGE, USE THE ARROW
    "
4E 20150 PRINT "KEYS OR USE THE
    MOUSE TO MOVE THE MOUSE
    "
47 20160 PRINT "POINTER, THEN PR
    ESS THE MOUSE BUTTON TO
    "
E6 20170 PRINT "MOVE THE CURSOR
    TO THAT POINT. TYPE"
EA 20180 PRINT "NEW OR CORRECTED
    DATA, THEN MOVE THE"
31 20190 PRINT "MOUSE CURSOR TO
    'DONE' IN THE MENU"
4A 20200 PRINT "BELOW AND PRESS
    THE MOUSE BUTTON TO"
D4 20210 PRINT "ACCEPT THE ENTRI
    ES ABOVE."
D9 20220 PRINT D$"IN#":S0
D3 20230 GOTO 10150
9D 29999 REM #30000
1B 30000 REM
28 30010 REM EXAMPLE
2B 30020 REM
A1 30030 Y1 = 4: GOSUB 63050:NF$
    = A$
2C 30040 Y1 = 5: GOSUB 63050:NL$
    = A$
91 30050 Y1 = 6: GOSUB 63050:AD$
    = A$

```



```

10 30060 Y1 = 7: GOSUB 63050:CI$
   = A$
E9 30070 Y1 = 8: GOSUB 63050:ST$
   = A$
11 30080 Y1 = 9: GOSUB 63050:ZI$
   = A$
17 30090 Y1 = 10: GOSUB 63050:TE$
   = A$
2E 30100 REM GO TO REMAINDER OF
   YOUR PROGRAM
10 30110 REM FOR EXAMPLE ...
36 30120 HOME
5E 30130 VTAB 10
EE 30140 PRINT NF$ "NL$
38 30150 PRINT AD$
80 30160 PRINT CI$, "ST$" "ZI$
90 30170 PRINT TE$
CA 30180 CALL - 198: CALL - 198
89 30190 END: REM END OF EXAMPL
   E
EC 35000 REM HIGHLIGHT TEXT
AD 35010 POKE V0,C1 - 64:SW = 2
AC 35020 IF B0 > 1 THEN 10150
40 35030 IF X3 < X0 THEN X3 = X0
05 35040 IF Y3 < Y0 THEN Y3 = Y0
88 35050 POKE 770,Y3: POKE 771,X
   3
80 35060 POKE 772,Y0: POKE 773,X
   0
FC 35070 CALL 37376
20 35080 Y3 = Y0:X3 = X0
07 35090 GOTO 10150
90 36000 REM COPY
60 36010 P3 = 775
38 36020 FOR II = Y2 TO Y3
BA 36030 FOR JJ = X2 TO X3
AC 36040 GOSUB 40020
39 36050 C3 = PEEK (V2) + 128
96 36060 IF C3 < 160 THEN C3 = C
   3 + 64
37 36070 IF C3 > 223 THEN C3 = C
   3 - 64
FE 36080 POKE V2,C3
CD 36090 IF P3 > 1000 THEN 36120
BA 36100 POKE P3,C3
DA 36110 P3 = P3 + 1
D5 36120 NEXT JJ
JE 36130 POKE P3,141
EE 36140 IF P3 < 1001 THEN P3 =
   P3 + 1
E7 36150 NEXT II
87 36160 POKE P3,255
80 36170 SW = 0
A5 36180 RETURN
E0 37000 REM DELETE
62 37010 P3 = 775
3A 37020 FOR II = Y2 TO Y3
BC 37030 FOR JJ = X2 TO X3
AE 37040 GOSUB 40020
38 37050 C3 = PEEK (V2) + 128
98 37060 IF C3 < 160 THEN C3 = C
   3 + 64
39 37070 IF C3 > 223 THEN C3 = C
   3 - 64
60 37080 POKE V2,160
D7 37090 IF P3 > 1000 THEN 37120
BC 37100 POKE P3,C3
DC 37110 P3 = P3 + 1
D7 37120 NEXT JJ
40 37130 POKE P3,141
F0 37140 IF P3 < 1001 THEN P3 =
   P3 + 1
E9 37150 NEXT II
89 37160 POKE P3,255
D4 37170 SW = 0:C0 = 160
A7 37180 RETURN
D7 38000 REM INSERT
64 38010 P3 = 775
05 38020 II = Y1:JJ = X1
00 38030 C3 = PEEK (P3)
F1 38040 IF C3 = 141 THEN II = I
   I + 1:JJ = X1:P3 = P3 +
   1: GOTO 38030

```

```

72 38050 IF II > 22 OR JJ > 40 T
   HEN 38090
D0 38060 IF C3 = 255 THEN SW = 0
   :C0 = PEEK (V0): GOTO 1
   0590
C8 38070 GOSUB 40020
03 38080 POKE V2,C3
4E 38090 JJ = JJ + 1:P3 = P3 + 1
C4 38100 GOTO 38030
C3 39000 REM CANCEL
36 39010 FOR II = Y2 TO Y3
88 39020 FOR JJ = X2 TO X3
AA 39030 GOSUB 40020
37 39040 C3 = PEEK (V2) + 128
94 39050 IF C3 < 160 THEN C3 = C
   3 + 64
35 39060 IF C3 > 223 THEN C3 = C
   3 - 64
FC 39070 POKE V2,C3
43 39080 NEXT JJ,II
C2 39090 SW = 0
56 40000 RETURN
24 40010 REM
78 40020 V2 = 1023 + 128 * (II -
   1) + JJ
40 40030 IF II > 8 THEN V2 = V2
   - 984
A6 40040 IF II > 16 THEN V2 = V2
   - 984
7E 40050 RETURN
7F 41000 REM DELETE A CHARACTER
83 41010 GOSUB 43010
96 41020 FOR II = V0 TO V2 - 1
88 41030 POKE II, PEEK (II + 1)
D2 41040 NEXT II
49 41050 POKE V2,160
57 41060 C0 = PEEK (V0)
90 41070 RETURN
8F 42000 REM DELETE TO END OF LI
   NE
85 42010 GOSUB 43010
76 42020 FOR II = V0 TO V2
7D 42030 POKE II,160
D4 42040 NEXT II
FA 42050 C0 = 160
8A 42060 RETURN
22 43000 REM
CF 43010 V2 = 1063 + 128 * (Y1
   1)
2E 43020 IF Y1 > 8 THEN V2 = V2
   - 984
94 43030 IF Y1 > 16 THEN V2 = V2
   - 984
7C 43040 RETURN
D8 44000 REM FIND MOUSE
56 44010 FOR S0 = 0 TO 6
AA 44020 IF PEEK (49420 + (256 *
   S0)) = 32 AND PEEK (49
   659 + (256 * S0)) = 214
   THEN S0 = S0 + 1: RETU
   RN
80 44030 NEXT S0
82 44040 PRINT "I CAN'T FIND A M
   OUSE INTERFACE CARD" CH
   R$ (7) CHR$ (7)
68 44050 END
A5 62999 REM #63000
24 63000 REM
2C 63010 REM SUBROUTINE TO "READ
   "
IF 63020 REM STRINGS FROM THE
B3 63030 REM VIDEO BUFFER
44 63040 REM
8F 63050 VTAB 24: FLASH: PRINT
   " WORKING ...
   " : NO
   RMAL: VTAB 1: HTAB 1
C9 63060 A$ = ""
FC 63070 REM CALCULATE V0
55 63080 REM (VIDEO BUFFER ADDRE
   SS)
A5 63090 V0 = 1037 + 128 * (Y1 -
   1)

```

```

12 63100 IF Y1 > 8 THEN V0 = V0
   - 984
66 63110 IF Y1 > 16 THEN V0 = V0
   - 984
2F 63120 FOR I = 1 TO 25
67 63130 C0 = PEEK (V0 + I)
AD 63135 IF C0 < 128 THEN C0 = C
   0 + 128
70 63136 IF C0 < 160 THEN C0 = C
   0 + 64
19 63137 IF C0 > 223 THEN C0 = C
   0 - 64
DD 63140 IF C0 = 160 AND PEEK (V
   0 + I + 1) = 160 THEN 6
   3190: REM END IF TWO BL
   ANKS
F9 63160 IF C0 > 128 THEN C0 = C
   0 - 128
F5 63170 A$ = A$ + CHR$ (C0)
D5 63180 NEXT I
C2 63190 IF RIGHT$ (A$,1) = CHR$
   (32) THEN A$ = LEFT$ (
   A$, LEN (A$) - 1): GOTO
   63190: REM REMOVE TRAI
   LING BLANKS
42 63195 IF A$ = CHR$ (96) THEN
   A$ = ""
66 63200 RETURN

```

Program 2: MOUSEY Filemaker

```

04 10 REM BASIC PROGRAM FOR
7C 20 REM GENERATING THE
4A 30 REM BINARY FILE
9A 40 REM "MOUSEY"
4E 50 HOME
36 60 VTAB 12: PRINT "WORKING ..
   ."
21 70 FOR I = 0 TO 872
88 80 READ A
19 90 POKE 37376 + I,A
BF 100 VTAB 12: HTAB 13: PRINT I
   + 1
DF 110 NEXT I
2A 120 PRINT CHR$ (4)"BSAVE MOUS
   EY,A37376, L873"
2B 130 PRINT: PRINT "DONE!"
77 10000 DATA 173,89,170,72,165,
   217,72
9B 10010 DATA 165,118,72,169,2,1
   33,118
84 10020 DATA 169,255,133,217,16
   9,191,133
B7 10030 DATA 51,169,0,133,243,7
   6,41
6E 10040 DATA 146,4,0,15,0,7,0
A8 10050 DATA 21,0,7,0,21,0,169
D6 10060 DATA 29,133,133,169,146
   ,160,0
84 10070 DATA 162,11,32,77,149,7
   6,69
57 10080 DATA 146,20,7,32,0,8,0
18 10090 DATA 22,0,8,0,22,0,169
A8 10100 DATA 57,133,133,169,146
   ,160,0
35 10110 DATA 162,11,32,77,149,1
   73,0
FE 10120 DATA 3,141,29,146,169,0
   ,141
FE 10130 DATA 30,146,173,1,3,141
   ,31
81 10140 DATA 146,169,0,141,32,1
   46,173
F8 10150 DATA 2,3,141,33,146,169
   ,0
68 10160 DATA 141,34,146,173,3,3
   ,141
1D 10170 DATA 35,146,169,0,141,3
   6,146
D7 10180 DATA 173,4,3,141,37,146
   ,169

```



```

5C 10190 DATA 0,141,38,146,173,5
,3
2C 10200 DATA 141,39,146,169,0,1
41,40
83 10210 DATA 146,173,29,146,141
,61,146
CB 10220 DATA 173,30,146,141,62,
146,173
18 10230 DATA 62,146,205,34,146,
48,15
15 10240 DATA 208,10,173,61,146,
205,33
22 10250 DATA 146,144,5,240,3,76
,134
05 10260 DATA 147,173,31,146,141
,63,146
75 10270 DATA 173,32,146,141,64,
146,173
88 10280 DATA 64,146,205,36,146,
48,15
7F 10290 DATA 208,10,173,63,146,
205,35
9D 10300 DATA 146,144,5,240,3,76
,123
FB 10310 DATA 147,24,173,37,146,
105,1
39 10320 DATA 141,65,146,173,38,
146,105
2A 10330 DATA 0,141,66,146,24,17
3,39
8E 10340 DATA 146,105,1,141,67,1
46,173
03 10350 DATA 40,146,105,0,141,6
8,146
B1 10360 DATA 173,62,146,205,66,
146,48
43 10370 DATA 10,208,29,173,61,1
46,205
F3 10380 DATA 65,146,176,21,173,
64,146
6E 10390 DATA 205,68,146,48,10,2
08,11
82 10400 DATA 173,63,146,205,67,
146,176
9C 10410 DATA 3,76,112,147,32,12
2,148
EF 10420 DATA 173,57,146,141,51,
147,173
A2 10430 DATA 58,146,141,52,147,
173,144
A4 10440 DATA 7,141,59,146,169,0
,141
29 10450 DATA 60,146,173,60,146,
201,0
D2 10460 DATA 48,9,208,24,173,59
,146
9B 10470 DATA 201,128,176,17,24,
173,59
91 10480 DATA 146,105,128,141,59
,146,173
EA 10490 DATA 60,146,105,0,141,6
0,146
48 10500 DATA 173,57,146,141,110
,147,173
5A 10510 DATA 58,146,141,111,147
,173,59
5D 10520 DATA 146,141,144,7,238,
63,146
9F 10530 DATA 208,3,238,64,146,7
6,195
8E 10540 DATA 146,238,61,146,208
,3,238
AB 10550 DATA 62,146,76,160,146,
173,29
9B 10560 DATA 146,141,61,146,173
,30,146
20 10570 DATA 141,62,146,173,62,
146,205
D8 10580 DATA 38,146,48,15,208,1
0,173
18 10590 DATA 61,146,205,37,146,
144,5
43 10600 DATA 240,3,76,119,148,1

```

```

73,31
BF 10610 DATA 146,141,63,146,173
,32,146
88 10620 DATA 141,64,146,173,64,
146,205
96 10630 DATA 40,146,48,15,208,1
0,173
3C 10640 DATA 63,146,205,39,146,
144,5
A3 10650 DATA 240,3,76,108,148,3
2,122
FF 10660 DATA 148,173,57,146,141
,220,147
CB 10670 DATA 173,58,146,141,221
,147,173
2C 10680 DATA 20,7,141,59,146,16
9,0
A7 10690 DATA 141,60,146,173,60,
146,201
57 10700 DATA 0,48,28,208,9,173,
59
B4 10710 DATA 146,201,127,144,19
,240,17
B5 10720 DATA 56,173,59,146,233,
64,141
B7 10730 DATA 59,146,173,60,146,
233,0
B3 10740 DATA 141,60,146,173,60,
146,201
7F 10750 DATA 0,48,28,208,9,173,
59
0C 10760 DATA 146,201,64,144,19,
240,17
DD 10770 DATA 56,173,59,146,233,
64,141
DF 10780 DATA 59,146,173,60,146,
233,0
AB 10790 DATA 141,60,146,173,60,
146,201
5B 10800 DATA 0,48,28,208,9,173,
59
E7 10810 DATA 146,201,64,144,19,
240,17
B9 10820 DATA 56,173,59,146,233,
64,141
BB 10830 DATA 59,146,173,60,146,
233,0
18 10840 DATA 141,60,146,173,57,
146,141
38 10850 DATA 95,148,173,58,146,
141,96
5A 10860 DATA 148,173,59,146,141
,20,7
92 10870 DATA 238,63,146,208,3,2
38,64
1D 10880 DATA 146,76,181,147,238
,61,146
FA 10890 DATA 208,3,238,62,146,7
6,146
43 10900 DATA 147,76,11,149,56,1
73,61
ED 10910 DATA 146,233,1,141,57,1
46,173
0A 10920 DATA 62,146,233,0,141,5
8,146
4C 10930 DATA 169,0,133,138,169,
128,174
E9 10940 DATA 58,146,172,57,146,
32,31
45 10950 DATA 149,142,58,146,140
,57,146
38 10960 DATA 24,169,255,109,57,
146,141
97 10970 DATA 57,146,169,3,109,5
8,146
F8 10980 DATA 141,58,146,24,173,
57,146
5B 10990 DATA 109,63,146,141,57,
146,173
0F 11000 DATA 58,146,109,64,146,
141,58
C4 11010 DATA 146,173,62,146,201
,0,48

```

```

CE 11020 DATA 28,208,9,173,61,14
6,201
11 11030 DATA 8,144,19,240,17,56
,173
96 11040 DATA 57,146,233,216,141
,57,146
DF 11050 DATA 173,58,146,233,3,1
41,58
EC 11060 DATA 146,173,62,146,201
,0,48
F6 11070 DATA 28,208,9,173,61,14
6,201
EF 11080 DATA 16,144,19,240,17,5
6,173
BE 11090 DATA 57,146,233,216,141
,57,146
BB 11100 DATA 173,58,146,233,3,1
41,58
B5 11110 DATA 146,96,104,133,118
,104,133
1C 11120 DATA 217,104,141,89,170
,169,141
67 11130 DATA 141,1,2,169,1,133,
52
9A 11140 DATA 96,133,137,132,135
,134,136
B0 11150 DATA 169,0,133,133,133,
134,70
B1 11160 DATA 136,102,135,144,13
,24,165
BE 11170 DATA 137,101,133,133,13
3,165,138
EC 11180 DATA 101,134,133,134,6,
137,38
B5 11190 DATA 138,165,136,5,135,
208,227
5B 11200 DATA 164,133,166,134,96
,133,134
FE 11210 DATA 132,135,160,0,169,
0,145
BB 11220 DATA 133,200,208,2,230,
134,138
2C 11230 DATA 208,4,198,135,48,4
,202
5B 11240 DATA 76,83,149,96,0,0

```

Program 3: TEXT Filemaker

```

51 10 D$ = CHR$ (4)
07 20 PRINT D$ "OPEN TEXT"
CF 30 PRINT D$ "WRITE TEXT"
EA 40 PRINT "COMPUTE!"
7E 50 PRINT "READER SERVICE"
89 60 PRINT "P.O. BOX 50950"
E3 70 PRINT "DES MOINES"
6A 80 PRINT "IA 50950"
9A 90 PRINT ""
E9 100 PRINT "1-800-346-6767"
DA 110 PRINT D$ "CLOSE"

```

Program 4: Joystick Modifications

```

FC 265 B0 = 4
CB 10150 X0 = PDL (0)
04 10160 Y0 = PDL (1)
78 10161 B1 = PEEK ( - 16287)
21 10162 IF B1 < 128 AND B0 = 3
THEN B0 = 4
21 10163 IF B1 < 128 AND B0 = 2
THEN B0 = 3
29 10164 IF B1 < 128 AND B0 = 1
THEN B0 = 3
25 10165 IF B1 > 127 AND B0 = 2
THEN B0 = 1
4D 10166 IF B1 > 127 AND B0 = 4
THEN B0 = 2
21 10170 IF PEEK ( - 16384) > 12
7 THEN 10440
A9 10180 Y0 = INT (Y0 / 10) + 1
BB 10190 X0 = INT (X0 / 6) + 1
32 20030 REM

```


IBM Variable Snapshot

Tony Roberts, Production Director

This programming utility lets you list the current values of all active variables in any BASIC program—an invaluable aid for debugging. It works on any IBM PC with BASICA or PCjr with Cartridge BASIC.

When things go haywire with a BASIC program, my first inclination is to check the variables: PRINT A\$, PRINT SCORE, PRINT UPPERLIMIT, and so on. Comparing what's actually stored in a variable with what you expected often helps to isolate programming problems.

Printing variable values over and over, however, quickly becomes tedious, especially when arrays are involved. "IBM Variable Snapshot" takes the work out of this process.

After temporarily appending the Variable Snapshot utility to your program, you can activate it with a simple GOTO command whenever your program stops with an error or you press the BREAK key. Once activated, Variable Snapshot sifts through memory, printing out first the scalar variables, then the array variables it finds there. Within seconds, you can see the values of all the variables your program has used. This kind of analysis has many benefits:

- By frequently checking the

variable list, you reduce the possibility of "forgotten" variables.

- You can quickly spot typographical errors in variable names. If the list contains both FILENAME\$ and FILENAM\$, you'll realize something is wrong.

- By checking variable types as well as names, you'll notice if the list contains both TOTAL% (an integer variable) and TOTAL! (a single-precision variable)—another common source of errors.

How To Take Snapshots

Type in Program 1 below and save it on disk in ASCII format. If you type it in with the "IBM Automatic Proofreader," published elsewhere in this issue, the program is saved in ASCII format automatically. Otherwise, use the command SAVE "SNAPSHOT.ASC",A.

Program 2 lets you test Variable Snapshot to verify that it's working properly before using it with your own programs. To run a test, type in Program 2 and save it on disk in ASCII format. Then append Snapshot to it with the command MERGE "SNAPSHOT.ASC." Now type RUN. The test program initializes several variables, then stops. When you type GOTO 1000 (the starting line number of Variable Snapshot), the name and value of each variable is printed on the screen. You can press CTRL-NUM LOCK on the PC or Fn-Q on the PCjr to pause the display, or stop it

at any time by pressing CTRL-BREAK on the PC or Fn-BREAK on the PCjr.

If the variable values are not what you expected, recheck your typing, paying close attention to the type declaration symbols (% , \$, ! , #) attached to the variables. If even one of these symbols is incorrect or missing, you'll have problems.

The test program initializes integer, string, single-precision, and double-precision variables as well as a full set of array variables. If everything prints out as expected, you can be pretty sure that Variable Snapshot is working well.

Friendly Filename And Quick Start

When Snapshot begins its work, the first thing it prints is the active disk filename, which the IBM stores in the 11 memory locations beginning at 4F1h (1265 decimal). This has nothing at all to do with variables, but simply provides an answer to the question "What did I call this program the last time I saved it?"

If you want to get started with Snapshot quickly, you can omit the entire array processing section (lines 1590-2220) and change line 1280 to read:

```
1280 IF QARRAYON% THEN END
```

This abbreviated version of Snapshot lists only simple variables, but you can go back later and add the lines to handle the array

Variable	Description
Q%,QQ%,QQQ%	loop counters
QTYPE%	variable type
QLENLEFT%	number of characters left in variable name
QDIMS%	number of dimensions in array
QARRAYON%	flag indicating if array boundary passed
QSTRLEN%	length of string variable
QBASE%	status of OPTION BASE command
Q\$	for single- and double-precision conversions
QCHAR\$	builds active filename
QFILES	active filename
QNAME\$	name of variable being processed
QVAR!	memory pointer to current variable
QARRAY!	start of array space
QFREE!	start of free space
QASIZE!	size of current array
QVALUE!	temporary storage for integer values
QSTRPTR!	points to location of actual string
QPTR!	points to start of next element in array
QDIMSIZ()	size of array dimensions

variables. The REMs in the program listing are not referenced by other lines, so you can safely omit them when typing the program.

After you have Snapshot working, edit line 1000 to suit your preferences for screen color, width, and so on.

You may want to renumber Snapshot so its line numbers won't interfere with those of your own programs. (Low line numbers were used in the listing to make entering the program easier.) Load the program into memory and use the command `RENUM xxxxx`, where `xxxxx` is Snapshot's new starting line number. Then save the program back to disk, again using the ASCII option so Snapshot can be merged other programs.

The version I use begins at line 60000, and I've programmed a function key to execute the command `GOTO 60000`. Whenever a program halts, I simply press Fn-6 to see the value of every variable.

Array Bases

IBM BASIC includes the `OPTION BASE` statement for defining the lowest-numbered element in an array. If a program contains the statement `OPTION BASE 0`, or if no `OPTION BASE` statement is included, all arrays start with a 0 element. An `OPTION BASE 1` statement means that arrays begin with element 1.

Variable Snapshot must know which `OPTION BASE` is in effect to

display array values properly. Memory location 45Ch (1116 decimal) provides this information. PEEKing that address yields either a 0 or 1, indicating which base is selected.

The adjacent memory location, 45Dh (1117 decimal), is related but a little more specific. If no `OPTION BASE` command has been issued, 45Dh contains a 0; if `OPTION BASE 0` has been executed, 45Dh contains a 1; and if `OPTION BASE 1` has been executed, the location contains a 2.

Try changing line 10 in Program 2 to read `OPTION BASE 0` and observe the effect when running Variable Snapshot.

Although IBM BASIC allows arrays of up to 255 dimensions, few programs make use of more than one or two. For this reason, Variable Snapshot does not include provisions for arrays with more than two dimensions. Additional loops can be added to handle more complex arrays, if necessary.

A Few Cautions

To be truthful, Snapshot does not list *every* variable—it ignores those

that begin with the letter Q. The Snapshot routine itself, you'll notice, uses only variables beginning with the letter Q. That keeps Snapshot's own variables from being printed along with those of your program.

If you're inclined to tinker with this routine, you must be careful about introducing new variables. Lines 1020-1040 initialize every variable used by the routine, effectively reserving space for them in the variable table.

Lines 1120-1140 determine the boundaries of the variable table, reference points the program cannot do without. If a new variable is added to the program after the boundary measurements are taken, confusion results; the boundaries move and Snapshot loses its way.

Although Snapshot works with most programs, there can be complications. If you've written your program to make use of all available memory, there won't be room in the variable table for Snapshot's own variables. You'll need to leave Snapshot about 300 bytes of workspace.

How Snapshot Works

As mentioned above, Snapshot reads the boundaries of the scalar variable area, the array variable area, and the free space area, then works its way through the variable areas byte by byte deciphering the information stored there. Once it reaches free space, its work is finished.

The IBM stores scalar variables as shown below.

Following the last character of the variable name is the value of the variable.

- An integer variable is stored in two bytes in the standard low byte/high byte format. The high bit of the second byte indicates the sign of the integer. If it is set, the integer is a negative number.

Byte 1 = type (2 = integer, 3 = string, 4 = single precision, 8 = double precision)
 Byte 2 = first character of variable name
 Byte 3 = second character of variable name
 Byte 4 = number of characters remaining in variable name
 Byte 5
 . = rest of variable name (high bit set)

• String variable pointers are stored in three bytes. The first is the number of bytes in the string, and the second and third point to the address (either in the string pool or in the BASIC program area) where the string is stored.

• Single-precision variable values are stored in four bytes. The values of these bytes can be concatenated into a string, then converted into a single-precision number using the CVS function.

• Double-precision variables occupy eight bytes, which can be concatenated and converted as above using the CVD function.

Array variables are stored similarly, but there's some additional information between the end of the variable name and the actual beginning of the variable values.

Following the variable name are two bytes that indicate the total size of the array. The next byte holds the number of dimensions. That is followed by two bytes describing the number of elements in the last dimension. Then two bytes describe the number of elements in the next to last dimension, and so on, until each dimension in the array has been defined.

Finally, the values of the array variables follow, and are stored in the same manner as values for scalar variables.

Using this information, the program listing, the description of Snapshot variables found in the accompanying table, and the actual program output, you should be able to develop a good understanding of how BASIC treats your variables.

For instructions on entering these listings, please refer to "COMPUTE!s Guide to Typing In Programs" in this issue of COMPUTE!

Program 1: IBM Variable Snapshot

```

CK 1000 DEF SEG:SCREEN 0,0:WIDTH 80:CO
LOR 7,0:
DB 1010 REM initialize variables
CB 1020 QZ=0:QQZ=0:QQQZ=0:QLENLEFTX=0:
QTYPEX=0:QDIMS=0:QARRAYONZ=0:
QSTRLENX=0:QBASEX=0:QDIMSIZEX(
1)=0:QDIMSIZEX(2)=0
LN 1030 Q$="" :QCHAR$="" :QFILE$="" :QNAME$=""
NJ 1040 QVAR!=0:QARRAY!=0:QFREE!=0:QAS
IZE!=0:QVALUE!=0:QSTRPTR!=0:QPTR
TR!=0
GG 1050 REM Get active filename
OL 1060 FOR QZ=0 TO 10
BA 1070 QCHAR$=CHR$(PEEK(&H4F1+QZ))
PA 1080 IF ASC(QCHAR$)>96 AND ASC(QCHA

```

```

R$)<123 THEN QFILE$=QFILE$+CHR
$(ASC(QCHAR$)-32) ELSE QFILE$=
QFILE$+QCHAR$
AH 1090 NEXT
LI 1100 PRINT:PRINT "Active disk filen
ame is: ";MID$(QFILE$,1,8);".
";MID$(QFILE$,9):PRINT
CM 1110 REM get addresses of scalar va
riables, array variables, and
free space
FH 1120 QVAR!=PEEK(&H35B)+PEEK(&H359)*
256
HI 1130 QARRAY!=PEEK(&H35A)+PEEK(&H35B
)*256
HD 1140 QFREE!=PEEK(&H35C)+PEEK(&H35D)
*256
HF 1150 QBASE=PEEK(&H45C)
BN 1160 REM Start of variable processi
ng
CH 1170 QTYPEX=PEEK(QVAR!)
JO 1180 IF (QTYPEX<2 OR QTYPEX>4) AND
QTYPEX<>8 THEN END
LG 1190 QLENLEFTX=PEEK(QVAR!+3)
PH 1200 REM get variable name
QN 1210 QNAME$=""
LL 1220 IF PEEK(QVAR!+1)>127 OR (PEEK(
QVAR!+1)=81 AND QARRAYONZ=0) T
HEN 2240
EC 1230 FOR QZ=1 TO QLENLEFTX
HJ 1240 QNAME$=QNAME$+CHR$(PEEK(QVAR!+
3+QZ) AND 127)
QP 1250 NEXT
NE 1260 QNAME$=CHR$(PEEK(QVAR!+1))+CHR
$(PEEK(QVAR!+2))+QNAME$
OI 1270 REM branch to appropriate rout
ine depending on variable type
EB 1280 IF QARRAYONZ THEN 1600
CF 1290 ON QTYPEX-1 GOTO 1320,1370,146
0
NP 1300 GOTO 1530
FM 1310 REM integers
EC 1320 QVALUE!=PEEK(QVAR!+QLENLEFTX+4
)+PEEK(QVAR!+QLENLEFTX+5)*256
DP 1330 IF QVALUE!>32768! THEN QVALUE!
=QVALUE!-65536!
PH 1340 PRINT QNAME$;"Z";"=" :QVALUE!
NC 1350 GOTO 2240
FE 1360 REM strings
PH 1370 PRINT QNAME$;"S";"=" :CHR$(34
);
BN 1380 QSTRLENX=PEEK(QVAR!+QLENLEFTX+
4)
MC 1390 QSTRPTR!=PEEK(QVAR!+QLENLEFTX+
5)+PEEK(QVAR!+QLENLEFTX+6)*256
GJ 1400 FOR QZ=0 TO QSTRLENX-1
PM 1410 PRINT CHR$(PEEK(QSTRPTR!+QZ));
QK 1420 NEXT
BI 1430 PRINT CHR$(34)
NB 1440 GOTO 2240
PJ 1450 REM single precision
PL 1460 Q$=""
FB 1470 PRINT QNAME$;"I";"=" :
CM 1480 FOR QZ=0 TO 3: Q$=Q$+CHR$(PEEK
(QVAR!+QLENLEFTX+4+QZ))
BP 1490 NEXT
BB 1500 PRINT CVS(Q$)
NK 1510 GOTO 2240
KB 1520 REM double precision
OE 1530 Q$=""
HH 1540 PRINT QNAME$;"D";"=" :
GN 1550 FOR QZ=0 TO 7: Q$=Q$+CHR$(PEEK
(QVAR!+QLENLEFTX+4+QZ))
BI 1560 NEXT
FE 1570 PRINT CVD(Q$)
OP 1580 GOTO 2240
AC 1590 REM array routines
JM 1600 QASIZE!=PEEK(QVAR!+4+QLENLEFTX
)+PEEK(QVAR!+5+QLENLEFTX)*256
JI 1610 IF ASC(QNAME$)=81 THEN 2240
BA 1620 QDIMS=PEEK(QVAR!+6+QLENLEFTX)
IB 1630 IF QDIMS>2 THEN 2240
QL 1640 QPTR!=QVAR!+7+QLENLEFTX
NA 1650 FOR QZ=QDIMS TO 1 STEP -1
LN 1660 QDIMSIZEX(QZ)=PEEK(QPTR!)+PEEK
(QPTR!+1)*256
NE 1670 QPTR!=QPTR!+2
BA 1680 NEXT
JS 1690 ON QTYPEX-1 GOTO 1720,1830,198
0
KI 1700 GOTO 2110
QL 1710 REM integer arrays
AB 1720 PRINT
BL 1730 IF QDIMS=2 THEN FOR QQQZ=QBAS
EX TO QDIMSIZEX(2)+(QBASEX=0)
BI 1740 FOR QZ=QBASEX TO QDIMSIZEX(1)+
(QBASEX=0)
DN 1750 QVALUE!=PEEK(QPTR!)+PEEK(QPTR
!+1)*256
AA 1760 IF QVALUE!>32768! THEN QVALUE!
=QVALUE!-65536!

```

```

IF 1770 IF QDIMS=1 THEN PRINT QNAME$;
"%(";MID$(STR$(QZ),2);")";"=" :
:QVALUE! ELSE PRINT QNAME$;"%("
";MID$(STR$(QZ),2);";";MID$(ST
R$(QQQZ),2);")";"=" :QVALUE!
OJ 1780 QPTR!=QPTR!+2
JM 1790 NEXT QZ
EH 1800 IF QDIMS=2 THEN NEXT QQQZ
NA 1810 GOTO 2240
HA 1820 REM string arrays
AG 1830 PRINT
BA 1840 IF QDIMS=2 THEN FOR QQQZ=QBAS
EX TO QDIMSIZEX(2)+(QBASEX=0)
GN 1850 FOR QZ=QBASEX TO QDIMSIZEX(1)+
(QBASEX=0)
IE 1860 QSTRLENX=PEEK(QPTR!)
KA 1870 QSTRPTR!=PEEK(QPTR!+1)+PEEK(QP
TR!+2)*256
CD 1880 IF QDIMS=1 THEN PRINT QNAME$;
"%(";MID$(STR$(QZ),2);")";"=" :
:CHR$(34); ELSE PRINT QNAME$;"%
(";MID$(STR$(QZ),2);";";MID$(
STR$(QQQZ),2);")";"=" :CHR$(34
);
CI 1890 FOR QQQZ=0 TO QSTRLENX-1
MF 1900 PRINT CHR$(PEEK(QSTRPTR!+QQZ))
;
HJ 1910 NEXT QQQZ
BP 1920 PRINT CHR$(34)
OA 1930 QPTR!=QPTR!+3
IB 1940 NEXT QZ
GI 1950 IF QDIMS=2 THEN NEXT QQQZ
OB 1960 GOTO 2240
EL 1970 REM single precision arrays
BH 1980 PRINT
CB 1990 IF QDIMS=2 THEN FOR QQQZ=QBAS
EX TO QDIMSIZEX(2)+(QBASEX=0)
EP 2000 FOR QZ=QBASEX TO QDIMSIZEX(1)+
(QBASEX=0)
NF 2010 Q$=""
IH 2020 FOR QQQZ=0 TO 3
CB 2030 Q$=Q$+CHR$(PEEK(QPTR!+QQZ))
GB 2040 NEXT QQQZ
AH 2050 IF QDIMS=1 THEN PRINT QNAME$;
"!(";MID$(STR$(QZ),2);")";"=" :
:CVS(Q$) ELSE PRINT QNAME$;"!("
";MID$(STR$(QZ),2);";";MID$(STR
$(QQQZ),2);")";"=" :CVS(Q$)
PK 2060 QPTR!=QPTR!+4
IJ 2070 NEXT QZ
FA 2080 IF QDIMS=2 THEN NEXT QQQZ
OJ 2090 GOTO 2240
NB 2100 REM double precision arrays
PD 2110 PRINT
QK 2120 IF QDIMS=2 THEN FOR QQQZ=QBAS
EX TO QDIMSIZEX(2)+(QBASEX=0)
FK 2130 FOR QZ=QBASEX TO QDIMSIZEX(1)+
(QBASEX=0)
DA 2140 Q$=""
DD 2150 FOR QQQZ=0 TO 7
DN 2160 Q$=Q$+CHR$(PEEK(QPTR!+QQZ))
HM 2170 NEXT QQQZ
CJ 2180 IF QDIMS=1 THEN PRINT QNAME$;
"%(";MID$(STR$(QZ),2);")";"=" :
:Q$ ELSE PRINT QNAME$;"%("
";MID$(STR$(QZ),2);";";MID$(ST
R$(QQQZ),2);")";"=" :CVD(Q$)
EN 2190 QPTR!=QPTR!+8
HI 2200 NEXT QZ
EP 2210 IF QDIMS=2 THEN NEXT QQQZ
NI 2220 GOTO 2240
GH 2230 REM Get address of next variab
le
HM 2240 IF QARRAYONZ<>1 THEN QVAR!=QVA
R!+QLENLEFTX+QTYPEX+4 ELSE QVA
R!=QVAR!+QASIZE!+QLENLEFTX+6
HH 2250 IF QVAR!=QARRAY! THEN QARRAYO
NZ=1
NB 2260 IF QVAR!=QFREE! THEN END
OH 2270 GOTO 1170

```

Program 2: Snapshot Demo

```

BL 10 REM Snapshot demo program
OK 20 OPTION BASE 1
LF 30 AZ=2:A$="This is a string." :A!=1
00001 :A#=345692811#
LA 40 DIM INTEGER$(5),STRIN$(5),SINGLE
!(5),DOUBLE$(5)
GN 50 DIM IGR$(5,3),STN$(5,3),SNG!(5,3
),DBL$(5,3)
IJ 60 FOR I=1 TO 5:INTEGER$(I)=I:STRIN
$(I)=CHR$(64+I):SINGLE!(I)=I*300
00:DOUBLE$(I)=I*1.5E+07:NEXT I
MS 70 FOR I=1 TO 5:FOR J=1 TO 3:IGR$(I
,J)=I+J:STN$(I,J)=CHR$(I+64)+CHR
$(J+48):SNG!(I,J)=I*0.5+J:DBL$(I
,J)=I/J:NEXT J,I
DK 80 END

```


ATARI TEXTDUMP

Ralph Johnson

Here's a short, simple utility that quickly dumps a GRAPHICS 0 screen to a printer. It works with all 400/800, XL, and XE computers.

I've always wanted the capability to dump a copy of a text screen to my printer. I also wanted this capability available from BASIC. My efforts to find such a program were fruitless. So, the only solution was to write one myself.

There were several requirements I established: 1) It should be fast—written in machine language. 2) It should sit in a relatively safe location in memory, surviving system resets. 3) It should always be ready to do its job, whether called in direct mode or from within a program. 4) It should be easy to use.

The result is "Atari Textdump." You can make your own copy of Textdump by typing in the program listing below. It creates an AUTORUN.SYS file on disk that automatically loads Textdump into memory page 6 (address 1536) when you boot the system from that disk. To call the routine, make

sure your printer is online and enter this statement:

A=USR(1536)

This works in both direct mode or within a program.

If you don't have a disk drive, or if you don't want Textdump to load as an AUTORUN.SYS file, delete lines 10-1000 in Program 1 and substitute this new line 10:

```
10 FOR A=1536 TO 1724:READ B:POKE  
A,B:NEXT A
```

Again, you can call Textdump as described above in either direct or program mode. You can also convert this version of the program into a module for use in your own programs.

If you like, you can modify Textdump to print a smaller portion of the GRAPHICS 0 screen. Simply POKE the desired number of rows you want to dump into memory location 1613.

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

Atari Textdump

```
CL 10 CLOSE #1  
PB 20 OPEN #1,8,0,"D:AUTORUN  
.SYS"
```

```
EJ 30 FOR A=1 TO 6:READ B:PR  
INT #1;CHR$(B);:NEXT A  
IA 40 FOR A=1536 TO 1724:REA  
D B:PRINT #1;CHR$(B);:  
NEXT A  
CP 50 CLOSE #1  
CM 1000 DATA 255,255,0,6,188  
,6  
DG 1002 DATA 104,162,80,169,  
3,157,66,3,169,8,157  
,74,3,169,144  
IN 1003 DATA 157,68,3,169,6,  
157,69,3,169,0  
BF 1004 DATA 141,143,6,157,7  
3,3,169,255,157,72,3  
,32,86,228,165  
KC 1005 DATA 88,133,203,165,  
89,133,204,162,0,160  
BF 1006 DATA 0,24,177,203,10  
5,32,157,147,6,232,2  
4,165,203,105  
EP 1007 DATA 1,133,203,165,2  
04,105,0,133,204,173  
,143  
OB 1008 DATA 6,201,24,240,52  
,224,40,240,4,224,40  
,208,217,169  
OL 1009 DATA 155,157,147,6,2  
38,143,6,162,80,169,  
9  
NP 1010 DATA 157,66,3,169,14  
7,157,68,3,169,6,157  
,69,3,169,0  
OL 1011 DATA 157,73,3,169,25  
5,157,72,3,32,86  
EJ 1012 DATA 228,162,0,224,0  
,240,173,162,80,169,  
12,157,66,3,32  
BE 1013 DATA 86,228,96,0,80,  
58,155,0,0,0  
LA 1014 DATA 0,0,0,0,0,0,0,0  
,0,0,0,0,0,0,0,0  
,0,0,0,0,0,0,0  
CI 1015 DATA 0,0,0,0,0,0,0,0  
,0,0,0,0,155,0
```

©

AmigaDOS Batch Files

Charles Brannon
Program Editor

AmigaDOS is more than a console-driven disk operating system. By executing a sequence of AmigaDOS commands stored in a file, AmigaDOS takes on some of the characteristics of a programming language. Whether you want to simplify repetitive disk commands or create personalized custom commands, batch files further extend the range and flexibility of AmigaDOS.

No matter how easy it is to use a program, the most popular programs are those that give users more power. And although a program may have scads of powerful commands, the most powerful programs are those which let users put the commands together in new ways—in effect, to write programs.

Instead of forcing you to always issue commands one at a time, a programmable application lets you create a script of commands to customize the behavior of the program. Whether we're talking about word processing macros, spreadsheet templates, relational database languages, or advanced machine language, programmability is the real key to software power. If you feel limited by a certain range of commands, you can combine the commands in new ways to create personalized features, just as we combine the vocabulary of English words to create a wealth of literature. Why just read when you can write?

Scripts, Sequences, And Batches

AmigaDOS is more than just a disk operating system—it's a programmable system that can process lists of its own commands as well as individual commands. In effect, AmigaDOS is a simple disk-oriented programming language.

A list of AmigaDOS commands can be stored in a disk file variously known as a *script*, a *sequence*, or a *batch file*. The term "batch file" is most commonly used by those who work with PC-DOS, MS-DOS, and CP/M, which are also programmable disk operating systems. To keep things straight, we'll use "batch files" synonymously with "scripts" or "sequences."

Even if you don't program in BASIC or any other language, you may be interested in learning about AmigaDOS batch files. The batch file "language" is simply made up of the same AmigaDOS commands you've probably been using all along (see "Introduction to AmigaDOS," Parts 1 and 2, in the February and March 1986 issues of COMPUTE!). There are also a few AmigaDOS commands designed especially for batch files.

Creating and running batch files is easy. Using a text editor, you just type in a list of AmigaDOS commands. Then you save the list on disk under a filename. To run the batch file, you type EXECUTE filename at an AmigaDOS prompt. AmigaDOS reads the batch file and executes the list of commands, just as if you had typed them one by one yourself.

We won't cover some of the

more advanced features of batch files, useful only to advanced C and machine language programmers. Instead, we'll concentrate on the everyday utility of batch file programming.

A Quick Example

In a moment, we'll show how to create batch files with ED, the AmigaDOS full-screen text editor, but first there's a simpler way to create a short batch file. Enter this line at an AmigaDOS prompt:

```
copy * to Hello
```

(Note that AmigaDOS commands can be entered in uppercase or lowercase.)

Although nothing seems to happen, AmigaDOS is waiting for you to enter some lines. We'll use the ECHO command to display a friendly message. ECHO displays any text that follows it within quotation marks, just like the PRINT statement in BASIC. One difference is that if you want to ECHO only a single word, the quotes aren't necessary.

At an AmigaDOS prompt, enter the following text, pressing RETURN after each line:

```
echo "Hello"  
echo "I am your friend, the Amiga"  
echo "personal computer."
```

After the last line, press CTRL-\. This key is the one to the left of the BACKSPACE key. CTRL-\. tells AmigaDOS that you're finished, and that it should finish writing and close the file. This key represents EOF, for End Of File.

To confirm that you've typed the file correctly, enter:

```
TYPE Hello
```


You should see the same lines you typed. Now you can start this simple program:

EXECUTE Hello

This should print on the screen:

Hello!

I am your friend, the Amiga
personal computer.

Using ED

It would be nice to have the Amiga actually speak this greeting. Rather than type in a whole new file, we'll use ED, the screen editor, to make the simple changes we're interested in. Enter:

ED Hello

This runs ED and also loads the batch file named Hello. When you start ED, you can give it the name of any file to edit. If the file-name doesn't exist, it will be created; otherwise the file is automatically displayed on the editor screen. (Incidentally, AmigaDOS has another text editor called EDIT, but it's not as easy to use as ED.)

We'll make the Amiga speak the ECHO messages aloud by taking advantage of the system's built-in speech synthesis via the AmigaDOS SAY command (added to AmigaDOS version 1.1). To learn more about SAY, just enter SAY by itself to enter an interactive mode with on-screen instructions.

After you start ED by typing ED Hello, the batch file we previously entered should be on the screen, with the cursor at the beginning of the first line. ED is a full-screen text editor, so you can move the cursor anywhere within the file (but not past the last line). To insert some text, just start typing. The DEL and BACKSPACE keys can be used to delete characters.

Move the cursor to the second ECHO line and press RETURN. This inserts a blank line. Cursor up to the blank line and enter:

SAY HELLO!

You don't need to press RETURN at the end of the line, since you already did this to open up a line for typing.

Now cursor to the end of the file and type:

SAY I am your friend, the Amiga
personal computer.

(Notice that SAY is the only Amiga-

DOS command that doesn't require you to enclose text containing spaces with quotes.) This is how your screen should look:

echo "Hello!"

say Hello!

echo "I am your friend, the Amiga"

echo "personal computer."

say I am your friend, the Amiga personal
computer.

With the cursor at the end of the file, press the ESC key. An asterisk (*) should appear. Press the X key, then RETURN. This exits ED and saves your changes back to disk.

Finally, type EXECUTE Hello to try out your talking batch file.

Although these techniques are sufficient for simple editing, ED has dozens of editing commands. For example, CTRL-B (press CTRL and B at the same time) blanks out and deletes the line the cursor is on. ESC-J-RETURN joins two lines together. Space doesn't permit a discussion of all these commands, but if you like to experiment, refer to the abbreviated ED reference chart accompanying this article.

Startup-Sequence

A special AmigaDOS batch file, called the *startup-sequence*, is executed automatically when you boot up an AmigaDOS or Workbench disk by inserting it at the Workbench prompt. Startup-sequence normally just displays a message, then launches the Workbench and ends the command line interface.

To edit this batch file, enter:

ed s/startup-sequence

This runs ED and calls up the file "startup-sequence" from the S subdirectory. This subdirectory, which can also be accessed as the S: device, is a convenient place for batch files. Just as AmigaDOS by default searches for AmigaDOS commands in the C subdirectory, the EXECUTE command first looks for a batch file in the S subdirectory. If AmigaDOS can't find the batch file in this subdirectory, it looks for it in the current directory. So no matter what your current directory is, you can always use your batch file if you place it in the S directory on your startup disk.

When you first load startup-sequence into ED, you'll see something like this:

Common ED Commands

Immediate Commands (hold down CTRL and press key):

CTRL-A Insert line at cursor position
CTRL-B Delete current line
CTRL-D Scroll text downward
CTRL-E Move cursor to top or bottom of screen
CTRL-N Delete character at cursor
CTRL-O Delete word or series of spaces
CTRL-U Scroll text upward
CTRL-Y Delete to end of current line

Extended Commands (precede by pressing and releasing ESC):

B	Move cursor to bottom of file
E/string1/string2/	Exchange string1 to string2
EQ/string1/string2/	Exchange, but query first
F/string/	Find string
J	Join current line with next line
Q	Quit without saving text
T	Move cursor to top of file
X	Exit, save text

echo "Workbench disk. Release 1.1"

echo ""

echo "Use Preferences tool to set date"

echo ""

LoadWb

endcli > nil:

Since this message appears every time you start up your disk, you may want to change the ECHO statements for a personalized message. Likewise, if you'd rather use AmigaDOS instead of the Workbench, delete the last two lines. The "> nil:" sequence makes AmigaDOS throw away the output of a command; here, the message "CLI task 1 ending."

Startup-sequence is a good place to put personalized commands. For example, if you like to keep your command directory in RAM for speed and convenience, you could insert these lines above the LoadWb line:

makedir ram:c
copy c to ram:c all quiet
cd ram:c

This copies all of the AmigaDOS commands from the C subdirectory on the floppy disk into a C subdirectory on the RAM disk. It also changes the current directory to the C subdirectory in RAM; so any AmigaDOS commands you type from then on will be loaded

from RAM: instead of from the floppy. In effect, this turns AmigaDOS into a memory-resident DOS, with all commands intrinsic instead of extrinsic. AmigaDOS responds much faster this way. However, this also uses up quite a bit of memory, so you may want to copy only the commands you use frequently.

Another useful startup action is to set the date and time. You can always do this with the Preferences tool or by opening a CLI and using the DATE command. However, it can be more convenient to enter the date when you first turn on your Amiga, allowing all files subsequently saved to be stamped with the current date and time. Just insert this line into startup-sequence:

date ?

The ? operator can be used in place of the parameter of a command. Instead of specifying the date, ? prompts the user to enter the date. It also displays the template for the date command (TIME,DATE, TO=VER/K:). If you like, use ECHO to display your own prompt, and > nil: to discard the template:

```
echo "Please enter the date and time."
echo "DD-MMM-YY HH:MM:SS"
date > nil:
```

From then on, whenever you boot up from this disk, you'll respond to the prompt by typing something like this:

27-jan-86 15:12

which automatically sets the system clock.

Variable Parameters

You can also send special options to your batch file. You enter these options on the command line along with the EXECUTE command. Just as with variables in BASIC, you can manipulate these parameters symbolically.

Let's say you'd like a batch file that gives you complete information on a file. It uses LIST to display the information about the file, and TYPE to display the file. You would use a command like EXECUTE SHOW RODEO to display the file RODEO. Use ED SHOW or COPY * TO SHOW to create this batch file:

```
.KEY name
LIST <name>
TYPE <name>
```

.KEY (don't forget the leading period) sets up a name for substitution text. Whatever you typed on the same line with EXECUTE is substituted wherever you use <name>. You must use the angular brackets, or LIST and TYPE would look literally for the file "name."

After creating this batch file, type this at an AmigaDOS prompt: EXECUTE SHOW S/STARTUP-SEQUENCE

The result is the same as if you had typed LIST S/STARTUP-SEQUENCE followed by TYPE S/STARTUP-SEQUENCE.

Other AmigaDOS commands let you check to see if the user has entered a specific string and check to see if a file exists. To prevent an error message, we can check to see if the file exists before we use LIST and TYPE:

```
.KEY name
IF EXISTS <name>
LIST <name>
TYPE <name>
ELSE
ECHO "<name> does not exist!"
ENDIF
```

Notice the use of IF, ELSE, and ENDIF. Looks like Amiga BASIC, doesn't it? In fact, the AmigaDOS IF-ELSE-END IF commands function very much like BASIC's. When the IF condition is true, AmigaDOS executes the following statements; otherwise the following statements are ignored. ELSE executes the statements following it only if the preceding IF was false. ENDIF cancels conditional processing and returns to executing all commands.

Any Parameters Missing?

Here's how to use the IF EQ option to test for the existence of a command-line parameter. If there is no parameter, <name> is null, so "<name>z" is simply "z". We use NOT to reverse the test. If the parameter "<name>z" is NOT equal to "z", then we must have a command line parameter. (We can't just test IF <name> NOT EQ "", since EQ wants two parameters, and the null string "" is not a parameter, but the lack of one.)

```
.KEY name
IF <name>z NOT EQ z
LIST <name>
TYPE <name>
ELSE
ECHO "You didn't give me anything to
```

```
SHOW."
ENDIF
```

Although you can't use leading spaces in the actual batch file, it's easier to follow the IF-ENDIF structures when you use indentation. Just don't type in the leading spaces. This version of the batch file SHOW checks both for the existence of the filename and for the presence of the filename parameter:

```
.KEY name
IF <name>z NOT EQ z
IF EXISTS <name>
LIST <name>
TYPE <name>
ELSE
ECHO "<name> does not exist!"
ENDIF
ELSE
ECHO "You didn't give me anything to SHOW."
ENDIF
```

You can use more than one parameter in the .KEY statement, just as many commands, such as DATE, accept two inputs.

If the user doesn't enter anything for the parameter, you can assign a default value using either .DEF or \$. If you use .DEF, the default phrase is used throughout the batch file. In this example, SHOW displays itself if you don't give it a filename.

```
.KEY name
.DEF s/show
LIST <name>
TYPE <name>
```

You can use \$ to substitute a default value only for the current substitution. Several batch commands may use the value in different ways, so each command may have its own default value. In the following example, LIST displays the whole directory if <name> is null, but TYPE types the file "TEMP" if <name> is null:

```
.KEY name
LIST <name>
TYPE <name>$temp
```

Labels And Branching

You can jump forward to a label with the SKIP command. You'd typically use SKIP along with an IF condition if you want to skip over a block of statements that shouldn't be executed if the IF was true. You declare the label with LAB. SKIP can't skip backward, only forward to a LAB statement. You can usually use IF and ELSE to accomplish the same thing, though.


```
.KEY name
IF exists <name>
TYPE <name>
SKIP ToMyLou
ENDIF
ECHO "<name> doesn't exist."
LAB ToMyLou
echo "Finished."
```

An EXECUTE command can execute another batch file, or even itself. This permits backward looping to some degree. Nested batch files can be quite handy. You can test and debug individual batch programs, then execute them together from a master execute script:

```
EXECUTE Greeting
EXECUTE GetDate
EXECUTE Assignments
```

The individual files could themselves contain other EXECUTE references.

ASSIGNing Shortcuts

If you're using EXECUTE a lot, you may grow weary of typing it. You can always rename EXECUTE to something short like x, but other batch programs may contain EXECUTE statements, requiring you to rename it back. Instead, you can use the ASSIGN command to assign any filename to a device name.

```
ASSIGN x: sys:c/EXECUTE
```

You can now use x: whenever you want to use the EXECUTE command. (The prefix sys:c/ makes sure that EXECUTE can be found no matter what directory you're in.)

The device name you create should not conflict with an existing one. To get a list of the current assignments, just type ASSIGN. You may want to ASSIGN d: c:list for a convenient and quick shorthand for directories (c: is synonymous with the C directory). You can then just type d: to get a LIST.

ASSIGN can be so handy for this kind of thing that you'll probably want to include your own sequence of ASSIGN commands within startup-sequence. If you put your ASSIGN statement within startup-sequence, you'll get these assignments for every session. Just remember that ASSIGN can only be used to attach a device name to a particular filename. ASSIGN d: "c:list quick" doesn't seem to work. Although LIST is a filename in the c directory, the "quick" parameter is not part of the filename. ©

Apple Disk Duper

Jason Coleman

Here's a program that lets you duplicate Apple disks quickly and conveniently. Though it can copy disks formatted for either DOS 3.3 or ProDOS, it must be run with ProDOS. It also requires 128K RAM.

Everyone knows the value of backing up disks. But how many of us take the time to make archive copies of important disks on a regular basis? "Apple Disk Duper" simplifies the process by making it possible to copy an entire disk in only two passes. It works on one- or two-drive systems with at least 128K RAM.

After typing in the program and saving a copy, simply run it and follow the instructions on the screen. Apple Disk Duper prompts you every step of the way.

Although the program runs only under ProDOS, it can copy DOS 3.3 disks as well as ProDOS disks. It works with any Apple Disk II-compatible drive, but not with the new 3½-inch UniDisk.

Apple Disk Duper

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

```
74 100 FOR X = 768 TO 785: READ
Y: POKE X,Y: NEXT
AA 110 DATA 32,0,191,129,9,3,176
,249,96,3,96,0,32,0,0,0,0
58 120 TEXT : HOME
47 130 VTAB 12: HTAB 12: PRINT "
DISK DUPLICATOR"
AA 140 VTAB 20: HTAB 9: PRINT "
HIT ANY KEY TO BEGIN":
POKE - 16368,0: GET ST$
```

```
4E 150 HOME
IC 160 VTAB 12: INPUT "ENTER NUM
BER OF DRIVES: ";ND$:ND =
VAL (ND$)
CB 170 IF ND < > 1 AND ND < > 2
THEN 390
FI 180 HOME : VTAB 12: PRINT "PU
T SOURCE DISK IN DRIVE 1"
7A 190 IF ND = 2 THEN VTAB 17: P
RINT "PUT DESTINATION DIS
K IN DRIVE2"
DB 200 VTAB 20: POKE - 16368,0:
PRINT "PRESS ANY KEY TO M
AKE COPY.": GET AK$
90 210 FB = 0:MX = 3
91 220 FOR N = 1 TO MX
C4 230 POKE 771,128
11 240 POKE 780,32: POKE 778,96
1E 250 FOR I = FB TO FB + 55
25 260 P2 = INT (I / 256):P1 = I
- 256 * P2
DE 270 POKE 782,P2: POKE 781,P1
58 280 CALL 768: POKE 780, PEEK
(780) + 2: NEXT I
84 290 IF N < MX THEN PRINT CHR$
(4)"BSAVE/RAM/COPY"N",A$
2000,L$6FFF":FB = FB + 56
62 300 NEXT N
28 310 IF ND = 1 THEN VTAB 12: P
RINT "PUT DESTINATION DIS
K IN DRIVE 1": GET AK$
ED 320 FOR N = MX TO 1 STEP - 1
FB 330 POKE 771,129: POKE 780,14
2
15 340 IF ND = 2 THEN POKE 778,2
24
68 350 IF N < MX THEN PRINT CHR$
(4)"BLOAD/RAM/COPY"N";N
79 360 FOR I = FB + 55 TO FB STE
P - 1:P2 = INT (I / 256):
P1 = I - 256 * P2
DF 370 POKE 782,P2: POKE 781,P1
71 380 CALL 768: POKE 780, PEEK
(780) - 2: NEXT I
88 390 FB = FB - 56
63 400 NEXT N
18 410 IF MX = 2 THEN 440
60 420 MX = 2:FB = 168: IF ND =
1 THEN VTAB 12: PRINT "PU
T SOURCE DISK IN DRIVE 1
": GET AK$
16 430 GOTO 220
07 440 HOME : VTAB 12: HTAB 15:
INVERSE : PRINT "COPY COM
PLETE": NORMAL : END ©
```


Smooth-Scrolling Billboards For IBM

Paul W. Carlson

Do you want to leave a message on your computer screen that's sure to be noticed? Or would you like to create an eye-catching display in a shop window that effectively communicates your message to the public? The programs presented here let you easily produce smooth-scrolling billboards on the 40- or 80-column screen of your IBM PC (with color/graphics adapter and BASICA) or PCjr (with Cartridge BASIC).

To be really effective, a billboard program must *smoothly* scroll its message across the screen. Programs that jerk the letters across the screen are very hard on the eyes. The speed necessary for smooth scrolling can be achieved only by avoiding the routines in the BIOS (Basic Input/Output System) and writing directly to video memory. However, this can cause a problem when text is used in graphics modes—writing directly to video memory disrupts the character generator. As a result, small flickering lines appear on the screen (for more details, see *COMPUTE! Books' Mapping the IBM PC and PCjr*, pages 193–198).

This problem can be solved by writing to video memory only during the time when the monitor's raster beam is in vertical retrace, while the display is idle. On some IBM-compatible computers (the

Compaq, for example), the problem can be avoided by writing to an inactive page of video memory and then making it the active page. The programs following this article make use of both methods.

With some computer and graphics card combinations, a few flickering lines remain at the very top of the screen when running the 80-column billboard program. These could have been eliminated, but only at the expense of speed and smoothness. About 300 characters can be written to video memory during the vertical retrace period, and 640 characters (eight lines of 80) need to be written for each screen update. Therefore, to eliminate the flickering lines entirely, we'd have to wait for three vertical retrace periods. These lines are less objectionable than the loss of smoothness caused by waiting for an extra retrace period.

Creating Billboards

Program 1 is for creating billboards on the 40-column screen, and Program 2 is for the 80-column screen. Both programs are extremely easy to use. After typing RUN, simply enter any text string at the prompt. If you want your message to contain a comma, enclose the entire text string in double quotes. When you press ENTER, the message enlarges and begins scrolling. It can be stopped at any time by pressing the Q key.

The programs can be customized to suit your taste. The character that forms the large letters can be changed from a solid block to another character by changing the DATA statement identified in the listing. For example, to change the solid block to a smiling face, change the DB to 02 in line 300. You can also modify the scrolling speed by changing the two bytes identified in the listing (the second byte has 256 times the effect of the first byte).

How It Works

The techniques used here can be applied to any program that must update a text screen very rapidly, so a brief description of the steps involved may be useful.

1. Set up a buffer in memory equal in size to the block of characters to be written to the screen (8×80 for the 80-column billboard).
2. For each input character, access the character PEL map in ROM at FFA6:OE. By columns, depending on whether or not a bit is set, put the code for a solid block or a space into the rightmost column of the buffer array.
3. When a column is complete, scroll the whole buffer one column to the left.
4. Wait for the beginning of a vertical retrace period, then copy the buffer to the inactive screen.
5. Make the inactive screen the active screen.

6. Do the next column in step 2.

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

Program 1: 40-Column Billboards

```
EM 10 ' Forty Column Scrolling
      Billboard
JO 20 '
LJ 30 ' Press the "Q" key to qu
      it.
JA 40 '
DI 50 DEF SEG: CLEAR, &H3FF0: N=&H4
      60A
QL 60 FOR J=0 TO 249: READ A$
BB 70 POKE N+J, VAL("&H"+A$): NEXT
FA 80 KEY OFF: CLS: SCREEN 0: WIDTH
      80
GL 90 INPUT "Text string"; T$: T$=T
      $+" "
FF 100 N=&H4000: K=LEN(T$): FOR J=
      1 TO K
LP 110 POKE N, ASC(MID$(T$, J, 1)):
      N=N+1
OA 120 NEXT: POKE N, 0: CLS: WIDTH 4
      0
JL 130 LOCATE,, 0: N=&H460A: CALL N
CC 140 WIDTH 80: CLS: KEY ON: END
EB 150 DATA 06, 8B, EC, 8C, D8, 8E, C0
      , B9
EN 160 DATA 80, 02, 8D, 3E, 08, 41, 1E
      , B8
KK 170 DATA 00, B8, 8E, D8, BE, 30, 02
      , F3
BB 180 DATA A4, 1F, B8, A6, FF, 8E, C0
      , 8D
GB 190 DATA 36, 00, 40, 8A, 1C, 46, 80
      , FB
JK 200 DATA 00, 74, F4, B7, 00, D1, E3
      , D1
KI 210 DATA E3, D1, E3, 83, C3, 0E, B9
      , 08
FK 220 DATA 00, 33, FF, 26, 8A, 07, 88
      , B5
GJ 230 DATA 00, 41, 47, 43, E2, F5, 56
      , 06
DK 240 DATA B9, 09, 00, 51, 33, FF, B9
      , 08
FI 250 DATA 00, BB, 4E, 00, D0, A5, 00
      , 41
MK 260 DATA 72, 04, B0, 20, EB, 02, B0
DF 270 ' The following value is
      the
JF 280 ' ASCII code of character
      that
HE 290 ' forms the large text.
HP 300 DATA DB
JH 310 DATA 88, 87, 08, 41, 83, C3, 50
      , 47
DN 320 DATA E2, EA, EB, 02, EB, B5, 8C
      , DB
CF 330 DATA 8E, C3, FC, B8, 08, 00, 8D
      , 36
EK 340 DATA 0A, 41, 8D, 3E, 08, 41, B9
      , 4E
FC 350 DATA 00, F3, A4, 46, 46, 47, 47
      , 48
MF 360 DATA 75, F4, A0, 08, 46, 34, 01
      , A2
HI 370 DATA 08, 46, B4, 05, 50, A8, 01
      , 75
BO 380 DATA 05, B8, 00, B8, EB, 03, B8
      , 80
BE 390 DATA B8, BE, C0, B9, A0, 00, BF
      , 30
HK 400 DATA 02, 8D, 36, 08, 41, BA, DA
      , 03
OK 410 DATA EC, AB, 08, 75, FB, EC, AB
      , 08
```

```
GC 420 DATA 74, FB, F3, A5, EB, 04, EB
      , 8B
JE 430 DATA EB, AA, B9, A0, 00, BA, DA
      , 03
OA 440 DATA EC, AB, 08, 75, FB, EC, AB
      , 08
IJ 450 DATA 74, FB, F3, A5, 58, CD, 10
      , B9
FF 460 ' The following two value
      s are the
FJ 470 ' time delay constant in
      the order
KH 480 ' least sig. byte, most s
      ig. byte.
CP 490 DATA 01, 00
AG 500 DATA E2, FE, 59, E2, DF, 07, 5E
      , B4
AG 510 DATA 06, B2, FF, CD, 21, 3C, 71
      , 74
MN 520 DATA 06, 3C, 51, 74, 02, EB, CF
      , BB
FP 530 DATA E5, 07, B8, 00, 05, CD, 10
      , CB
```

Program 2: 80-Column Billboards

```
KF 10 ' Eighty Column Scrolling
      Billboard
JO 20 '
LJ 30 ' Press the "Q" key to qu
      it.
JA 40 '
DI 50 DEF SEG: CLEAR, &H3FF0: N=&H4
      60A
HC 60 FOR J=0 TO 250: READ A$
BB 70 POKE N+J, VAL("&H"+A$): NEXT
FA 80 KEY OFF: CLS: SCREEN 0: WIDTH
      80
GL 90 INPUT "Text string"; T$: T$=T
      $+" "
FF 100 N=&H4000: K=LEN(T$): FOR J=
      1 TO K
LP 110 POKE N, ASC(MID$(T$, J, 1)):
      N=N+1
HD 120 NEXT: POKE N, 0: CLS
JL 130 LOCATE,, 0: N=&H460A: CALL N
CC 140 WIDTH 80: CLS: KEY ON: END
EB 150 DATA 06, 8B, EC, 8C, D8, 8E, C0
      , B9
BH 160 DATA 00, 05, 8D, 3E, 08, 41, 1E
      , B8
CP 170 DATA 00, B8, 8E, D8, BE, 60, 04
      , F3
BB 180 DATA A4, 1F, B8, A6, FF, 8E, C0
      , 8D
GB 190 DATA 36, 00, 40, 8A, 1C, 46, 80
      , FB
JK 200 DATA 00, 74, F4, B7, 00, D1, E3
      , D1
KI 210 DATA E3, D1, E3, 83, C3, 0E, B9
      , 08
FK 220 DATA 00, 33, FF, 26, 8A, 07, 88
      , B5
GJ 230 DATA 00, 41, 47, 43, E2, F5, 56
      , 06
DK 240 DATA B9, 09, 00, 51, 33, FF, B9
      , 08
KI 250 DATA 00, BB, 9E, 00, D0, A5, 00
      , 41
MK 260 DATA 72, 04, B0, 20, EB, 02, B0
DF 270 ' The following value is
      the
JF 280 ' ASCII code of character
      that
HE 290 ' forms the large text.
HP 300 DATA DB
GN 310 DATA 88, 87, 08, 41, B1, C3, A0
      , 00
JO 320 DATA 47, E2, E9, EB, 02, EB, B4
      , 8C
GE 330 DATA DB, BE, C3, FC, B8, 08, 00
      , 8D
```

```
NE 340 DATA 36, 0A, 41, 8D, 3E, 08, 41
      , B9
CP 350 DATA 9E, 00, F3, A4, 46, 46, 47
      , 47
PJ 360 DATA 48, 75, F4, A0, 08, 46, 34
      , 01
JD 370 DATA A2, 08, 46, B4, 05, 50, A8
      , 01
BK 380 DATA 75, 05, B8, 00, B8, EB, 03
      , B8
MH 390 DATA 00, B9, 8E, C0, B9, 40, 01
      , BF
NG 400 DATA 60, 04, 8D, 36, 08, 41, BA
      , DA
DF 410 DATA 03, EC, AB, 08, 75, FB, EC
      , AB
KO 420 DATA 08, 74, FB, F3, A5, EB, 04
      , EB
HC 430 DATA 8A, EB, AA, B9, 40, 01, BA
      , DA
EL 440 DATA 03, EC, AB, 08, 75, FB, EC
      , AB
FI 450 DATA 08, 74, FB, F3, A5, 58, CD
      , 10
AF 460 DATA B9
FH 470 ' The following two value
      s are the
FL 480 ' time delay constant in
      the order
LJ 490 ' least sig. byte, most s
      ig. byte.
BO 500 DATA 01, 00
BI 510 DATA E2, FE, 59, E2, DF, 07, 5E
      , B4
BI 520 DATA 06, B2, FF, CD, 21, 3C, 71
      , 74
MP 530 DATA 06, 3C, 51, 74, 02, EB, CF
      , BB
FB 540 DATA E5, 07, B8, 00, 05, CD, 10
      , CB
```

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Commodore 64 Screen Genie

James A. Ledger

This thoughtfully designed utility helps you draw complete screens using character graphics. When you're finished, it writes a complete BASIC routine to recreate the graphics screen. The program runs on any Commodore 64 (or 128 in 64 mode) with either disk or tape.

"Commodore 64 Screen Genie" is both a screen editor and a program generator. With it, you can quickly and easily draw backgrounds for games, colorful title screens, or just pages of instructions. It offers a wealth of editing commands for designing a text or graphics character screen in normal, multicolor, or extended background mode. Then, almost instantly, it can write a BASIC routine to recreate that screen. This new routine is merged with whatever program is in memory. Since Screen Genie takes up no BASIC program space, it can be used with many other utilities such as the DOS Wedge, "TurboDisk," or "MetaBASIC."

Screen Genie is written entirely in machine language, so you'll need to enter it with the MLX machine language entry program found elsewhere in this issue. Follow the MLX instructions closely; here are the addresses you'll need for MLX:

Starting address: 0801
Ending address: 1D10

Built-In Help Screen

Screen Genie loads and runs like a normal BASIC program. Once you run it, however, the program

breaks into several modules which move to various places, leaving the BASIC program space completely free (more on this process later).

The first thing you'll see is a help screen showing all of the Screen Genie commands. Fortunately, you don't have to memorize all the commands shown here. Since the help screen is always available, the only key sequence you need to remember is CTRL-H (hold down CTRL and press H). Selecting any command from the help screen returns you to the work screen and performs that command. Pressing any other key simply returns you to the work screen. Of course, all of the commands are also available directly from the work screen.

The help screen serves another purpose by indicating which modes and cursor functions are selected. For instance, if you select the Paint cursor function by pressing the f3 function key, a white arrow appears next to that option on the help screen.

Once you enter the work screen, almost all of the keys work as they normally do—text and graphics characters can be typed in whatever color you like. However, you may not type a quotation mark, insert a character by pressing SHIFT-INST/DEL, or break out of the program by pressing RUN/STOP-RESTORE. The delete key (DEL) is not disabled, but works in a slightly different way: It erases the character at the cursor position and moves the cursor one space left, but it doesn't drag any characters on the right with it.

Finally, to prevent the screen from scrolling, you are not allowed to type anything in the bottom right corner. Instead, this space is used to show the current color for the characters you're typing. That's a handy feature, since the cursor itself is no longer a blinking box. Instead, it's a blinking black and white underline.

Immediate Commands

Screen Genie's commands are divided into four groups: immediate commands, cursor functions, screen modes, and color selection. Here is an explanation of the immediate commands:

CTRL-H (Help). Display help screen.

CTRL-T (Top clear). Clear from the top of the screen to the current cursor position.

CTRL-B (Bottom clear). Clear from the bottom of the screen to the current cursor position.

CTRL-M (Move). Move a block of characters from one screen location to another. Before you can move a block, you must first define its upper-left and lower-right corners. Press CTRL-M, then place the cursor on the upper-left corner of the block you want to move, and press RETURN. Move the cursor to the lower right corner of the block, then press RETURN a second time. Now the block is defined. To move it elsewhere on the screen, move the cursor to the place where you want to put the upper-left corner of the new block, then press RETURN. The contents of the new area are replaced by the contents of the defined block (note that the original

area is not disturbed). The Move command does not permit you to place the new block in any position that would overlap a screen border; all of the new block must fit inside the screen.

CTRL-Z (Memorize). Memorize the current screen by saving its contents in a memory buffer. A saved screen can be restored with CTRL-O.

CTRL-O (Oops). Swap the current screen with whatever is stored in the buffer. Pressing it again swaps it back. Besides restoring the screen after a manual save (CTRL-Z), this command can also undo any screen clear or move command.

CTRL-P (Program). Write a series of BASIC program lines to recreate the screen you've designed. These lines, beginning with the line number you choose, are merged with whatever BASIC program is in memory, if any. This feature performs a true merge, rather than simply tacking program lines onto the end of the current program. However, it does not replace any existing lines. If the merge operation would replace an existing program line, Screen Genie displays a message and gives you a chance to choose a new beginning line number.

The Program option also lets you add a line to set specific background and border colors. Likewise, if you're in extended background or multicolor mode when you choose this feature, you're given the option of adding lines that perform the setup for the current mode.

Finally, you have the option of adding a program line that waits for the user to press any key. This is useful for multiple pages of instructions, and so forth. Just be sure to include a prompt such as PRESS ANY KEY TO CONTINUE somewhere on the screen. If you choose this option while in extended background or multicolor mode, you may also add a line to turn the mode off after a key is pressed.

The default setting for all Program options is yes. Pressing any key other than Y or RETURN at the prompt selects no. If you have two or more sequential screens that use the same colors or mode, then you need only set these up on the first screen and turn the respective

mode off on the last screen.

CTRL-X (Exit to BASIC). This lets you save, load, and edit BASIC programs as usual. Screen Genie is designed so that you can exit to BASIC and later reactivate the utility without disturbing a BASIC program in memory. To reactivate Screen Genie, just type GENIE and press RETURN.

Under ordinary circumstances, pressing RUN/STOP-RESTORE does not disable Screen Genie. If you disable it in some other way, type SYS 50800 and press RETURN to start it up again. When you reenter Screen Genie, the work screen contains whatever was on the screen when you left BASIC: Press CTRL-O immediately to recall what you were working on at the time of your last exit.

Since the GENIE command works in program mode as well as direct mode, you can edit a previously designed screen by inserting the word GENIE just after the last PRINT statement, and then running only that portion of the program that displays the screen. For example, if the routine that recreates your screen uses lines 500-525, then you could add GENIE to the end of line 525 (or the beginning of line 526) and type RUN 500. You'll need to give the new screen a different beginning line number, and then delete the old routine when you exit. (Don't forget to remove the GENIE command from the program when it's finished.)

Modes

In addition to ordinary text mode (what you see when you turn on the 64), Screen Genie lets you work in extended background color mode or multicolor mode, or replace the usual character set with a custom-defined character set of your own. Consult the *Commodore 64 User's Guide* for additional information on how to use these modes.

CTRL-K (Extended background). This mode permits each character to have any of four different background colors, but lets you use only the first 64 characters of the character set.

CTRL-C (Multicolor). Since the ordinary character set looks quite strange in multicolor mode, this

mode will most likely require a custom character set. It cannot be used at the same time as extended background mode; selecting one mode turns the other off.

CTRL-U (User-defined characters). Selecting this mode causes the 64 to use a custom character set. Only the uppercase/graphics character set is available in this mode. Before choosing this option, you must store the character definitions in memory beginning at location 61440. Note that this configuration is only needed while you're editing the screen with Screen Genie. Once the screen design is done, and you have generated a BASIC routine to recreate the screen (see the Program option above), you can change your program to use whatever character set and memory locations you want.

Custom character mode demands a little more effort on your part. As in other cases, Screen Genie's Program option generates a complete routine with all of the necessary PEEKs, POKes, and PRINTs needed to reproduce the screen. However, it's your job to put the custom character definitions in memory, decide on a location for the screen, and perform the extra POKes needed to set everything up.

Cursor Functions

This group of options gives you additional control over the drawing cursor. They are selected by pressing one of the odd-numbered function keys. Any or all of these may be turned on at one time; however, if the Draw function (f1) is active, it takes precedence over the other three.

f1 (Draw with the cursor). This option lets you draw with any character. There are two ways to select the drawing character. You can either move the cursor to the desired character and press f1, or press f1 and type the character you want to use. To erase, press the space bar.

f3 (Paint with the cursor). Select a painting color just as you would normally change the cursor color in BASIC. Press CTRL or the Commodore key along with a number key from 1-8.

f5 (Change case with the cursor). This is very useful in extended

background mode where a shifted character has a different background color.

f7 (Reverse characters with cursor). This option is also handy in extended background mode, where reversing a character gives it a different background color. When you reverse a space character in normal mode, it has whatever color happens to be stored in color memory—unless the color happens to be the same as the background color, in which case it is changed to the current text color in order to make it visible. You can guarantee the color of reversed spaces by turning on the Paint function at the same time.

Color Control

The even-numbered function keys provide you with complete color control as follows:

f2. Cycle the border color (memory location 53280).

f4. Cycle the normal background color (location 53281).

f6. The menu lets you cycle background color registers one, two, and three (these color registers are used only in extended background or multicolor mode).

f8. Cycle the color of every character that is the same color as the character under the cursor. If you continue to press f8, Screen Genie remembers which characters you started changing and cycles only those characters, rather than switching to new ones each time. As soon as you press any other key, however, these characters are forgotten.

Compatibility

Screen Genie is designed to coexist with other Commodore 64 utilities as peacefully as possible. To minimize memory conflicts, nearly all of its program code and workspace areas reside in the hidden RAM under the 64's BASIC ROM, Kernal ROM, and I/O address space. Even so, some not-so-hidden RAM had to be used. The memory locations from 50800-52223 (\$C670-\$CBFF) are used for links to the system, interrupt-driven routines, sprite shapes, and screen memory. This still leaves locations 49152-50799 (\$C000-\$C66F) free for programs such as "TurboDisk," and locations

52224-53247 (\$CC00-\$CFFF) free for programs such as the DOS Wedge. Programs which reside in the upper BASIC program area, such as "MetaBASIC," will not be affected at all.

If you want to use other utilities with this program, install them *before* you load Screen Genie. There is one minor quirk when using Screen Genie with MetaBASIC. Screen Genie wedges itself in through the BASIC error vector at 768-769, which is reset by some of the commands in MetaBASIC. No harm is done when this occurs—you'll just have to reenter Screen Genie with SYS 50800 rather than the more convenient GENIE command.



The "Screen Genie" screen editor/program generator makes it easy to create graphic screens like this and incorporate them in your own Commodore 64 BASIC programs.

Screen Genie For Commodore 64

Please refer to the "MLX" article in this issue before entering the following listing.

```
0801:18 08 0A 00 9E 32 30 37 B5
0809:34 3A 53 43 52 45 45 4E E0
0811:20 47 45 4E 49 45 00 00 EF
0819:00 A9 04 85 0E A9 0D 85 23
0821:0F A9 00 85 10 A9 A0 85 69
0829:11 A2 0F A0 00 88 B1 0E E9
0831:91 10 C0 00 D0 F7 E6 0F 69
0839:E6 11 CA 30 06 D0 EE A0 4F
0841:88 D0 EA A0 80 B9 8B 1C 4F
0849:99 6F C6 88 D0 F7 A0 00 0B
0851:98 99 00 C7 88 D0 FA A9 B7
0859:FF 8D 15 C7 A0 3F 99 40 61
0861:C7 88 10 FA A0 15 A9 C0 96
0869:99 80 C7 88 88 88 10 F8 67
0871:A9 FF 8D 80 C7 8D 83 C7 53
0879:8D D2 C7 8D D5 C7 A0 0F F4
0881:A9 03 99 C0 C7 88 88 88 60
0889:10 F8 78 A9 22 85 01 A9 5C
0891:D0 A0 E0 A2 10 20 EF AA 04
0899:A9 26 85 01 58 20 78 AB A8
08A1:18 20 92 A4 A9 01 20 CF C3
08A9:AA A9 00 AD 11 D0 48 29 D9
08B1:EF 8D 11 D0 A9 09 A2 09 0C
08B9:20 9B A5 38 20 92 A4 68 F5
08C1:85 48 20 C9 AA A9 17 A2 14
08C9:0A 20 9B A5 A9 C8 A0 B8 1F
08D1:A2 04 20 EF AA A9 D8 A0 85
```

```
08D9:BC A2 04 20 EF AA A9 E1 D2
08E1:A2 09 20 9B A5 A9 00 8D A4
08E9:01 08 8D 02 08 A9 03 85 C0
08F1:2D 85 2F 85 31 A9 08 85 FD
08F9:2E 85 30 85 32 AD 11 D0 1C
0901:09 10 8D 11 D0 4C 39 A4 2D
0909:93 0D 0D 20 20 1C 12 02 63
0911:08 20 2A 2A 2A 20 57 4F E6
0919:52 4B 2D 53 43 52 45 45 35
0921:4E 20 2A 2A 2A 02 08 20 D3
0929:92 02 05 0D 02 04 20 1E F4
0931:54 4F 20 52 45 2D 45 4E 22
0939:54 45 52 20 41 46 54 45 24
0941:52 20 45 58 49 54 20 54 E2
0949:4F 20 42 41 53 49 43 0D BA
0951:0D 02 04 20 54 59 50 45 DA
0959:20 12 20 47 45 4E 49 45 B3
0961:20 92 20 41 4E 44 20 50 54
0969:52 45 53 53 20 52 45 54 BE
0971:55 52 4E 0D 0D 02 04 20 F5
0979:98 28 20 4F 52 20 12 20 32
0981:53 59 53 20 35 30 38 30 0B
0989:30 20 92 20 29 02 06 0D 7A
0991:02 04 20 81 50 52 45 53 6B
0999:53 20 12 53 48 49 46 54 1D
09A1:2D 43 4C 52 92 20 54 4F D6
09A9:20 43 4C 45 41 52 20 53 61
09B1:43 52 45 45 4E 02 07 0D 8C
09B9:02 04 20 1F 43 55 52 52 2A
09C1:45 4E 54 20 43 4F 4C 4F D5
09C9:52 20 49 4E 44 49 43 41 2A
09D1:54 45 44 20 48 45 52 45 2B
09D9:2D 2D 2D 2D 3E 13 00 CE
09E1:98 13 1D 1D 43 4F 4D 50 BC
09E9:55 54 45 21 1D 50 55 42 8D
09F1:4C 49 43 41 54 49 4F 4E AD
09F9:53 1D 50 52 45 53 45 4E 7C
0A01:54 53 02 04 11 02 08 9D D2
0A09:1D 1D 1D 1D 1D 1D 1D 1D
0A11:1D 1D 1D 1D 1D 00 93 9E 1F
0A19:75 02 26 63 69 62 20 98
0A21:75 63 69 75 63 69 B0 63 D2
0A29:69 75 63 69 75 63 69 B2 11
0A31:20 B2 20 75 63 69 75 89
0A39:63 69 B2 20 B2 20 B2 75 A2
0A41:63 69 20 20 62 62 20 20 64
0A49:6A 63 69 62 20 20 62 63 68
0A51:6B AB B3 20 AB B3 20 62 4D
0A59:6D 62 20 20 62 63 B2 AB 74
0A61:B3 20 62 6D 62 20 62 AB 7E
0A69:B3 20 20 20 62 62 20 62 62
0A71:6A 60 6B 6A 63 6B B1 20 33
0A79:6D 6A 63 6B 6A 63 6B B1 6B
0A81:20 B1 20 20 6A 63 6B 6A 3A
0A89:63 6B B1 20 B1 20 B1 6A 3E
0A91:63 6B 20 20 62 6A 62 26 1F
0A99:63 6B 99 75 02 12 60 69 47
0AA1:9C 75 02 12 60 69 99 62 01
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0AE1:99 62 48 2D 48 45 4C 50 77
0AE9:20 28 54 48 49 53 20 4D 4C
0AF1:45 4E 55 29 62 9C 62 46 0A
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0B01:20 5F 62 99 62 42 2D 43 9E
0B09:4C 45 41 52 20 54 4F 20 F4
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0B19:9C 62 46 33 2D 50 41 49 88
0B21:4E 54 02 09 20 5F 62 99 21
0B29:62 54 2D 43 4C 45 41 52 AB
0B31:20 54 4F 20 54 4F 50 02 DA
0B39:04 20 62 9C 62 46 35 2D 33
0B41:43 48 41 4E 47 45 20 43 EA
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0B51:99 62 4D 2D 4D 4F 56 45 E2
0B59:02 0C 20 62 9C 62 46 37 CF
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1419:06	14	26	15	B0	BC	98	65	6E	16A1:20	F3	A9	4C	D0	A6	A2	05	40	1929:8D	1D	D0	8D	1B	D0	A9	13	DE
1421:14	85	14	A5	15	69	00	B0	90	16A9:95	2D	CA	94	2D	CA	10	F8	3C	1931:20	D2	FF	60	78	48	A9	24	8A
1429:B1	85	15	4C	E1	A6	A5	14	FB	16B1:20	73	A5	A5	1A	85	0E	A5	82	1939:85	01	68	60	48	A9	26	85	3C
1431:85	1C	A5	15	C9	FA	90	07	8B	16B9:1B	85	0F	A9	00	85	5F	A9	CF	1941:01	68	58	60	86	56	85	57	0F
1439:AD	DC	A2	AC	4C	DB	A6	85	31	16C1:D0	85	60	20	73	A5	20	7C	B4	1949:A2	03	A9	00	95	58	CA	10	76
1441:1D	A9	00	85	1A	A9	D0	85	59	16C9:C6	20	B5	AA	4C	96	A9	20	F2	1951:FB	A0	0F	06	56	26	57	78	5E
1449:1B	A5	47	29	10	F0	1D	20	82	16D1:81	AA	B1	16	20	87	AA	60	D5	1959:F8	A5	58	65	58	85	58	5A	02
1451:15	AB	20	53	AB	20	6D	AB	8C	16D9:20	81	AA	B1	18	20	87	AA	E1	1961:59	65	59	85	59	A5	5A	65	98
1459:D0	30	A9	00	8D	B7	AD	20	F1	16E1:29	0F	60	A9	19	85	26	A9	E1	1969:5A	85	5A	D8	58	88	10	E3	EB
1461:0E	AA	A9	D6	A2	AD	20	41	2B	16E9:00	85	16	85	18	A9	F8	85	71	1971:A2	02	B5	58	48	4A	4A	4A	FB
1469:AA	4C	87	A7	24	48	50	1A	62	16F1:17	A9	FC	85	19	60	20	E4	7B	1979:A4	20	8A	AC	68	29	0F	20	1B
1471:20	15	AB	20	53	AB	20	6D	5D	16F9:FF	F0	FB	60	20	E4	FF	F0	6D	1981:8A	AC	CA	10	ED	A5	5B	D0	0C
1479:AB	D0	0F	A9	3A	8D	B7	AD	4D	1701:FB	C9	59	F0	0B	C9	0D	F0	64	1989:03	20	8E	AC	60	C5	5B	F0	A3
1481:20	0E	AA	A9	FD	A2	AD	20	23	1709:07	08	A9	4E	20	D2	FF	28	4B	1991:FB	09	30	85	5B	4C	D2	FF	14
1489:41	AA	20	0E	AA	A5	41	20	70	1711:60	A9	FF	20	2E	AA	A0	2E	66	1999:20	9D	9D	00	93	1F	02	0A	1E
1491:5B	AA	8D	7E	AD	8E	7D	AD	FB	1719:AA	A5	14	20	2E	AA	A5	15	07	19A1:0D	4C	41	53	54	20	4C	49	CF
1499:A5	42	20	5B	AA	8D	88	AD	29	1721:20	2E	AA	20	85	C6	90	02	AC	19A9:4E	45	20	4E	55	4D	42	45	E6
14A1:8E	87	AD	A5	46	29	02	F0	CE	1729:E6	40	E6	14	D0	02	E6	15	6A	19B1:52	20	55	53	45	44	3A	20	C4
14A9:0F	A9	FF	D0	02	A9	32	8D	F3	1731:60	20	31	AC	A0	00	91	1A	CA	19B9:00	93	12	1C	2A	2A	2A	20	43
14B1:8F	AD	20	53	AB	A9	72	A2	D1	1739:20	39	AC	E6	1A	D0	02	E6	C8	19C1:49	4E	56	41	4C	49	44	20	3B
14B9:AE	20	9B	A5	20	F9	A9	D0	1C	1741:1B	E6	54	60	85	10	86	11	D1	19C9:45	4E	54	52	59	20	2A	2A	AB
14C1:07	A9	76	A2	AD	4C	C9	A7	AA	1749:A0	00	B1	10	C9	FF	F0	03	32	19D1:2A	92	20	54	52	59	20	41	80
14C9:A9	8A	A2	AD	20	41	AA	20	14	1751:20	2E	AA	E6	10	D0	02	E6	8D	19D9:47	41	49	4E	2E	0D	00	0D	C0
14D1:6C	AA	24	48	70	26	20	0E	21	1759:11	C9	00	D0	EB	60	A2	FF	B5	19E1:1C	4C	49	4E	45	20	4E	55	DF
14D9:A9	A0	27	20	CC	A9	C9	60	E6	1761:29	0F	C9	0A	90	06	A2	31	D4	19E9:4D	42	45	52	20	45	58	43	2B
14E1:F0	0F	C9	A0	F0	04	C9	E0	95	1769:18	69	26	60	69	30	60	A5	3B	19F1:45	45	44	53	20	36	33	39	4F
14E9:D0	0B	20	05																							


```

1A99:00 97 31 39 38 2C 30 3A 7A
1AA1:92 31 39 38 2C 31 00 97 D3
1AA9:35 33 32 38 32 2C 30 30 E1
1AB1:3A 97 35 33 32 38 33 2C C7
1AB9:30 30 3A 97 35 33 32 38 E5
1AC1:34 2C 30 30 00 97 35 33 20
1AC9:32 36 35 2C C2 28 35 33 62
1AD1:32 36 35 29 AF 31 39 31 CB
1AD9:00 97 35 33 32 37 30 2C C8
1AE1:C2 28 35 33 32 37 30 29 53
1AE9:B0 31 36 00 97 35 33 32 B3
1AF1:37 30 2C C2 28 35 33 32 2E
1AF9:37 30 29 AF 32 33 39 00 C6
1B01:97 35 33 32 36 35 2C C2 7B
1B09:28 35 33 32 36 35 29 B0 B3
1B11:36 34 00 0D 0D 41 44 44 7A
1B19:20 4C 49 4E 45 20 54 4F 23
1B21:20 53 45 54 20 55 50 0D 2E
1B29:00 45 58 54 45 4E 44 45 32
1B31:44 20 42 41 43 4B 47 52 16
1B39:4F 55 4E 44 20 4D 4F 44 93
1B41:45 20 4F 52 0D 4D 55 4C C5
1B49:54 49 43 4F 4C 52 20 4D 92
1B51:4F 44 45 3F 20 59 9D 00 7E
1B59:42 41 43 4B 47 52 4F 55 95
1B61:4E 44 20 52 45 47 49 53 26
1B69:54 45 52 53 20 31 2D 33 ED
1B71:3F 20 59 9D 00 42 41 43 23
1B79:4B 47 52 4F 55 4E 44 20 F2
1B81:26 20 42 4F 52 44 45 52 90
1B89:20 43 4F 4C 4F 52 53 3F F8
1B91:20 59 9D 00 0D 0D 41 44 45
1B99:44 20 4C 49 4E 45 20 54 34
1BA1:4F 20 54 55 52 4E 20 4F C2
1BA9:46 46 0D 00 93 0D 1C 12 51
1BB1:02 05 20 50 52 45 53 53 D4
1BB9:20 4B 45 59 53 20 31 2D BB
1BC1:33 20 54 4F 20 43 59 43 1D
1BC9:4C 45 20 43 4F 4C 4F 52 4C
1BD1:53 02 05 20 92 02 03 0D 84
1BD9:00 0D 97 02 1D 20 6F 02 B0
1BE1:04 B7 70 0D 02 05 20 42 8D
1BE9:41 43 4B 47 52 4F 55 4E 38
1BF1:44 20 52 45 47 49 53 54 4B
1BF9:45 52 20 20 30 20 20 A5 55
1C01:02 04 20 A7 0D 02 1D 20 84
1C09:6C 02 04 AF BA 0D 0D 00 97
1C11:0D 0D 0D 12 1F 02 06 20 03
1C19:50 52 45 53 53 20 27 53 A8
1C21:50 41 43 45 27 20 46 4F 24
1C29:52 20 57 4F 52 4B 2D 53 DF
1C31:43 52 45 45 4E 02 05 20 41
1C39:92 00 89 8A 8B 8C 85 86 B4
1C41:87 88 02 14 0D 0F 08 10 A5
1C49:18 1A 0B 03 15 A1 35 A1 E0
1C51:3B A2 2B A1 CD A1 B0 A1 47
1C59:41 A1 A1 A1 50 A1 03 A1 99
1C61:18 A2 8F A4 15 A4 1F A6 AA
1C69:A2 A6 05 A1 5F A1 66 A1 47
1C71:7D A1 94 90 05 1C 9F 9C E0
1C79:1E 1F 9E 81 95 96 97 98 43
1C81:99 9A 9B 00 63 00 8B 00 D2
1C89:B3 50 F2 20 8E C6 4C 1D 55
1C91:A4 20 93 C6 4C 69 FE 20 29
1C99:93 C6 20 33 A5 4C 8E C6 C6
1CA1:20 93 C6 20 13 A6 4C 8E 04
1CA9:C6 A9 26 85 01 60 48 A9 90
1CB1:27 85 01 68 60 A5 12 F0 34
1CB9:1B C6 13 D0 17 A9 14 85 AD
1CC1:13 AD 27 D0 49 01 8D 27 71
1CC9:D0 AD 2D D0 49 01 8D 2D 1F
1CD1:D0 8D 2E D0 4C 31 EA E0 86
1CD9:0B F0 03 4C 8B E3 A5 7A AA
1CE1:8D DB C6 A5 7B 8D DC C6 9D
1CE9:A0 04 AD DB C6 D0 03 CE 35
1CF1:DC C6 CE DB C6 AD 01 08 D8
1CF9:D9 EA C6 D0 DE 88 10 EA E3
1D01:68 68 4C 70 C6 47 45 4E 46
1D09:49 45 40 AA 00 00 00 00 EB

```

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Screen Saver 64

Stephen E. Masters

Here are two fast, useful routines for storing and retrieving high-resolution graphics screens with a disk drive. They work with the Commodore 64 or Commodore 128 in 64 mode.

Taking advantage of the Commodore 64's high-resolution graphics can be a time-consuming process at best. Even with extra commands such as those found in Simons' BASIC, it may take many minutes or even hours to plot a detailed screen. Utilities for dumping a high-resolution screen to your dot-matrix printer are readily available. At times, however, you may wish to save your graphics screen in a disk file so you can display it later without rerunning the program that created it. And if you own an Okimate 10 or similar color printer, the ability to save multicolor graphics screens is particularly useful.

"Screen Saver 64" provides two machine language (ML) routines that let you quickly save and retrieve hi-res graphics screens—both standard and multicolor—

from disk. Though they're written in ML, you can use them without knowing the ins and outs of ML yourself. And we've included two demonstration programs that show exactly how to use the ML routines for real applications.

To get started, type in and save Programs 1 and 2. Program 1 puts the screen save routine into memory, and Program 2 creates the screen retrieval routine. Since both ML routines go into the same memory area, they must be used separately. If you have an ML monitor and wish to examine the routines, note that each is broken into two parts, located from memory locations 679-738 and 828-1023 (decimal).

Saving A Graphics Screen

Here are the steps for saving a graphics screen with Screen Saver 64:

1. Run Program 1 to place the ML screen save routine in memory.
2. Create your hi-res or multicolor screen as usual. If you don't know how to do this, the Commodore 64

Programmer's Reference Guide and many other books explain the required steps. Program 3 (see below) contains a simple demonstration.

3. Execute a statement like `OPEN 2,8,2,"filename,P,W"` to open a disk file for writing (replace *filename* with the name of your own file). You must open the file as a PRG (program format) file using the ,P suffix as shown above. The ,W suffix indicates that you're opening the file for a write operation, and the first numeral 2 sets the logical file number (2 in this case) for that file.

4. Execute `SYS 1007` to activate the ML save routine. *This must be done while you are in hi-res or multicolor mode.* The ML routine finds the currently defined graphics screen and associated color memory, and stores their contents in the disk file.

5. Execute a statement like `CLOSE 2` to close the file. It is *very important* that you end the procedure by `CLOSE`ing the file, specifying the same logical file number (2 in this case) which was used to open it. If you omit this vital step, you may end up with a poison (unclosed) file on the disk that could damage other files or render the whole disk unreadable.

Retrieving A Graphics Screen

Once you have saved the screen to disk, it's easy to retrieve. Here are the steps to follow for bringing a graphics screen back into memory:

1. Run Program 2 to put the ML retrieval routine in memory.

2. Perform the steps needed to enter the appropriate hi-res or multicolor graphics mode.

3. Execute a statement like `OPEN 2,8,2,"filename,P,R"` to open the disk file for reading (input). Again, the ,P suffix specifies a PRG file, and the ,R suffix opens the file for reading.

4. Execute `SYS 881`. The ML routine loads the graphics data back into the right memory locations.

5. Execute a statement like `CLOSE 2` to close the disk file. Again, you should use the same logical file number (2 in this case) used when opening the file.

6. At this point you can continue

with a BASIC program or do whatever else you like.

Graphics Demonstrations

Programs 3 and 4 contain practical demonstrations of how to use these two routines from BASIC. Type in and save both programs, then load and run Program 1 to put the ML save routine in memory. Now load and run Program 3. This program uses the hi-res drawing example from pages 123-126 in the *Commodore 64 Programmer's Reference Guide*. Lines 110-140 define the hi-res screen and color memory to start at locations 8192 and 1024, respectively, then clear the graphics screen. Lines 150-230 draw a simple sine wave pattern. (Be patient; it takes a few minutes to complete the drawing.) Line 270 opens the disk file using 2 as the logical file number and `SINEWAVE.HIRES` as the filename. After checking the disk error channel, the program calls the ML save routine.

The sine wave disappears as the hi-res memory is moved temporarily to a new location and stored in the disk file. Then the routine moves the picture back to its original location, saves color memory, and returns control to BASIC. After checking the error channel again, the BASIC program restores the normal screen display and ends.

Program 4 shows how to use the ML retrieval routine. Since it looks for a file named `SINEWAVE.HIRES` on the disk, you can run it only after you've used Program 3 to create the file. Run Program 2 to put the ML retrieval routine in memory, then load and run Program 4. Lines 110-130 define the hi-res screen starting at location 24576, a different area than the one it was saved from. Lines 140-150 fill the screen with a uniform pattern. (Note that this is done only for the purpose of demonstration, to confirm that the retrieval routine puts new information on the screen. It is *not* necessary to clear the graphics screen before using this routine.)

Lines 160-190 open a disk file for reading, using the same name as Program 3 (`SINEWAVE.HIRES`). After checking the error channel (180-190), the retrieval routine is called with `SYS 881`. The hi-res

screen is restored right before your eyes: First the graphics information appears, then color memory is brought in as well. After a brief pause, the program restores the screen to normal and ends.

Inside The ML Routines

The ML save routine saves the currently defined graphics screen and its associated color memory wherever they are located—even if the hi-res screen is stored in the RAM underneath a ROM area. The ML retrieval routine brings the stored screen back into whatever area you have currently defined as the graphics screen, even if that's a different location from the area from which it was saved. This lets you create and store a complex graphics display using one particular graphics aid (Simons' BASIC, etc.) and retrieve it for use by any other program.

Since sprites are independent of other graphics, these routines can't store or retrieve sprite shapes that appear on the screen.

To make this routine compatible with as many programs as possible, memory usage is restricted to three areas. It uses memory locations 679-738 (normally unused) and 828-1023 (the cassette buffer) to store the routines, and also zero-page locations 2 and 251-254. To save a screen, the ML routine first looks in locations 56576 and 53272 to locate the graphics screen and normal screen memory (which becomes the hi-res color memory). It then swaps the 8K bytes of hi-res RAM memory with the contents of locations 24576-32767 (\$6000-\$7FFF). This is done by "turning off" the computer's ROM chips temporarily so the swapping routine can see hi-res memory no matter where it's located. Then the routine switches the Kernal ROM back in to write the 8,000 bytes of hi-res information to the disk file, and moves the hi-res screen back to its original location. The 1,000-byte screen memory area is written directly to the disk file.

Note that since no memory swapping is done for color memory, this part of your screen *must* be located in a memory area that's not normally hidden by ROM.

Finally, the normal color mem-

ory at 55296-56295 (used in multi-color mode) as well as the screen background byte at 53281 is written to disk. The final disk file is 10,003 bytes (40 blocks) long. Two extra bytes are added at the beginning of the file to make it compatible with version 3.0 of the Okimate Color Print program.

The retrieval routine works in reverse, finding where the graphics screen and color memory are located in the current configuration, then restoring everything to the correct memory locations. Since RAM can be POKEd even if it's under ROM, no memory swapping is required and the contents of the disk file are moved directly into the appropriate memory areas.

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

Program 1: Screen Saver 64

```
CS 100 REM PROGRAM 1 SCREEN SA
VER 64
PE 110 SU=0:FORI=688TO738:READ
X:SU=SU+X:POKEI,X:NEXT
CK 120 IFSU<>4855THENPRINT"ERR
OR IN DATA IN LINES 170
-220":STOP
QX 130 SU=0:FORI=828TO1022:REA
DX:SU=SU+X:POKEI,X:NEXT
PQ 140 IFSU<>31598THENPRINT"ER
ROR IN DATA IN LINES 24
0-470":STOP
SR 150 PRINT"SCREEN SAVE INSTA
LLED":END
MS 170 DATA173,0,221,41,3,73,3
,10,10,10
QP 180 DATA10,10,10,133,254,17
3,24,208
QJ 190 DATA41,8,10,10,101,254,
133,2,105
DA 200 DATA31,141,169,2,173,24
,208,41,240
DB 210 DATA74,74,234,234,101,2
54,141,168
XM 220 DATA2,105,3,141,167,2,9
6
KB 240 DATA160,0,132,251,132,2
53,165,2,133
PH 250 DATA252,169,96,133,254,
120,165,1,72
MG 260 DATA41,253,133,1,177,25
1,170,177
DA 270 DATA253,145,251,138,145
,253,200
RK 280 DATA208,243,230,252,230
,254,165
HK 290 DATA254,201,120,208,233
,104,133,1
JH 300 DATA88,234,234,234,96,1
62,2,32,201
MD 310 DATA255,169,0,32,210,25
5,165,2,32
SX 320 DATA210,255,160,0,132,2
51,169,96
RK 330 DATA133,252,234,234,177
,251,32,210
XS 340 DATA255,165,252,201,127
,240,7,200
```

```
PX 350 DATA208,242,230,252,208
,238,200
MX 360 DATA152,201,64,208,232,
96,160,0
FC 370 DATA132,251,173,168,2,1
33,252,177
FA 380 DATA251,32,210,255,165,
252,205,167
SH 390 DATA2,240,7,200,208,241
,230,252
MD 400 DATA208,237,200,152,201
,232,208
JB 410 DATA231,160,0,132,251,1
69,216,133
XS 420 DATA252,177,251,32,210,
255,165,252
JD 430 DATA201,219,240,7,200,2
08,242,230
XE 440 DATA252,208,238,200,152
,201,232
XC 450 DATA208,232,173,33,208,
32,210,255
PH 460 DATA32,204,255,96,32,17
6,2,32,60
MX 470 DATA3,32,113,3,32,60,3,
32,163,3,96
```

Program 2: Screen Retriever 64

```
PR 100 REM PROGRAM 2 SCREEN RE
TRIEVE
PE 110 SU=0:FORI=688TO738:READ
X:SU=SU+X:POKEI,X:NEXT
HE 120 IFSU<>4855THENPRINT"ERR
OR IN DATA IN LINES 160
-180":STOP
JQ 130 SU=0:FORI=881TO1004:REA
DX:SU=SU+X:POKEI,X:NEXT
XK 140 IFSU<>21290THENPRINT"ER
ROR IN DATA IN LINES 19
0-250":STOP
HM 150 PRINT"SCREEN RETRIEVE I
NSTALLED":END
KB 160 DATA173,0,221,41,3,73,3
,10,10,10,10,10,133,
254,173,24,208
PD 170 DATA41,8,10,10,101,254,
133,2,105,31,141,169,2,
173,24,208,41,240
KP 180 DATA74,74,234,234,101,2
54,141,168,2,105,3,141,
167,2,96
PC 190 DATA32,176,2,162,2,32,1
98,255,32,207,255,32,20
7,255,234,160,0,132,251
AH 200 DATA165,2,133,252,32,20
7,255,145,251,165,252,2
05,169,2,240,7,200,208
QK 210 DATA241,230,252,208,237
,200,152,201,64,208,231
,160,0,132,251,173,168,
2
FR 220 DATA133,252,32,207,255,
145,251,165,252,205,167
,2,240,7,200,208,241,23
0
AB 230 DATA252,208,237,200,152
,201,232,208,231,160,0,
132,251,169,216,133,252
,32
JE 240 DATA207,255,145,251,165
,252,201,219,240,7,200,
208,242,230,252,208,238
,200
SH 250 DATA152,201,232,208,232
,32,207,255,141,33,208,
32,204,255,96,999
```

Program 3: Screen Saver Demo

```
DG 100 REM PROGRAM 3 SCREEN SA
VE DEMO
HS 110 BASE=2*4096:POKE53272,P
EEK(53272)OR8
BH 120 POKE53265,PEEK(53265)OR
32
BK 130 FOR I=BASE TO BASE+7999
:POKEI,0:NEXT
KD 140 FOR I=1024TO2023:POKEI,
3:NEXT
MS 150 FOR X=0 TO 319 STEP.5
RF 160 Y=INT(90+80*SIN(X/10))
KR 170 CH=INT(X/8)
QC 180 RO=INT(Y/8)
RF 190 LN=YAND7
AR 200 BY=BASE+RO*320+8*CH+LN
GX 210 BI=7-(XAND7)
BX 220 POKEBY,PEEK(BY)OR(2*BI)
AP 230 NEXT X
EG 240 POKE1024,16
GR 250 FOR I=1[2 SPACES]TO 100
0:NEXT[2 SPACES]I
BM 260 OPEN15,8,15
JK 270 OPEN2,8,2,"SINEWAVE.HIR
ES,P,W"
RJ 280 INPUT#15,Z1,Z2$,Z3,Z4
AG 290 IF Z1<>0 THEN CLOSE2:CL
OSE15:PRINT Z1;Z2$;Z3;Z
4:GOTO350
MX 300 SYS 1007
AS 310 CLOSE2
AM 320 INPUT#15,Z1,Z2$,Z3,Z4
RS 330 IF Z1<>0 THEN CLOSE15:P
RINT Z1;Z2$;Z3;Z4
MH 340 FOR I=1 TO 1000:NEXT I
MM 350 POKE53265,PEEK(53265)AN
D 223
DF 360 POKE53272,PEEK(53272)
[2 SPACES]AND 247
DR 370 END
```

Program 4: Screen Retriever Demo

```
XF 100 REM PROGRAM 4 SCREEN RE
TRIEVE DEMO
PH 110 POKE56578,PEEK(56578) O
R 3:POKE 56576,(PEEK(56
576)AND252)OR 2
HD 120 BASE=6*4096:POKE53272,P
EEK(53272)OR8
FG 130 POKE53265,PEEK(53265)OR
32
FM 140 FOR I=BASE TO BASE+7999
:POKE I,66:NEXT
CS 150 FOR I=16384+1024 TO 163
84+2023:POKE I,77:NEXT
GE 160 OPEN15,8,15
QJ 170 OPEN2,8,2,"SINEWAVE.HIR
ES,P,R"
CC 180 INPUT#15,Z1,Z2$,Z3,Z4
GG 190 IF Z1<>0 THEN CLOSE2:CL
OSE15:PRINT Z1;Z2$;Z3;Z
4:GOTO230
RS 200 SYS 881
PJ 210 CLOSE2
MC 220 FOR I=1 TO 2500:NEXT I
DF 230 POKE56576,(PEEK(56576)A
ND252) OR 3
FR 240 POKE53272,PEEK(53272)AN
D 247
HD 250 POKE53265,PEEK(53265)AN
D 223
```

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Atari FontMaker

Charles Brannon, Program Editor

"FontMaker" simplifies the design of character sets for all text modes on Atari 400/800, XL, and XE computers. Although programmers will find FontMaker a valuable addition to their utility library, nonprogrammers can also benefit. Next month, we show how to use FontMaker to customize Atari SpeedScript's special character set. Whether you want Old English or a computer age font, FontMaker has the tools you need to express your creativity. It requires at least 16K RAM; disk drive recommended.

"FontMaker" is a sophisticated character editor written completely in machine language to work with all Atari text modes. Even though a character set (or *font*) editor is a handy utility for programmers, you don't need to know anything about machine language or programming to have fun with it. We include a simple subroutine that lets you load and merge character sets with your own BASIC programs. And next month, we'll show how to use the special ANTIC 3 character sets with the Atari version of our *SpeedScript* word processor (COMPUTE!, March 1986).

Since FontMaker is written in machine language for speed and compactness, you need to type it in with MLX, our machine language editor. See the MLX article elsewhere in this issue for instructions on typing in and using MLX to enter machine language programs.

When you run MLX, answer

the first three screen prompts like this:

Starting Address: 12288
Ending Address: 14887
Run/Init Address: 12288

Next you'll be asked "Tape or Disk?". Although FontMaker can load as a boot tape, it's much easier to use with a disk drive. If you press D for Disk, you'll be asked "Boot Disk or Binary File?". Press F to select binary file. FontMaker will run from a boot disk, but without DOS, there's no way to save or load character sets. So make sure you select F, since MLX can't convert from a boot disk to a binary file.

At the first screen prompt, 12288:, start typing the data from Program 1. See the MLX article for a list of commands that let you type in a program in several sessions. When you've typed the last line, MLX prompts you for a disk filename. This will be the name under which FontMaker is saved to disk. If you're using Atari DOS 2.0S, 2.5, or 3.0, you may use the filename AUTORUN.SYS. This allows FontMaker to automatically load and run when you turn on the computer with the disk in the drive. Be sure this disk also contains the DOS files.

If you want to prevent loading FontMaker automatically (especially if you haven't finished typing it but want to save your preliminary typing), you can rename AUTORUN.SYS to some other name. You can also load FontMaker from DOS 2.0S or 2.5 with menu selection L. If you're using another DOS, such as OS/A+ or DOS XL, you may be able to save FontMaker with a different name, such as FONT.COM

and type the command FONT to run FontMaker.

Editing Characters

Assuming you've typed in and saved FontMaker, run it and follow along with this article. You'll see a screen with a colorful 8 × 8 grid, a list of brief instructions, and four rows of characters at the bottom of the screen (see screen photo).

When FontMaker starts, it asks you to pick a character. You can edit one character at a time. When you're asked to select a character, you can use the joystick to move a cursor around in the four rows of characters, then press the fire button to select the character highlighted by the cursor. Or you can simply press the keyboard key corresponding to the character. Action then shifts to the 8 × 8 character editing grid.

Within the grid, you can move the editing cursor (a hollow white box) with either the joystick or the cursor keys. You don't need to use CTRL with the cursor keys to move the cursor—CTRL-cursor up/down/left/right and SHIFT-cursor up/down/left/right are reserved for other features. When drawing in the character grid, press the fire button or the space bar to reverse (toggle) the dot at the cursor position. Previously set dots are turned off, and blank spaces are turned on. You can hold down the fire button while you move the joystick to draw lines and figures.

As you change the grid, you can see the character in actual size in the character set window. The cursor highlights (reverses) the selected character, but a row of the



"Atari FontMaker" lets you design your own custom character fonts for any Atari text mode.

character you're editing is also displayed. In addition, there's a sample of text ("The quick brown fox jumped over the lazy dogs") so you can judge relative character height and spacing.

To create an entirely new character, you may want to start by pressing SHIFT-CLEAR to erase the existing character pattern. This gives you a clean canvas for your design.

Undo Your Mistakes

If you don't like a change you've made, press U to undo all the changes made since you've selected the character. Press U again to undo the undo, restoring the change you've made. You can press F to fix a character, recopying its image from the standard character set stored in the computer's Read Only Memory (ROM). It's important to distinguish between these options: U reverts to the previous character image, F always gives you the ROM image. If you change the letter A to a spaceship, change B to a rocket, then go back to A and change the spaceship to an alien, U switches between the alien and the spaceship; F gives you the pattern for the letter A. Beware that you can't undo the Fix command.

If you hold down the OPTION button while pressing F, the entire character set is fixed, recopied from ROM. This wipes out any changes you have made to the character set, so be careful.

To select another character to edit, press P and use the joystick or keyboard to pick the new character. In some text modes (see the G command below), the joystick cursor may seem to move strangely. It

consistently moves up or down between rows of 32 characters. Since there are only 20 characters per line in modes 1 and 2, these rows wrap around the right margin. You move left and right within a row of characters, and up and down between rows of 32 characters.

FontMaker can display the character set in all Atari text modes. These are GRAPHICS 0 (the default text mode), "GRAPHICS 0½" (technically known as ANTIC 3, a nine-line true-descender mode), multicolor ANTIC mode 4, multicolor ANTIC mode 5, GRAPHICS 1, and GRAPHICS 2. Press G to cycle through these modes.

The SpeedScript Character Mode

If you've never heard of the ANTIC text modes, don't fret; they're not normally accessible from BASIC. The Atari SpeedScript word processor (and, incidentally, the PaperClip word processor from Batteries Included) uses the ANTIC 3 mode for large, readable characters. ANTIC 3, nicknamed GRAPHICS 0½, is a special 40-column mode that lets you define characters within an 8 × 10 character space. Other Atari text modes have only an 8 × 8 character grid. This means that ANTIC 3 characters can have true descenders. (A *descender* is the part of a character that drops below the line of type, such as the tail on a lowercase y or j.)

You still use just eight rows to define a character in ANTIC 3, but the character is positioned within ten screen scan lines. For uppercase characters, the eight rows of the character grid are displayed in rows 1-8 of the character matrix, with two blank lines at the bottom of each character, reserving space for lowercase descenders. For lowercase characters, the first two lines of the character grid are forced blank. The first two rows of the character definition are actually displayed at lines 9 and 10 of the character space, making it easy to reserve space for the descenders. The third through eighth rows of the character are displayed starting at the third line of the character space.

This may sound confusing, but fortunately FontMaker lets you design ANTIC 3 characters without

having to mentally translate what you see on the grid to what the character should look like. (However, the Rotate option seems to work strangely in this mode due to the unusual memory configuration used by ANTIC 3 characters.) Just be aware that lowercase characters are actually written two lines lower on the screen than uppercase characters. If you start with the normal character set, you'll need to use the roll and shift options to align the characters. Using the roll or shift commands (see below), roll the lowercase characters down two lines and all the uppercase characters down by one line. While you work, refer to the "quick brown fox" sentence to see that all the characters line up properly.

Since there are forced blank lines for uppercase characters, you can use the lower seven lines to define a large character. Leave the top line blank if you want two-line descenders. The normal Atari character set only uses six columns for a character, giving two pixel spaces between each character on the screen. A larger character can use up to seven columns, leaving the last column blank to keep characters from running into each other. When designing some character sets, though, such as a cursive script, you may want characters to connect together, so you can use the full horizontal space.

You can press the CTRL-cursor keys to roll the character within the grid. Pixels that are pushed off the edge of the grid wrap around to the opposite side. This is especially useful for those ANTIC 3 characters. If you press SHIFT with the cursor keys, the pixels that are shifted off the edge of the grid are lost. This can be used to crop a character, or quickly erase a certain column or row. Just roll the character until the column or row you want to erase is at the edge of the grid, then shift the character to push away the pixels.

Other special commands: Press I to invert the character, reversing all the pixels within the grid. R rotates the characters 90 degrees (turns the pattern on its side). Press R twice to turn a character upside-down. M gives you a left-to-right mirror image of the character, as if you picked up the character,