

The Year Ahead: Interviews With Industry Experts

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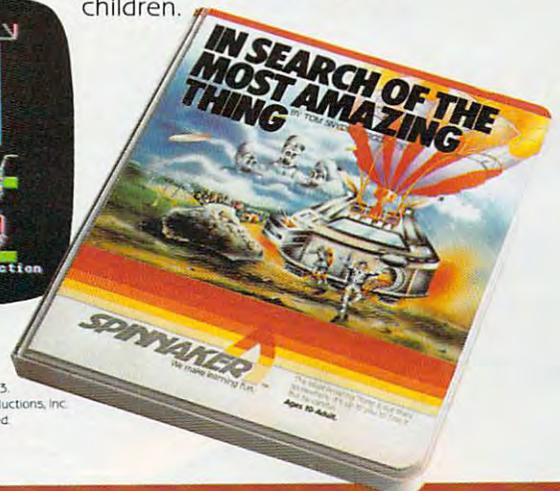
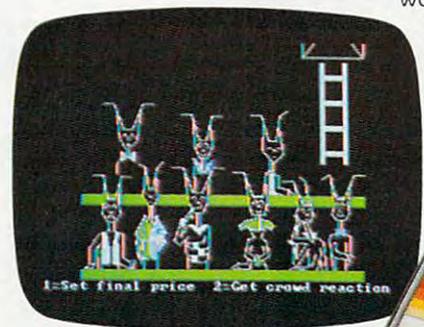
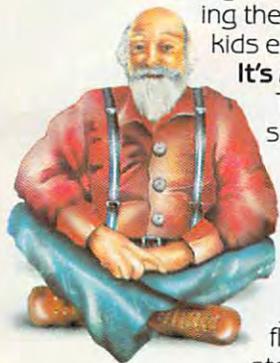
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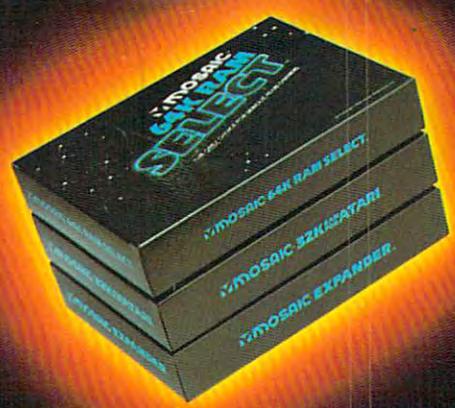
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EDITOR'S NOTES

The recent TI announcement of a pending second quarter loss in the \$100 million range sent shock waves through the consumer computer end of the stock market. In two days, TI stock dropped almost 50 points before beginning a gradual upturn. What's happening out there in the trenches of this economic warfare?

It would seem that Commodore is remaining profitable by constantly refining, redesigning, and maintaining rigorous internal cost controls. Various manufacturers, including TI, have been pulled into the trap of selling computers at loss leader prices. The expectation (perhaps more accurately the fervent hope) then becomes that money will be made on the software. With so much competition for software dollars only time will tell, but Commodore's recent and aggressive software price cuts don't bode well for the loss leader philosophy.

In Tom Halfhill's noteworthy article in this issue you'll discover an incredible array of information on the Consumer Electronics Show. Items of particular note: Atari has completely revamped their computer line, and Coleco introduces "Adam," a computer package of tremendous significance.

Random Bits and Rumors: With the advent of "Adam," we can expect to see new packaged systems to appear, most notably in the \$500-\$700 range. One recent concern we heard voiced regarding price cutting for computers: do people treat them less seriously as prices drop (e.g., is a \$299 VIC-20 "more" of a computer than an \$85 VIC-20)? It would seem that the manufacturers will have to convey the message that these are powerful, capable computers, and back that up with useful software. Commodore's *Magic Desk* (see Tom's article) is a good case

in point.

IBM's new home computer is still under the tightest wraps. We still expect it by September or October and still expect a price in the \$700 ball park. There's always the chance that IBM will sit back and watch the battle for a while to let things shake out a bit, but we think not. The IBM home computer would appeal to many on name alone, and IBM's well aware of that.

Robert Lock



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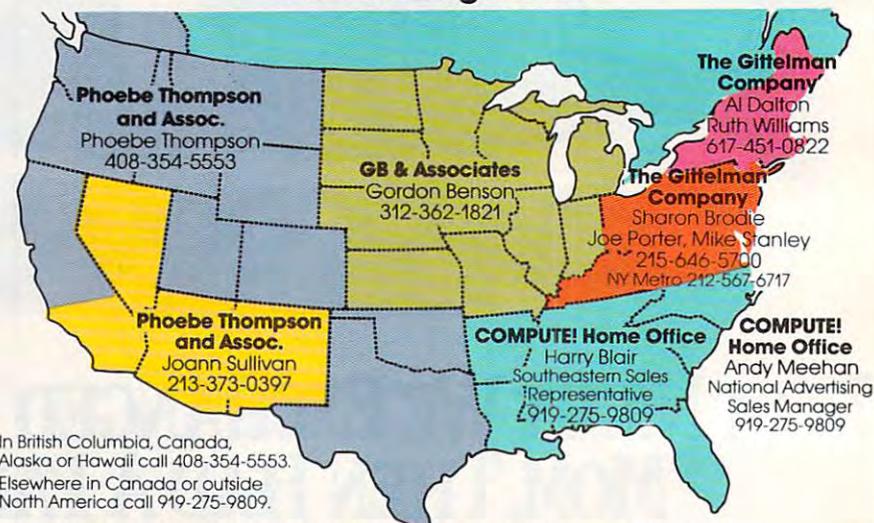
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READERS' FEEDBACK

The Editors and Readers of COMPUTE!

Commodore's Public Domain Software

Several readers have written asking about the public domain software released by Commodore. Earlier this year, Commodore announced that they were making 656 educational programs available to anyone, by placing them in the public domain.

Since that time, the software has been reorganized and has been distributed to Commodore dealers. All of the programs are educational (math, English, history, computer science, business, etc.) and are available through Commodore dealers. All programs are for the PET or the 64.

There are 27 diskettes available, each holding up to 20 programs, which are individually packaged and sell for \$6.95. Also, copies can be made at Commodore dealerships for a nominal cost.

Since the programs have been placed in the public domain, all prices are, according to Commodore, charged only to offset actual disk costs or the time for dealer copying. None of the programs is available on tape.

What's RS-232?

I am confused with all this RS-232 jargon. I have read the section in the *VIC-20 Programmer's Reference Guide*, but it seems to be written for someone who is already familiar with RS-232. I'd like to interface a serial printer, and also a bar code concentrator – that's a buffer memory which stores ASCII received from several bar code scanning stations.

First, check **COMPUTE!** (August 1982). "VIC-20 Communications/The RS-232 Interface" applies to both the VIC and the 64. In October, "Ask the Readers" gives more information on interfacing printer devices.

However, neither of these references gives all the answers. Right now, there are users working on problems associated with the "full handshake" option, which doesn't work at all on the VIC and which has problems on the 64. Until Commodore releases a new ROM to fix the problem on either or both machines, users must go after the problem themselves by using machine language programming on an interrupt level – and that's a complex job. **COMPUTE!** should soon be able to publish a success story on how it's done.

VIC Disk Details

After reading through the VIC-1541 Disk Drive manual some questions arise:

1. How can the 1541 be speed-changed for the VIC-20 through software if the 1541 is in the 64 mode to start with? Will it recognize such a software command if in the wrong speed mode?
2. What are the considerations in using a second disk drive? The manual discusses changing the "8" drive number to another via software or hardware, but which is preferable? And would most programs one buys have to be modified if the drive address is changed? And when would one profitably use a second drive – main program of first drive and data files on another, or what?
3. The manual briefly alludes to drive numbers but does not explain the connection between drive numbers and device numbers. Is there a connection, and how would a drive know its drive number (as opposed to its device number)?
4. The 1541 manual says that you can't copy whole disks from one 1541 to another 1541. Is this really true? Is it immutable, or is there a way around this glitch?

Karl Thurber

The difference in data transfer speed between the VIC and 64 is not so great that the drive in its 64 mode is unable to understand commands sent to it by the VIC. In fact, the VIC can usually read programs from the disk without giving the "slow down" command. To write data reliably, however, you should always set the drive for the proper speed by typing:

OPEN 15,8,15,"UI-":CLOSE 15

When peripherals are connected to the serial bus, the computer must know what to call them before it can talk to them. If you attach two disk drives without changing the device number of one of them, they will lock up the bus in an electronic argument over which one has the right to call itself device 8. The simplest solution is to perform the hardware modification described in the manual, which changes the device number once and for all. The problem with this is that it's a little drastic for most people. The procedure for changing

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3.3. Atari 400/800 version requires 48K and BASIC cartridge. Both versions require only one disk drive.

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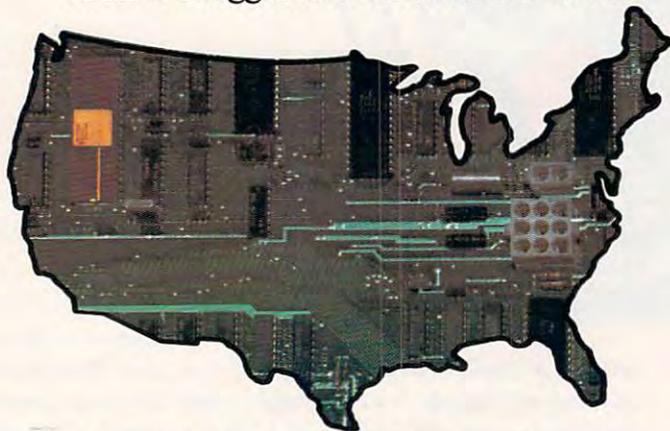
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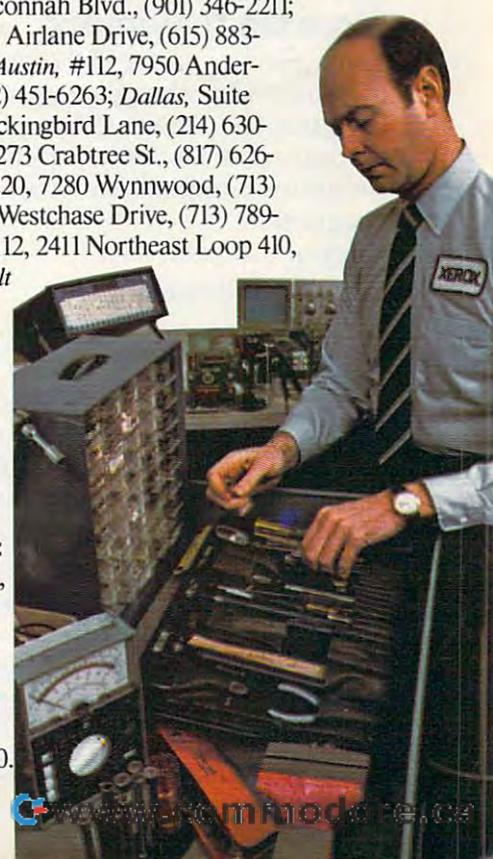
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the device number via software is to turn on one of the drives and the computer, load and run the "DISK ADDR CHANGE" program on the demonstration diskette supplied with the drive, then turn on the other drive (which will then be device 8).

Since Commodore's standard device number for disk drives is 8, software that reads or writes to disk will probably make this assumption, which means that to use those programs without modification you'll have to use only the first drive. Having multiple drives becomes profitable at the point where the convenience of not having to constantly switch disks becomes worth the cost of a second drive. The example you cited, using one drive for programs and the second for data files, is a very common one. Also, some tasks, such as duplicating disks, are inherently less complicated when you have more than one drive.

For dual drive units such as Commodore's 4040 and 8050, both drives have the device number 8. To distinguish between them, one is designated as drive 0 and the other as drive 1. Drive numbers are not truly relevant to single drives (where the unit is always drive 0); however, this feature was retained in the DOS (disk operating system) for the 1541 to maintain compatibility with the Commodore dual drives, and to leave open the possibility of dual drive units for the VIC and 64.

It is possible to copy whole disks from one 1541 to another as long as the device number of one of them has been changed. A program called "COPY/ALL" by **COMPUTE!** Associate Editor Jim Butterfield, which copies the contents of a disk in device 8 to a disk in device 9, is provided on the demonstration disk which comes with the 1541 drive.

More On TI Memory

Many owners of the TI-99/4A would be interested in determining the exact amount of available memory (in bytes). This two-line program is very simple and can save a lot of hair pulling when you write programs which fill the memory. Here is the program:

STEP 1

Enter the following:

```
1 A=A+8
2 GOSUB 1
```

Do not use a variable that has already appeared in the program. For example, if you have used the variable "A" within the program, choose another. Second, the program must work correctly before using this mini-program.

STEP 2

Once this is entered into the memory, enter the RUN command. The process will take between 15 and 30 seconds to execute, depending upon the length of your program. After execution, MEMORY FULL IN 1 will appear. Now enter PRINT A (no line number) and a value will appear on the

screen. This value is the number of bytes remaining in the computer's memory.

To determine the total amount of free memory available, clear the memory (store your program first) and repeat Steps 1 and 2. The value displayed will be 14536. There are 14536 free bytes available (the mini-program itself uses 40 bytes, so add 40 to the 14536). The computer is advertised as having 16K bytes. 1424 are used for screen display, etc. So, when a program is stored in the memory and you want to determine how many bytes the program used, enter the following:

```
PRINT 14576-A
```

Howard Patlik

80 Columns For The Commodore 64

The February "Readers' Feedback" discussion of Commodore 64 add-ons stated 80-column format could be achieved by use of other manufacturers' products, but would "require a separate video monitor" instead of a TV set.

I am considering a color monitor to use with my Commodore 64 and will eventually want to use it as a word processor with 80 columns. The Commodore 64 will only work with a composite input color monitor. I am confused as to the capabilities of that type of monitor. Will it handle the 80-column format, or will I have to get an RGB type color monitor along with some type of interface converter?

R. C. Freytag

The good news is that composite input color monitors give a reasonably good display for 80-column format. The bad news is that, at present, the 80-column boards all have black and white output, so the color monitor is no particular advantage. Also some word processing programs are not designed to work with the 80-column add-ons, so make sure before you buy that the items you are purchasing will work together.

Flashing Atari Prompt

I was intrigued by Glenn Murray's "Flashing Prompt For VIC and PET" (**COMPUTE!**, December 1982). It was just the thing for a number of my programs. It was easily adjusted for my Atari. I offer the re-worked program for your readers:

```
10 POKE 752,1
20 DIM A$(30), B$(30), X$(30)
30 A$="PRESS ANY KEY TO CONTINUE"
40 B$="{CLEAR}"
50 X$=A$
60 FOR R=1 TO 100
70 POKE 656,2: PR. X$: REM ***PRINTS MESSAGE
  IN WINDOW***
80 FOR W=1 TO 333:NEXT W
90 IF PEEK(764)=255 THEN 110
```

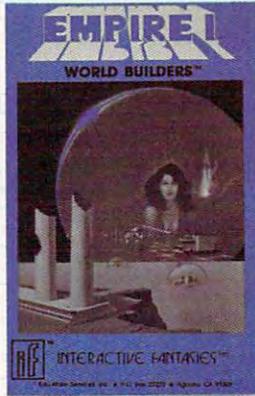
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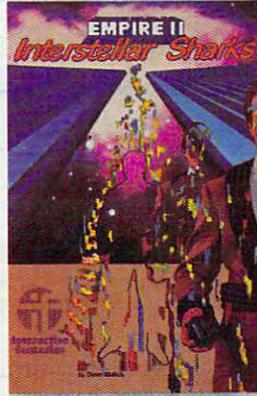
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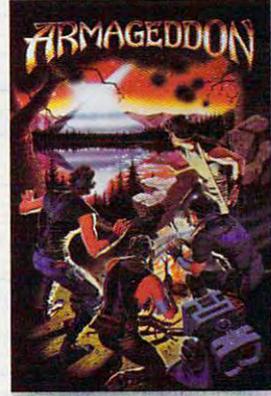
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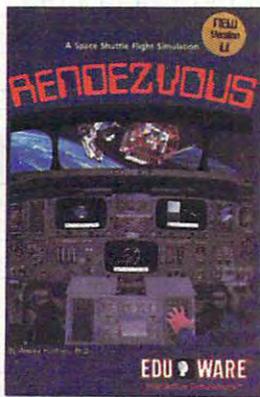
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```

100 IF PEEK(764) <> 255 THEN RETURN :REM
    ***THIS GOS. RETURNS**
110 IF X$ = A$ THEN X$ = B$:NEXT R
120 IF X$ = B$ THEN X$ = A$:NEXT R

```

Note: Line 100 returns this GOS. routine to the main program. When you return the first entry should be, POKE 764,255:PR. B\$.

Barry E. Krischer

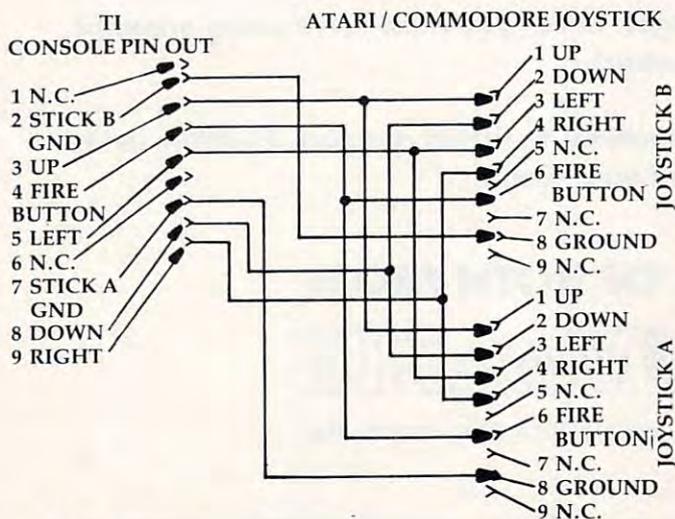
How To Build Your Own TI-99/4A Joystick Adapter

As an owner of a TI-99/4A, I decided I wanted a joystick to go with it. To save time and money, I got the Atari pin configuration from a friend and TI's configuration from the TI toll-free information line. After that it was a simple matter of buying three nine-pin "D" connectors (two male and one female), a small box, and some wire. Following this wiring diagram, you can make this adapter in about an hour and be able to select any joystick from the wide variety of Atari-compatible joysticks sold.

Gary Cook



Thanks for the suggestion. We built it here and it works perfectly.



Extended BASIC For The 64?

Is there an extended BASIC available for the Commodore 64? If so, does the extended version include commands for the superb graphics capabilities of the 64?

David J. McKeehan

The 64 comes with a version of Commodore BASIC called "Upgrade" or 2.0 BASIC. This version does not contain disk commands like the newer PETs, nor does it contain special commands for graphics as on the Atari or the TI with extended BASIC.

Fortunately, there are several ways that BASIC on the 64 can be improved. By plugging in cartridges, you can effectively increase your amount of ROM memory. Commodore has plans to release a VSP (Video Support Package) cartridge that will add the graphics commands BASIC presently lacks. There are also cartridges available commercially that add disk commands of BASIC 4.0.

Another way to extend BASIC is with programs that "patch" into it through a machine language program like BASIC AID 64 that will appear in an upcoming issue of **COMPUTE!**

The last and most ambitious method is to make the ROM "invisible" and replace BASIC with another program running in the RAM underneath. This should make it possible to run languages such as Pascal or the new BASIC in the Commodore P128 series computers, without much sacrifice of RAM memory.

Atari Assembler Graphics

I have an Atari 800 and I'm currently using the Assembler Editor cartridge. I can't seem to instruct the computer to switch graphics modes. I've fiddled and faddled here and there with addresses, but it doesn't display a mode that doesn't have garbage all over it. When I read the "Boing" game in **COMPUTE!** ("Insight: Atari," August 1982) I typed in the subroutine and it didn't work. Using the BASIC cartridge and calling up the program after a graphics call seems like a cop out. Help!

Mark Macuirles

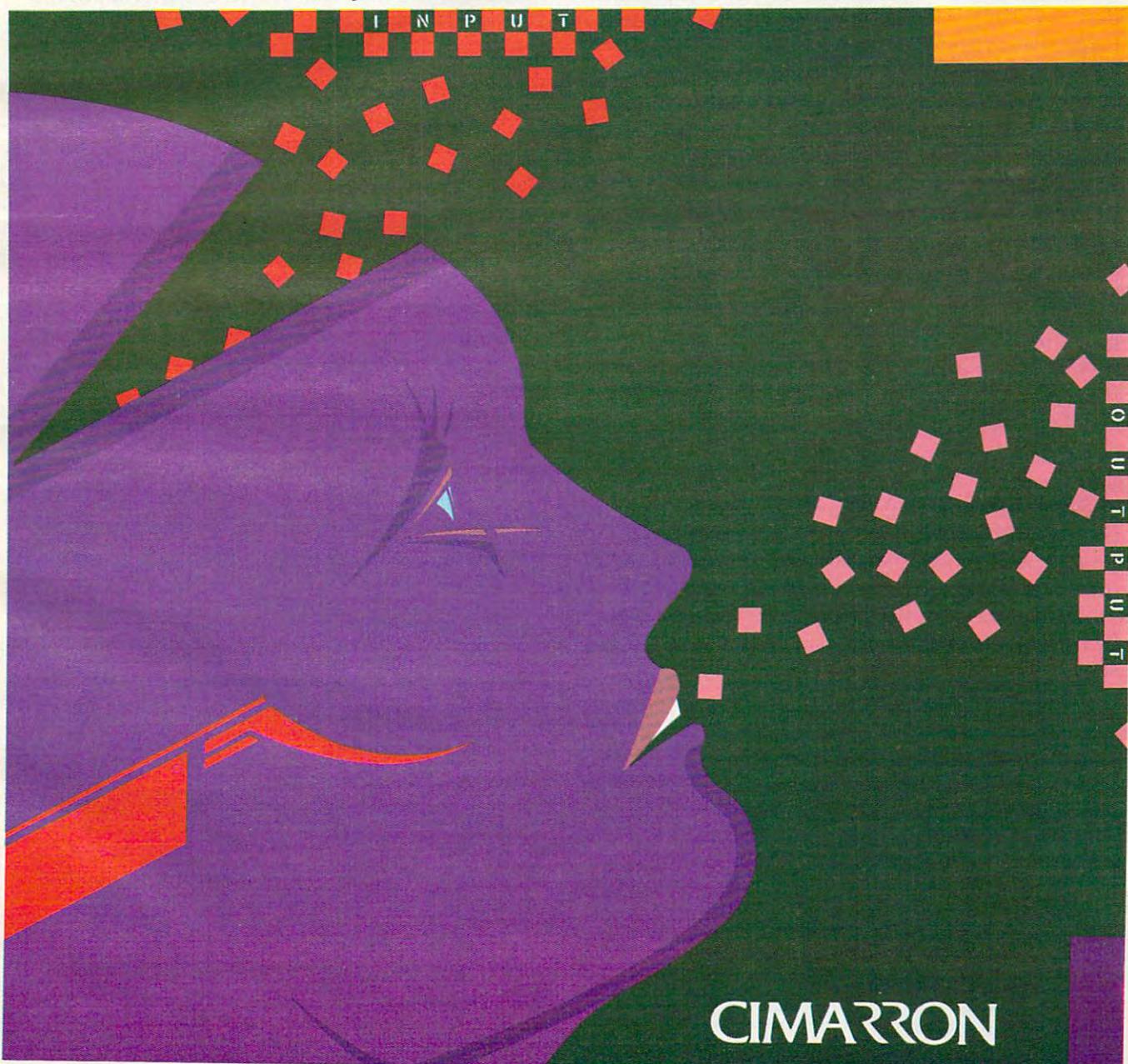
For information on calling graphics modes from machine language, refer to "Insight: Atari" (**COMPUTE!**, February 1982). Bill Wilkinson presents a modular set of routines for GRAPHICS, PLOT, DRAWTO, etc. It is not a program, but rather a series of routines that you can include in your programs.

COMPUTE! welcomes questions, comments, or solutions to issues raised in this column. Write to: Readers' Feedback, **COMPUTE!** Magazine, P.O. Box 5406, Greensboro, NC 27403. **COMPUTE!** reserves the right to edit or abridge published letters.



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Computers And Society

David D Thornburg, Associate Editor

The Continuing Evolution Of Languages

Last month we discussed the ongoing Japanese development of a new generation of computer as described in *The Fifth Generation*, a book by Edward Feigenbaum and Pamela McCorduck. This ten-year development project promises to have a lasting impact on our concept of computers. While I didn't elaborate on the topic, I think that the choice of computer language to be used with these machines will be as important as the details of the machine architecture itself. It was thus interesting to find that the language chosen for the fifth generation machines is Prolog.

I had not heard of this language before, and I decided that I should check with some of my Stanford friends to see if they knew about it. With their help I was directed to an excellent guide to this language: *Programming in Prolog*, by W. F. Clocksin and C. S. Melish (Springer-Verlag, \$16).

There are two things that surprise me about this language. The first is its tremendous power, and the second is that it has been around since the early 1970s. Interestingly, *Programming in Prolog* (published in 1981) is the first book to appear on this language. The authors wrote the book while they were at the Department of Artificial Intelligence at the University of Edinburgh, a school that has long been a center for Prolog research.

Prolog is used primarily for symbolic computation. Many of its applications are the standard fare of artificial intelligence research – abstract problem solving, mathematical logic, understanding natural language, and the creation and exploration of relational data bases. In other words, Prolog is being used in many applications for which LISP or Logo otherwise might be considered the language of choice.

Creating Facts

To get some picture of Prolog's power, let's examine some program statements. One of the basic structures in Prolog is the "fact." A fact is

created in the following way. Suppose we wanted to express the idea that David is a friend of Pam. To express this in Prolog, we would write:

```
friend(david,pam).
```

We could create some more facts by entering:

```
female(pam).  
male(david).
```

and so on.

A fact in Prolog consists of a relationship followed by the objects of the relationship, separated by commas and placed inside parentheses. The names chosen for objects and relationships are totally up to the programmer, as long as the names of constants start with lowercase letters. Each complete Prolog statement must end with a period.

Once a collection of facts has been entered into the computer, the data base can be asked to examine the validity of an assertion. Suppose, for instance, that the following facts were present in the system:

```
likes(joe,fish).  
likes(mary,book).  
likes(joe,mary).  
likes(john,book).
```

We can ask a question in Prolog by typing ?- followed by the assertion we want to test. If we typed:

```
?- likes(joe,money).
```

the system would type:

```
no
```

because there is no fact present in the system to confirm the validity of this assertion. If, on the other hand, we typed:

```
?- likes(joe,mary).
```

Prolog would search its data base until it found the desired fact, at which point it would type:

```
yes
```

on the display screen.

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Variables

While this application may not appear very powerful, consider the way that Prolog uses variables. Suppose we wanted to know something that Joe likes. To find something we would type:

```
?- likes(joe,What).
```

The word "What" is a variable. Variables can have any name the programmer desires, as long as they start with an uppercase letter. On receiving this question, Prolog searches its data base to find the relationship "likes" and the object "joe." Once it has found these, it then sets the value of "What" to the remaining object. The screen would then show:

```
What = fish
```

since this is the first thing that was shown for the desired relationship. When Prolog finds a match, it places a marker at the relevant fact in case you want to search for other matches. To find other things that Joe likes, one just presses the semicolon (;) key and RETURN. Prolog continues its search and prints:

```
What = mary
```

This process can be continued until the search fails. This aspect of Prolog is very similar to the use of "property lists" in Logo.

Factual Relationships

Questions can be asked about conjunctions of facts also. For example, if one were to ask if there is something that Mary and John both like, one would write:

```
?- likes(john,X), likes(mary,X).
```

The comma is used in Prolog to represent the logical AND operation. At this point you should be able to convince yourself that the computer will print

```
X = book
```

as a response.

In addition to facts, Prolog programs are constructed from rules. An example of a rule is "X is a sister of Y if X is a female and X and Y have the same parents." In Prolog, this rule could be written as:

```
sisterof(X,Y) :-  
    female(X),  
    parents(X,M,F),  
    parents(Y,M,F).
```

The Prolog primitive :- stands for "if."

Suppose we now had the following entries in the data base:

```
female(kathy).  
female(pam).  
female(pat).  
male(greg).  
male(david).
```

```
parents(kathy,cleo,bob).  
parents(pam,virginia,ernie).  
parents(david,cleo,bob).  
parents(greg,virginia,ernie).
```

With the "sisterof" procedure in place, we can ask questions like:

```
?- sisterof(kathy,david).
```

to which the computer would respond with a "yes" answer. Alternatively, we could find out if Greg has a sister by entering:

```
?- sisterof(X,greg).
```

to which the computer would reply:

```
X = pam
```

It doesn't take much imagination to see that Prolog programs can be written to solve many types of logic problems.

In addition to manipulating objects and variables, Prolog also works with lists. The Prolog data base (consisting of both facts and rules) is searched by a technique called "backtracking" which insures that matches will be found if they occur anywhere in the data base. By moving back and forth in the program, Prolog differs from languages like BASIC in which commands are followed in strict order. If Prolog is unable to answer a query with one set of objects, it will backtrack and start over with a new set until it has found a solution or has exhausted the data base. This feature of the language is one reason that Prolog has thus far appeared primarily on large computers such as the DEC PDP-10. Unless Prolog programs are compiled, they would run quite slowly on personal computers.

And yet this powerful language will probably appear on small computers for many of the same reasons Logo did. When people get sufficiently interested in a language, some enterprising programmer will implement it. There is already a CP/M-based version of the language available from England. I haven't seen it yet, so I can't comment on it. As the impact of the "fifth generation" starts to be felt, Prolog will become more generally available on personal computers.

While the description of Prolog given above is necessarily quite incomplete, it does give some of the flavor of the language. Next month we will explore other powerful languages that are hiding right under our noses. You may be surprised to see what they are!

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The Fall Computer Collection At The Summer Consumer Electronics Show

Tom R. Halfhill, Features Editor

The flood continues: at least 17 new personal computers were introduced at the Summer Consumer Electronics Show in Chicago, and the end is not in sight. Among industry leaders, Atari made the biggest showing with a completely revised line, plus a radical new approach to software merchandising; among the newcomers, the strongest challenge came from Coleco.

It's been only recently – maybe a year or two – since home computer shoppers have had more than a handful of machines to choose from. Apple, Atari, Commodore, Radio Shack, Texas Instruments. Still, people agonize over the decision.

By this Christmas – destined to be called the Christmas of the Computers – there should be 30 to 40 under-\$1000 personal computers for shoppers to sort out. Computers of almost every conceivable variation, from about \$40 for a minimal 2K memory machine to upwards of \$1000 for a full-blown 64K personal computer with built-in modem, speech synthesizer, and double-sided/double-density disk drive.

How will people choose from this bewildering array of equipment? According to industry analysts, the majority will stick with the established leaders – Commodore, Texas Instruments, and Atari. “The window is closing,” says one consultant, “for new entrants in the low-end home

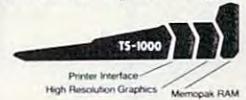
market.” They expect many, if not most, of the new arrivals to be forced out within the next year. In other words, the rich will get richer as the poor get poorer (perhaps a misleading expression, given the aggressive price wars which are driving even the Big Three toward the corporate poorhouse).

Yet, a few of the newcomers are making strong challenges, as evidenced by the hardware they displayed at the recent Summer Consumer Electronics Show in Chicago. In particular, the talk of the show was Coleco's entry into the field with an integrated system that includes an 80K computer with detachable keyboard, high-speed tape drive, letter-quality printer, and software, complete for under \$600 – only \$450 if you already own a Colecovision game machine. But no one was ignoring Atari, either. Atari scrapped its entire home computer line – including the brand-new but much-maligned 1200XL – in favor of a completely new line of four computers and numerous accessories. Considering the financial problems dogging Atari and TI, plus the approaching entry of IBM into the home market, it appears that the next 12 months will be a make-it-or-break-it year even for the “established leaders.” In short, no one can afford to sit back and rest easy. And no one is.

Here's a rundown of the most significant developments at the Summer CES:

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MEMOTECH KEYBOARD For ease of operation, the Memotech keyboard is a high quality standard typewriter keyboard, with TS-1000 legends. The keyboard is cable connected to a buffered interface which is housed in a standard Memopak case and plugs directly into the back of the



TS-1000 or other Memopaks. **MEMOPAK HRG** The Memopak High Resolution Graphics, with up to 192 by 248 pixel resolution, enables display of high resolution "arcade game" style graphics through its resident 2K EPROM, programmed with a full range of graphics subroutines.

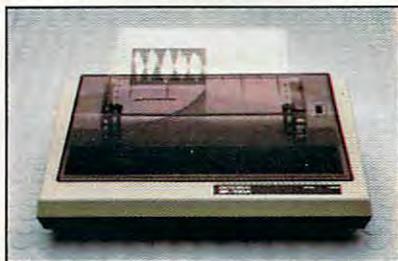
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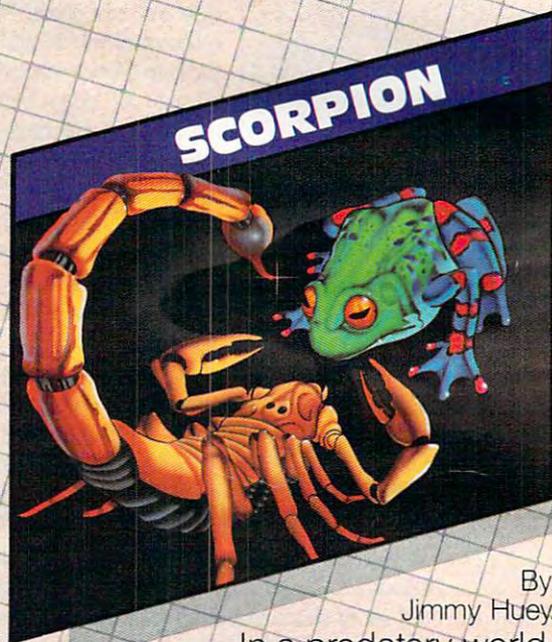
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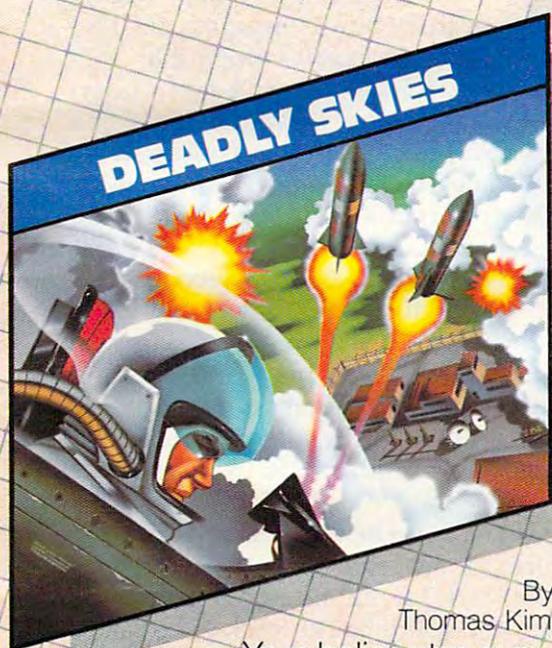
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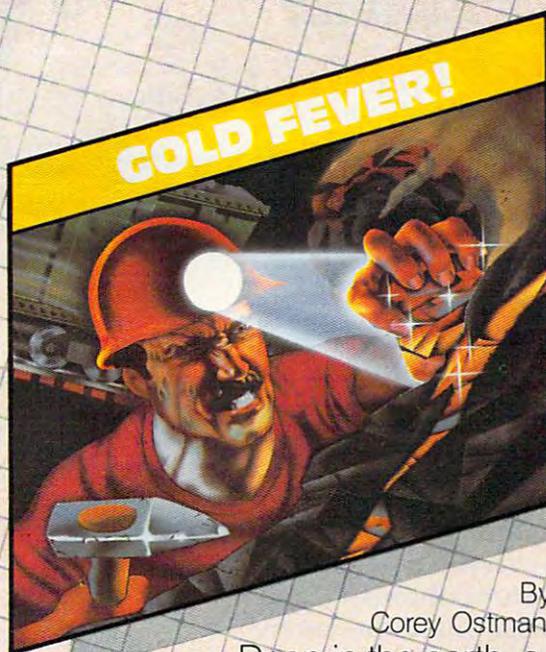
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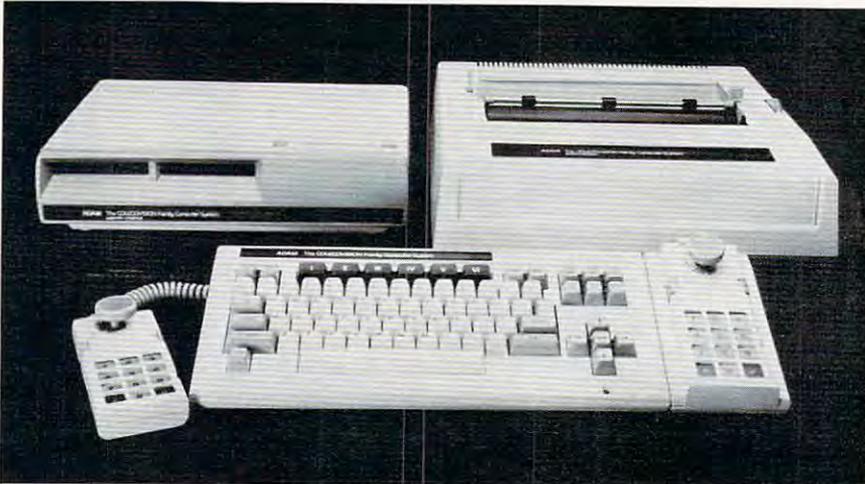
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Coleco's Adam

By the first day of the show it became apparent that Coleco's new "Adam" home computer was the system to beat. After Coleco shattered price barriers by introducing an impressive grouping of hardware and software for under \$600, Commodore announced a similar package deal for under \$1000, built around its newly discounted Commodore 64. And Atari told *The Wall Street Journal* it



Coleco's "Adam" system – the talk of the show.

could offer a comparable system with the new 600XL and a letter-quality printer, also for under \$600. Another competitor, newcomer Unisonic, even went so far as to redesign its prototype computer *at the show* – and then they stationed a pretty woman next to the Coleco display to pass out photocopied announcements.

Just what set everybody scrambling? Adam definitely *is* a price breakthrough, even if (at this writing) all the design specifications are not finalized. Adam has 80K of Random Access Memory (RAM), expandable to 144K (although it's not yet clear how much of this RAM is actually available to the user); a Z80A chip for its Central Processing Unit (CPU), allowing CP/M compatibility; a 75-key, full-stroke, typewriter-style keyboard that detaches from the main box on a coiled cord, much like the IBM PC (in fact, the keyboard strongly resembles the IBM PC's); a very high-speed cassette tape drive which Coleco claims is "comparable to a disk drive," and which stores 500K per cassette; a letter-quality daisy wheel printer; Applesoft-compatible Microsoft BASIC; a TI sound chip with three sound channels; 32 sprites (programmable shapes for animation); four expansion slots; a slot for ROM cartridges and ColecoVision games; built-in word processing software; two joystick controllers with keypads, which also can control the cursor; and even an arcade-style game to get you started, *Buck Rogers Planet of Zoom*.

And yes, Coleco promises to sell the whole package for under \$600. If you already own a ColecoVision game machine, you can buy a functionally identical version of Adam that plugs into your unit and costs only \$450. Coleco says Adam will be available this fall.

Options will include an adapter for playing Atari VCS 2600 video game cartridges, a second tape drive (built into the main box with the first drive), an 80-column screen adapter, and accessories to allow running CP/M (Control Program for Microcomputers), an industry-standard operating system that allows access to thousands of programs, mostly business-oriented.

Interestingly, Adam was one of three new computers at CES with Applesoft-compatible BASIC. However, Adam's internal memory arrangement is different from the Apple's, which means the majority of Applesoft programs will not run until the PEEKs, POKEs, and CALLs are translated. Also, Coleco representatives said they didn't know

if the BASIC includes new commands to support features which Adam has but the Apple does not, such as sophisticated sound and sprite graphics. Other graphics seem to be the same, with 16 colors and a high-resolution mode of 256 by 192 pixels (screen dots).

Will Coleco's Adam be a significant challenge to Commodore, TI, and Atari, which have tremendous head starts? Remember that Coleco proved in the past year it could crack open what some analysts thought was almost a closed market – the video game machines – and still make a strong showing despite a late entry. Expect a hard-charging advertising campaign to win similar success for Adam in the months ahead.

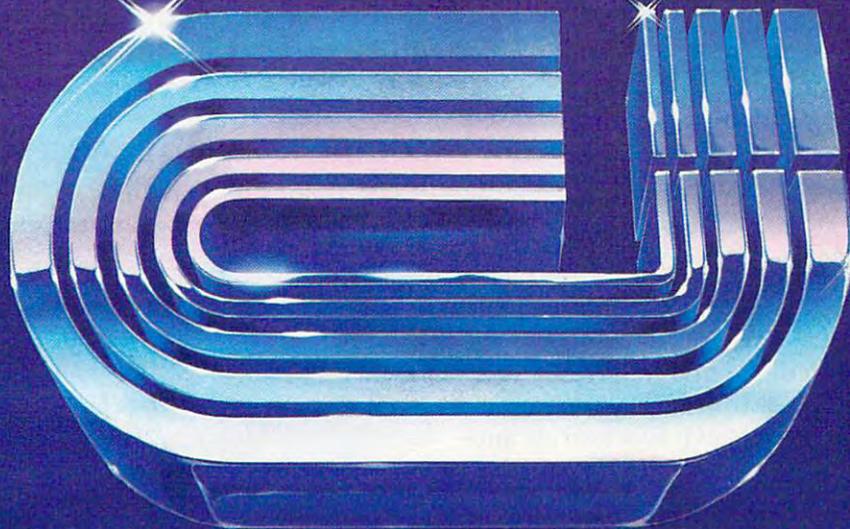
Atari's Clean Sweep

Even Atari acknowledges it has been undergoing some rough times lately. Its profits have been seriously eroded by increased competition and by one of the most dramatic price wars in consumer history. Its image suffered when mounting losses prompted the company to shift manufacturing overseas, eliminating more than a thousand American jobs. And its top-line home computer, the Atari 1200XL, was introduced only a few months ago to something less than critical acclaim.

It was immediately obvious at CES that Atari had decided it was time for drastic action.

First, Atari reorganized its corporate structure, consolidating the home video game and

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home computer divisions. This is more than just a corporate shuffle. It should avoid future conflicts between the two entities, such as the present incompatibility between the home computer division's machines and the video game division's recently announced add-on keyboard for the Atari 2600 VCS.

Second, Atari made a move that some industry analysts are labeling the most significant development of the year – a new subsidiary, Atari Publishing, will begin producing hit software for competing computers, including arch rivals Commodore and TI.

Third, Atari has completely restructured its home computer line. Its entire current lineup – from the four-year-old 400 and 800 to the struggling 1200XL – has been discarded. Atari is betting everything on a new line of four redesigned computers and an array of impressive accessories and peripherals.

Fourth, Atari is acknowledging the importance of support from third-party manufacturers and the grassroots. The new computers are designed to be easily and almost infinitely expandable, and their architecture is “open” – freely available to independent companies that want to make accessories. What's more, to assure that the new machines are better received on the grassroots level than the ill-fated 1200XL, Atari flew 15 top user group officers from all over the country to CES, all expenses paid.

The problems of the past 12 months appear to have galvanized Atari, and the company is responding with an all-out effort to recover its position in the marketplace.

The XL Series

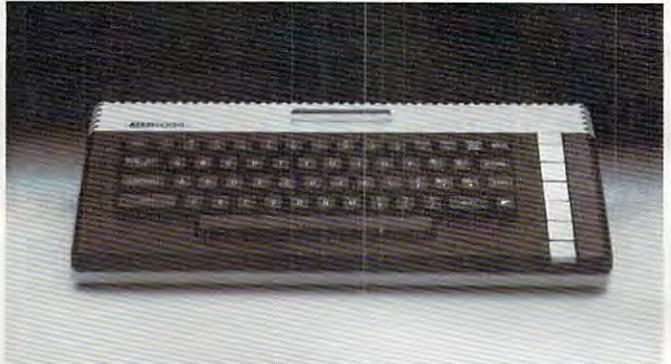
Atari's new XL computers range in list price from \$199 to an unannounced top end that will be about \$1000. Not only are they hardware- and software-compatible with each other, but best of all, they are fully compatible with the discontinued models. That includes almost all the new peripherals and accessories.

The computers are compact, attractive, incorporate the best features of the 1200XL plus some new ones, and together form a comprehensive product lineup:

- *Atari 600XL.* The low-end computer, with a suggested retail of \$199 that most likely will be discounted, comes with 16K RAM expandable to 64K. Like all the XL computers, the 600XL has a rear slot with an edge connector that is a “full processor bus” – an extension of the main circuit board (motherboard). This slot is the key to the almost limitless expansion of the XL series. As detailed below, it allows almost anything to be added to the computers, even co-processors, as

on the Apple. The 600XL's expansion slot accepts a 48K memory module that brings the computer up to a full 64K for about \$100. This would make it identical in features and price to the next model, the 800XL, except for the lack of a monitor jack.

Also in common with the other XL computers, the 600XL has built-in Atari BASIC. It has a full-stroke, typewriter-style keyboard with non-glare keycaps, a topside slot for ROM cartridges, and 24K of Read Only Memory (ROM), which includes the BASIC language and operating system.



Atari 600XL, 16K RAM.

The operating system of all the XL series computers appears to be nearly identical to the 1200XL's. This means all four machines have most of the features introduced by the 1200XL, such as the HELP key, the international character set, self-testing, and the ability to disable ROM to access extra RAM underneath. For instance, disabling BASIC – formerly accomplished by unplugging the separate BASIC cartridge – now is done by holding down the OPTION key while switching on the computer, or via POKEs from within a program.

In addition, the XL series retains the traditional Atari features, such as 256 colors, four sound channels, five text modes, eleven graphics modes, hi-res graphics of 320 by 192 pixels, programmable character sets, up to five sprites, separate chips to handle the screen and graphics, a serial port for adding peripherals, and so on. However, there are only two joystick ports instead of the usual four.

- *Atari 800XL.* As described, basically this is a slightly larger, 64K version of the 600XL. At a suggested retail of \$299, it costs the same as a 600XL expanded to 64K, although the built-in memory makes it less unwieldy. The only difference would be the monitor jack, absent on the 600. Even the keyboards are identical, but they do differ slightly from those on the upper-end models, the 1400XL and 1450XLD. The lower-end computers have non-glare keycaps and lack the four special function keys (F1 through F4) first seen on the 1200XL.

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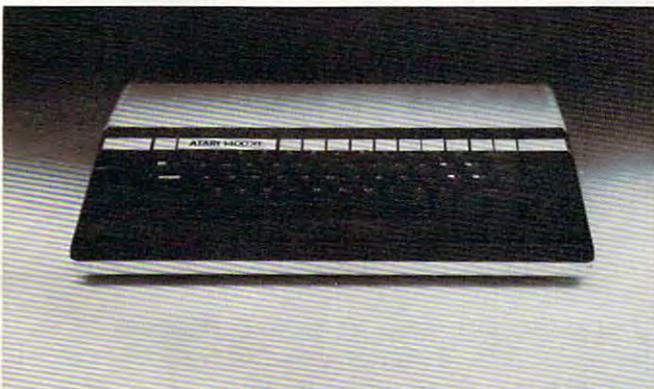


Atari 800XL, 64K.

Atari says the 600XL and 800XL should be available by the time you're reading this.

- **Atari 1400XL.** This is the model that most closely resembles the discontinued 1200XL (in fact, one Atari spokesperson told us – in jest, perhaps? – that a warehouse-full of 1200XLs might be converted into 1400XLs). Its outward appearance is virtually identical to the 1200XL's in every detail except the one that triggered most of the criticism against its late brother – the 1400XL has a rear expansion slot. Inside, it also adds two impressive new features, both built-in: a direct-connect modem and a speech synthesizer.

Although the 1400XL's price was not announced, sources say it will be in the \$500-\$600 range. Atari says it will be available in the fall.



Atari 1400XL, with 64K, built-in modem and speech synthesizer.

- **Atari 1450XLD.** Topping off the new Atari line, the 1450XLD has all the features of the 1400XL – including the 64K RAM, built-in modem, and speech – and adds a built-in, double-sided/double-density disk drive. The drive stores up to 254K per 5¼-inch disk and is two and a half times faster than the current drives (which store only 92K). A magnetically isolated disk-storage compartment alongside the drive can be converted to a second drive later. Also, the new drive will recognize and read the current disks (details below).

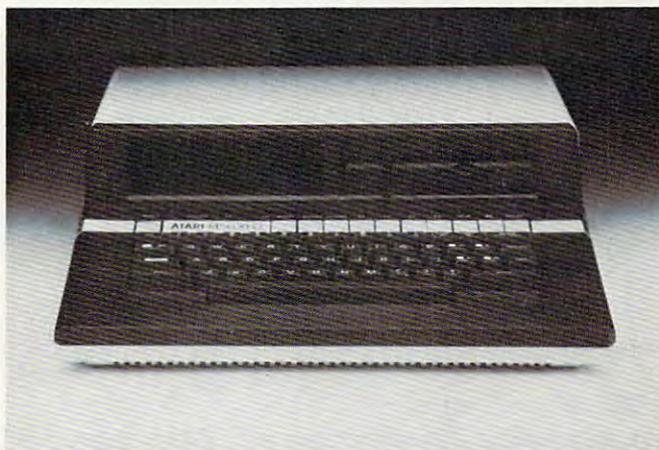
The 1450XLD's price also was not announced,

but should be around \$1000. Atari says it will be available by Christmas.

Making The Atari Talk

The modem and voice synthesizer aboard the 1400XL and 1450XLD are well-integrated with the rest of the computer. The 300-baud modem is handled as the "T" device (for telecommunications or telecomputing); the voice, as the "V1" device. In other words, the modem and voice are addressed as easily as any other device supported by the operating system, such as the screen, keyboard, disk drive, cassette recorder, printer, etc. This simple BASIC program will make the 1400XL or 1450XLD greet you with a "hello":

```
10 DIM A$(10)
20 A$="HELLO"
30 OPEN #1,4,0,"V1:PF"
40 PRINT #1;A$
```



Atari 1450XLD, with 64K, built-in modem, speech synthesizer, and double side/double density disk drive.

As on all Ataris, the voice emanates from the TV speaker. The speech, created by a Votrax chip, is comparable to the Voicebox sold for Atari and Apple computers by the Alien Group. It's easily understood, but unmistakably a computer.

Addressing the modem and voice as standard Atari devices provides great flexibility. For instance, an Atari spokesperson told us the voice can just as easily be sent through the modem. And the computer includes built-in software to operate the modem.

Also, there are three speech modes. Notice line 30 above: OPEN #1,4,0,"V1:PF" opens a device channel to the voice in *phoneme* mode. Phonemes are the phonetic building blocks of a spoken language. For the best speech, words should be spelled phonetically. "ATARI" is spelled "UHTAHREE." In this mode, the computer ignores certain consonants which might confuse the synthesizer, such as C and X. For a "soft" C, you must use an S; for a "hard" C, a K. Similarly, an X is spelled EKS. The other two speech modes are *alpha* and *numeric*. Alpha is a

more direct text-to-speech mode. The numeric mode allows voice programming in machine language.

Interestingly, we found that hitting BREAK while the computer is talking does not shut up the voice. This has always been true of sounds created with the four sound channels. This may mean that synchronizing speech with screen graphics could be a relatively simple programming task.

Atari's New Peripherals

Atari engineers must have been awfully busy for the past year. Besides all the new computers, Atari introduced a slew of new peripherals and accessories. Most of them work with the discontinued models, too. A summary:

- *Atari 1050 Disk Drive.* This double-density drive replaces the old 810 unit. It stores 127K per disk. It is not double-sided, as is the 1450XLD's on-board disk drive, which may not be available separately. The 1050 is trimmer than the 810, designed to match the XL series computers, and it automatically recognizes and adjusts itself for the current single-density Atari disks. Thus, it is fully compatible with both old and new systems. It should be available immediately at a list price of \$449. However, until the new double-density DOS III (Disk Operating System) becomes available this fall, it will be shipped with the single-density DOS II. We saw a preliminary version of DOS III with instruction screens that could be summoned at a touch of the HELP key, plus a new option on the DOS menu called "Convert DOS II." Old disks can be converted to double-density with this option.

- *Atari CP/M Module.* This small box adds CP/M capability to any Atari computer when plugged into the serial port – which means it also works on the older models. It contains a Z80 microprocessor, 64K RAM, CP/M 2.2 operating system, switchable 40/80 column screen adapter, a serial port, and a monitor jack. This last feature allows CP/M and 80-column video even on Atari's lowest-priced models, the 600XL and old 400, which do not come with monitor jacks. Compatible with the 1050 and old 810 disk drives, the module brings thousands of (mostly business-oriented) CP/M programs within reach of Atari users. It should be available by the end of this year. The price is unannounced, but sources peg it at under \$400.

- *Atari Expansion System.* With this box, the XL series can be expanded almost without limit. It plugs into the rear expansion slot and thus is compatible only with the new computers. It adds two RS-232C serial ports, a Centronics-standard parallel port, and most importantly, eight card slots. The slots could accept 80-column cards, extra memory, RAM-based disk emulators, co-

processors for CP/M or IBM compatibility – almost anything. Atari, however, is expecting third-party companies to supply most of these add-ons. The architecture is open to everyone. (The box is the XL series' counterpart of the old 850 Interface Module, which Atari says it will continue manufacturing until demand dries up.)

- *Atari 1027 Printer.* This amazing letter-quality, 80-column printer retails for only \$349. One-third the size of most printers, it uses standard typing paper, prints bidirectionally at 20 characters per second, and even underlines. It plugs into the serial port and works with the older models as well.

- *Atari 1030 Modem.* This is a 300-baud, direct-connect modem that permits phone numbers to be dialed from the computer keyboard. The price has not yet been announced.

- *Atari Touch Tablet.* With this pad and its stylus (or your fingers), you can draw pictures and diagrams, write script, or select menu options. There are two fire buttons on the tablet and another on the stylus. The tablet plugs into the joystick ports and has a drawing surface of 4½ inches by 6 inches.

- *Light Pen.* When the 400 and 800 were first introduced a few years ago, Atari announced – and even demonstrated – a light pen. Then problems cropped up and the light pen disappeared. Now it's back, and we saw it really work. You can draw and paint on the screen in different colors, choose from menus, and so on. No price yet, but Atari promises the pen will be in stores by the end of the year.

- *Trak-Ball, Remote-Control Joysticks.* The long-awaited Trak-Ball operates as either a true positional trackball or as a directional trackball, so it can substitute for an Atari joystick. The price is \$59.95. The remote-control joysticks are jumbo versions of the standard Atari controllers with protruding antennas. A receiver plugs into the joystick ports. Range is about 20 feet. The price is \$74.95 per joystick with receiver.

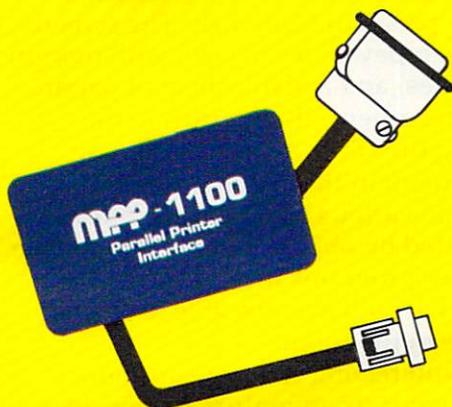
The computer keyboard for the VCS also was displayed at the show – in early prototype stage (see "Atari's New Add-On Computer For VCS 2600 Game Machine," **COMPUTE!**, May 1983). The keyboard has been slightly redesigned since it was first announced a few months back. Atari has renamed it "The Graduate" instead of "My First Computer." It is still planned to sell this fall for under \$90, and some predict the VCS itself will drop to around \$40 by then (at this writing, the going price is \$79).

Atari also introduced more software than we have room to mention, including games, educational programs, graphics utilities, and the Logo programming language on a 16K cartridge.

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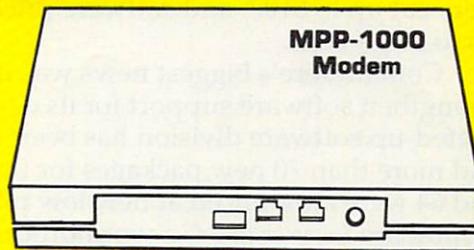
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Atari Publishing

Realizing that there can be a greater market for home computer software than hardware – especially with the price wars going on – Atari's biggest software news of the show was its decision to sell programs for competing computers. Although this will help alleviate one of the problems with the competition that Atari cites in its advertising, the profits will be welcome. The new Atari Publishing subsidiary will sell hit games for the TI-99/4A, the Commodore 64 and VIC-20, the Apple, and the IBM PC.

All these computers will get versions of *Pac-Man*, *Centipede*, *Defender*, *Dig Dug*, and *Donkey Kong*. In addition, there will be versions of *Stargate* for the VIC-20, Commodore 64, Apple, and IBM PC; *Robotron* for the VIC-20 and 64; and (licensed from Synapse) *Shamus*, *Protector*, *Picnic Paranoia*, and *Slime* for the TI.

The games will come on cartridges for the TI, VIC, and 64, and on disks for the Apple and IBM. Prices range from \$34.95 for disks to \$44.95 for cartridges.

Commodore Strengthens Software

On the hardware front, Commodore was relatively quiet at this CES, at least compared to the blockbusters they dropped at the last two shows. No new computers were announced. A few previously announced but still-to-be-introduced computers and peripherals were shown again, and one computer was dropped before reaching the market.

But even when Commodore is "quiet," it is far from silent. Fueling the price wars further, Commodore chopped the wholesale cost of the Commodore 64 from about \$360 to \$200, which means retail prices at some outlets should be \$250 or less by mid- to late summer.

In addition, prices on printers and disk drives were cut up to \$100, and software prices were cut up to 50 percent.

Commodore's biggest news was its efforts to strengthen software support for its computers. A beefed-up software division has been formed, and more than 70 new packages for the VIC-20 and 64 were announced at new low prices. Examples are *Easyscript 64*, a word processor for under \$50, *Multiplan*, a spreadsheet for under \$100, a small business accounting package of five programs for under \$250, and *Magic Desk I – Type and File*, an under-\$100 program that one spokesperson called "Commodore's answer to Apple's Lisa."

Magic Desk I, a cartridge for the 64, is the first of a series of programs aimed primarily at home users. The screen comes up with a picture of a room containing a desk, typewriter, index file, telephone, calculator, ledger, wastebasket, artist's

easel, file cabinet, and a digital clock. Floating in the air is a hand with a pointing finger. Using a joystick, trackball, or "mouse" (not yet available), you can move the hand to point to any object in the room. Pressing the fire button selects that option.

For instance, pointing at the typewriter and pressing the fire button loads a typewriter-like word processing program from disk. The screen really looks like a typewriter carriage, with margin stops, paper guides, and a blank sheet of paper. You can type a document, then return to the room by pressing fire. Back at your desk, you can file the document in the cabinet, toss it in the wastebasket, or do various other things. The other options represented by objects in the room will be enabled by further programs in the *Magic Desk* series. Eventually, you'll even be able to define your own objects in the room.

Some other interesting software announcements for the 64 were six adventure games, including the popular *Zork* series; *Wizard of Wor*, the first talking game using the speech module introduced at previous shows; *Super Expander 64*, a cartridge with extended commands for graphics and sound; *Music Machine* and *Music Composer*, which use the plug-in synthesizer keyboard announced at the Winter CES; and *Logo* and *PILOT* languages on disk.

The bulk of the software seemed to be for the 64, but new VIC programs included *VICwriter*, a word processor; *SimpliCalc*, a spreadsheet; *VICfile*, a data base manager; *Know Your Child's IQ*; and *Number Nabber*, *Shape Grabber*, a teaching game for children.

On display was the previously announced portable version of the Commodore 64, known as the Executive 64 (formerly called the SX-100). The current prototype has a built-in, six-inch color monitor and disk drive, and is priced at \$995. A second drive is optional. Commodore has moved the delivery date back to sometime this fall.

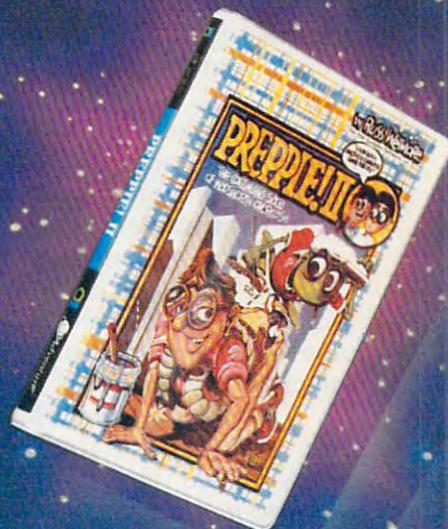
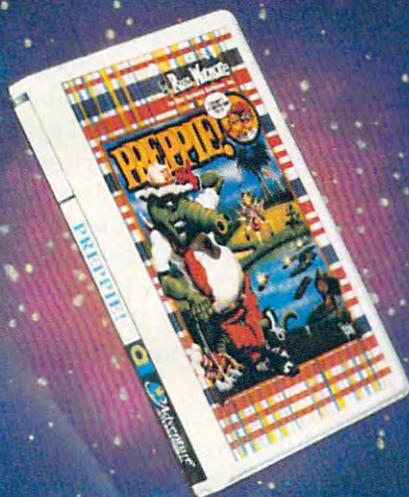
Not on display was a new computer announced at last summer's CES, variously known as the P Series, P128, or P-500. Intended to be a souped-up version of the Commodore 64, with 128K RAM expandable to 256K, a larger keyboard, and sleeker styling, the P was dropped without official explanation. Unofficially, Commodore wanted to concentrate on other projects. The P is being transformed into an 80-column machine without color or graphics, and will be aimed instead at the small business market. Commodore says it may be available later this year, along with the closely related B and BX Series announced last summer.

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one or two new computers, possibly the TI-99/4B and the TI-99/8. So much for rumors.

The 99/8, however, is said to be very near. Insiders say it will come with 80K RAM, built-in speech, and sell for roughly \$500. BASIC, Forth, Logo, and UCSD Pascal will be the available languages. The 99/4B, they say, will fall somewhere between the 99/4A and 99/8 in features and price.

It could be that TI is somewhat gun-shy after its recent experience with the 99/2. Introduced at the Winter CES, the 99/2 was an economy version of the 99/4A without color or sound. It was designed to sell for \$99. Unfortunately for TI, the ongoing price war with Commodore and Atari heated up a little faster than anticipated. To compete, TI slashed the price of the 99/4A again and started another rebate program. This brought the 99/4A to under \$100. Unable to cut the 99/2's price accordingly, TI was forced to drop the new model it had spent months (and millions) developing. Now that each one of the Big Three has been burned in a similar way – Atari with its 1200XL and Commodore with its P128 and Max Machine – they may be more circumspect about making splashy introductions of new computers.

Although TI unveiled no new machines at CES, the company did introduce a 99/4A with a redesigned white housing. Word is the new plastic case is cheaper to manufacture, and that it will match the design of the coming 99/8.

The most interesting TI news, though, was a plug-in speech and *voice recognition* device for the 99/4A. Called the Milton Bradley MBX Expansion System, it works with ten software packages available from MB and TI. We saw it used with an educational game for children, *I'm Hiding*. Wearing a small headset with a microphone, the child names an object on the screen which might be hiding a tiny creature. The program responds to these verbal commands and even talks back with a remarkably human-like voice. The MBX will be available later this year for \$129. Versions also may be adapted for other computers.

TI also introduced a 300-baud, direct-connect modem for \$99; *TI-Mini-Writer*, a cassette-based word processor for \$19.95; four games (*M*A*S*H*, *Sneggit*, *Moonmine*, and *Entrapment*); and six educational packages, including three games based on *E.T. the Extra-Terrestrial*.

NEC Portable Computer

The almost overnight success of Radio Shack's Model 100 portable computer seems to have caught many in the industry off guard. Watch for several similar computers to be introduced in the coming year.

The 100's sudden success also was reportedly a large factor in NEC's decision to export its version of the Model 100 to the United States. The

NEC PC-8200, still being redesigned for the American market, looks almost exactly like the Model 100. This is not surprising, because NEC makes part of the Model 100 for Radio Shack. Therefore, the specifications, and even the built-in programs, are nearly identical.

NEC is departing a bit from the Model 100's design, however. Preliminary specs call for 16K RAM standard instead of 8K, expandable to 96K instead of 32K. The onboard modem found in the Model 100 may be removed, but a spreadsheet program added. The keyboard is slightly changed, with five special function keys instead of eight, and the cursor keys arranged in an efficient diamond pattern. As for pricing, NEC says only that it will be "competitive" with the Model 100. It's scheduled for delivery late this year.

Unitronics Sonic

Another interesting computer was the Unitronics "Sonic." Display models were early prototypes not yet fully functional, and this is the computer that was upgraded right at the show in response to Coleco's stunning introduction. Nevertheless, the Sonic has its own distinguishing features.

It comes with 80K of user-available RAM, plus another 16K to support its TI graphics chip. The TI chip gives the Sonic 32 sprites and 16 colors. The Sonic also has a built-in Waferdrive, a very fast mass storage device that uses Exatron Stringy Floppy technology. A wafer the size of a business card can store up to 128K. A 12K operating system and Applesoft-compatible BASIC load from one of these wafers each time the computer is switched on.

Other features: 6502 CPU chip (the same as Apple, Atari, and Commodore); upper/lowercase, 40-column screen; 70-key typewriter-style keyboard with 16 function keys; three sound channels with music synthesis; three different expansion ports, one Atari-style joystick port, and a VIC-20-compatible serial port. In addition, the Sonic will come with some software, including *Frogger*, the *Magic Window* word processor, Applesoft-compatible BASIC, the operating system, and blank wafers. Unitronics says the Sonic will be available this fall for \$400.

Also planned are a Z80 Card Module to add CP/M capability, interface modules for the Atari 2600 VCS and Colecovision game machines, the Unimodem, and other peripherals and software.

Timex Computers

Timex displayed two improved versions of the Timex/Sinclair 2000 introduced at the Winter CES, plus a completely new model, the T/S 1500.

The T/S 2000 series computers are basically upgraded versions of the Sinclair ZX Spectrum, a popular machine in the United Kingdom. The

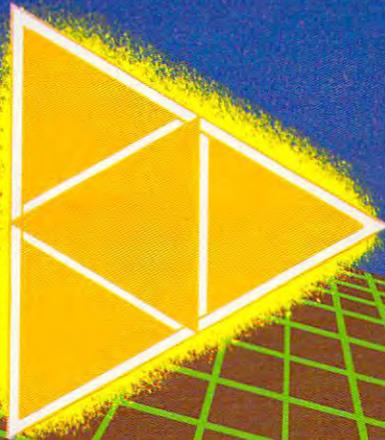
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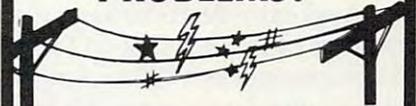


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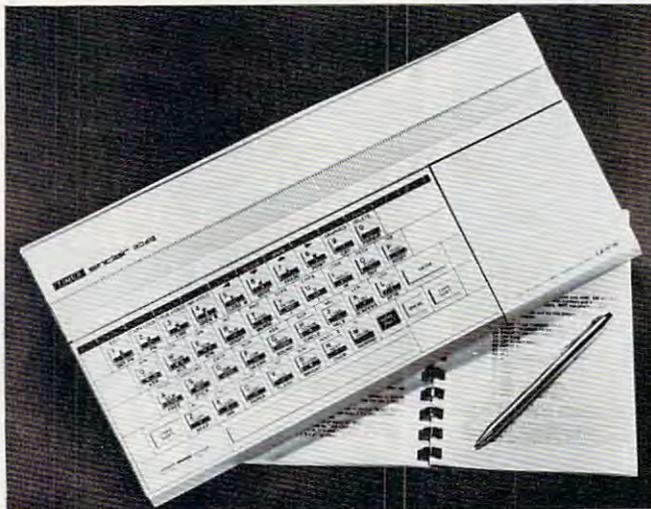
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top-line T/S 2048 is a compact computer with 48K RAM and 24K ROM with BASIC; interface for standard cassette recorders; eight colors; hi-res graphics of 256 x 192 or 512 x 192; selectable 32- or 64-column screen; TV and monitor output; 10-octave sound generator; 42-key rubber "half-stroke" keyboard (not a membrane keyboard, as on the T/S 1000); one-touch BASIC keyword entry; upper/lowercase; Z80A CPU; and two joystick ports. Timex also added a slot for cartridge software and a bank-switching feature that allows addressing even more memory. Timex says the T/S 2048 will be available by fall for \$199.95.

The other 2000 series computer, the T/S 2024, has all the same features except less memory: 24K RAM and 16K ROM. It costs \$149.95. Both work with the T/S 2040 printer (\$99.95) and ZX Spectrum cassette software. In addition, Timex is producing a line of software on cassettes and cartridges, specifically for the 2000 series, priced from \$9.95 to \$29.95.



The Timex/Sinclair 2048 with 48K RAM and hidden cartridge slot (beneath cover at right).

Timex's completely new computer, the T/S 1500, more closely resembles the ZX Spectrum, although it is not a color computer. It comes with 16K RAM expandable to 32K; 8K ROM with BASIC; interface for standard cassette recorders; 40-key rubber half-stroke keyboard; one-touch BASIC keyword entry; 32-column screen; programmable character sets; 22 graphics characters; and 64 x 44 graphics. The price is \$79.95. An optional interface will allow the T/S 1500 to use 2000 series cartridges.

Mattel Aquarius II

Besides showing its Aquarius, Mattel revealed a sequel, the Aquarius II.

Available later this year, the Aquarius II is a more powerful computer with 20K RAM and 12K ROM. Other improvements over the Aquarius

include a full-stroke, typewriter-style keyboard (without the hazardous RESET key that destroys programs) and extended Microsoft BASIC. All other features are the same as the Aquarius, except the Aquarius II is expandable to 64K RAM. It works with all Aquarius software and hardware introduced to date. Price will be in the \$130-\$175 neighborhood.

Mattel also displayed new accessories for its computers. The plug-in Aquarius Command Console allows computer control of household appliances and security alarms. The screen draws a cutaway picture of the house with all electrical outlets. Up to 32 devices can be controlled automatically (in seven-day cycles) or manually from the computer. The Aquarius Master Expansion Module is a large box with room for two disk drives, extra memory, two cartridges, and up to seven other peripheral boards. The Aquarius Four-Color Printer has blue, red, green, and black, and generates 40 or 80 columns on 4½-inch-wide paper. The Aquarius Phone Modem is a 300-baud device that plugs into the computer's cartridge slot. Mattel says all four products will be available later this year; prices are undetermined.

New software released for the Aquarius includes a Logo cartridge; games such as *Burgertime*, *Advanced Dungeons & Dragons*, and *Tron*; and home management programs such as *Finform* (a spreadsheet) and *Fileform* (a word processor).

Mattel also announced Aquarius Home Services, a data base available by modem through the CompuServe Information Service. It will have a "Hints from Heloise" column, educational games for children, SAT college-prep drills for high-schoolers, electronic mail, classified ads, and information on Aquarius computers.

Vectrex Computer

This summer's award for the most unusual computer shown at CES must go to the Vectrex Graphic Computer System. Still in early prototype stages, it consists of an add-on computer keyboard for the Vectrex game machine.

In case you're unfamiliar with the Vectrex, it's a unique game machine with its own built-in video screen. Unlike regular TV, however, the screen is a *vector-graphics* screen. TV sets use *raster-scan* screens. An example of a vector-graphics screen is the arcade version of *Asteroids*. Images are formed not with pixels, as on raster-scan displays, but with oscilloscope lines. Some unusual effects can be created this way, including simulated 3-D.

The Vectrex now sells for \$99 to \$129, and the computer add-on, when it becomes available, should cost around \$100. It will have 16K RAM expandable to 64K, 16K ROM with BASIC, three sound channels, a 40-column by 15-line screen,

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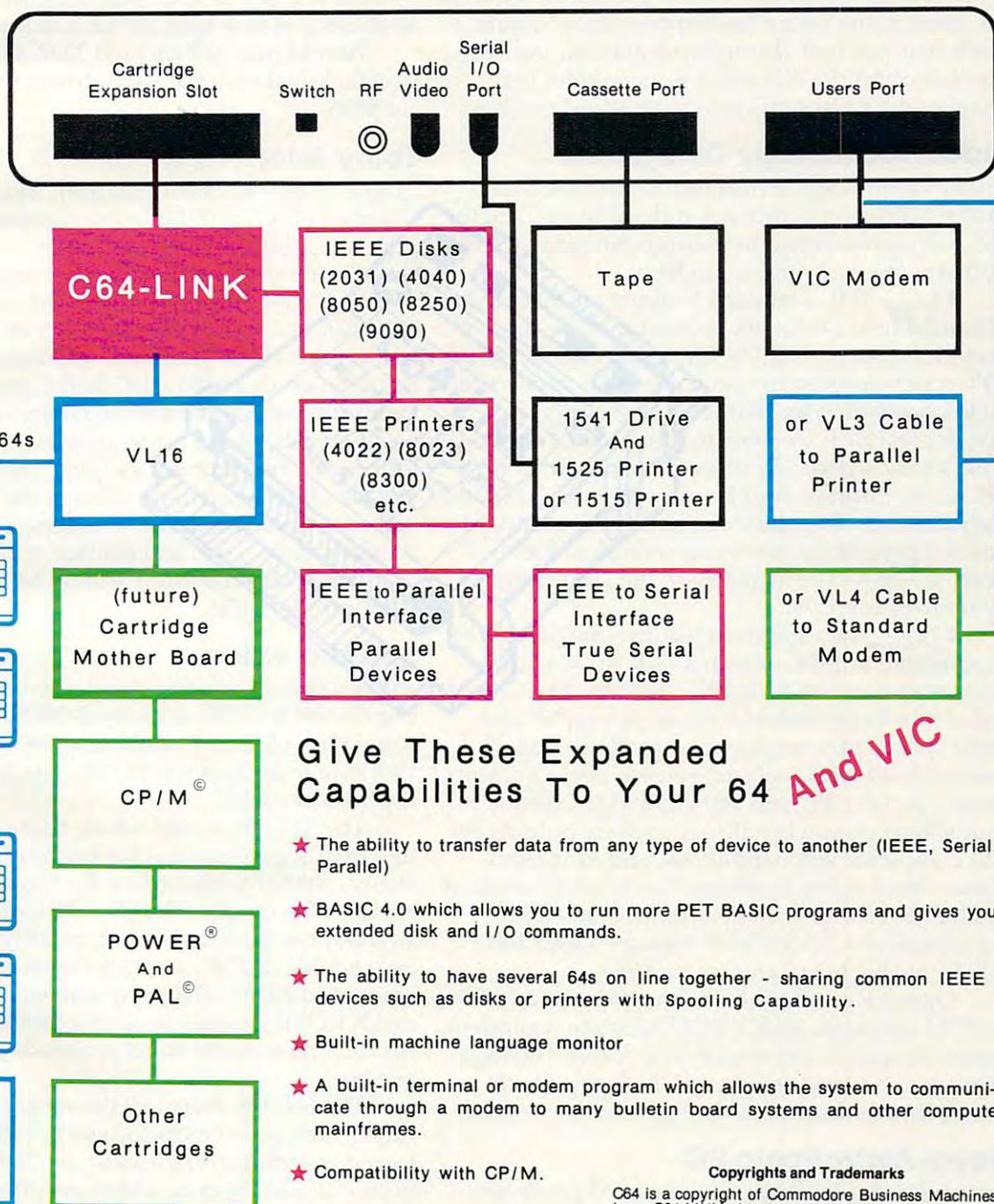
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- ★ Built-in machine language monitor
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- ★ Compatibility with CP/M.

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and a 6809 CPU (as in the Radio Shack Color Computer). A Stringy Floppy drive will be optional. The BASIC has special sound commands such as NOTE, AMPLITUDE, ENVELOPE, and NOISE. A light pen introduced for the game machine also will work with the computer.

Another accessory may also work with this new computer: the new 3-D Imager. Designed for the Vectrex game machine, the 3-D Imager is a pair of heavy glasses that you wear while peering into the vector screen. One lens is blue, the other red, just like the 3-D movie glasses of the 1950s, except some kind of motorized disc spins in front of the lenses. When you look at the screen without the glasses, the vector lines appear to be vibrating. But when you look through the glasses, the lines are stable and the 3-D effect is incredible. Just imagine the games this computer could produce.

Video Technology Computers

Video Technology, which introduced the first under-\$100 color computer at the Winter CES (the VZ-200), showed two new computers at this CES. Both are more advanced models:

- *Laser 2001*. Standard features are 80K RAM expandable to 144K (16K is consumed by the graphics chip); 16K ROM Microsoft BASIC; 6502A CPU; cartridge slot; rubber half-stroke, typewriter-style keyboard; user-definable keys; upper/lowercase; full-screen editing; 16 colors; two Atari-style joystick ports; 36-column text mode; 256 x 192 hi-res graphics; four sound channels; 300-baud standard cassette interface; Centronics-standard parallel port; and a rear expansion slot. Video Tech says it will be available in the United States by January for \$299.

- *Laser 3000*. Standard features are 64K RAM expandable to 192K onboard; 24K ROM with Applesoft-compatible BASIC; 6502A CPU; 81-key full-stroke keyboard with numeric keypad and eight special function keys; upper/lowercase; selectable 40- or 80-column screen; hi-res graphics modes of 560 x 192 and 280 x 192; eight colors; four sound channels with six octaves; outputs for TV, composite video monitors, and RGB (Red-Green-Blue) hi-res monitors; Centronics-standard parallel interface; cassette interface; and a rear expansion slot. Video Tech says the Laser 3000 will be available by January for \$699.

Optional accessories will include disk drives, a CP/M cartridge, an RS-232C interface, a modem, joysticks, and an expansion box. Video Tech is a Hong Kong-based company which exports its products to subsidiaries throughout the world.

Royal Alphatronic PC

Royal, known for its typewriters and printers, will import a Japanese-made computer to the United States this fall.

Called the Alphatronic PC, it has a Z80A CPU; 64K RAM and 32K ROM with BASIC; interfaces for Centronics-parallel, RS-232C, cassette, and system expansion; a hidden cartridge slot; CP/M compatibility; selectable 40- or 80-column screen; eight colors; an 85-key, full-stroke keyboard with numeric keypad and six special function keys; outputs for TV, composite video, and RGB monitors; and TRS-80-style line editing.

One unusual feature is a high-pitched beeper which emits a constant tone whenever you hit more than one key at a time – inevitable during fast touch-typing. The tone does not stop until you press a key in the lower-left corner of the keyboard, or else turn off the computer.

Accessories will include 320K slim-line disk drives. Royal says the Alphatronic PC will sell for \$695.

Tomy Tutor

Tomy, a large toy manufacturer, introduced the "Tomy Tutor," a 16-bit home computer that can generate attractive game graphics.

The only other 16-bit home computer is the TI-99/4A. The Tutor has 16K RAM expandable to 64K; 32K ROM with extended BASIC; a rubber, half-stroke, typewriter-style keyboard; 16 colors; upper/lowercase; 256 x 192 hi-res graphics; 32-column screen; three sound generators with eight octaves each, plus a noise generator; cassette interface; TV and monitor outputs; and a cartridge slot for plug-in software. Accessories include a recorder, joysticks and controllers, a voice synthesizer, disk drive, and printer.

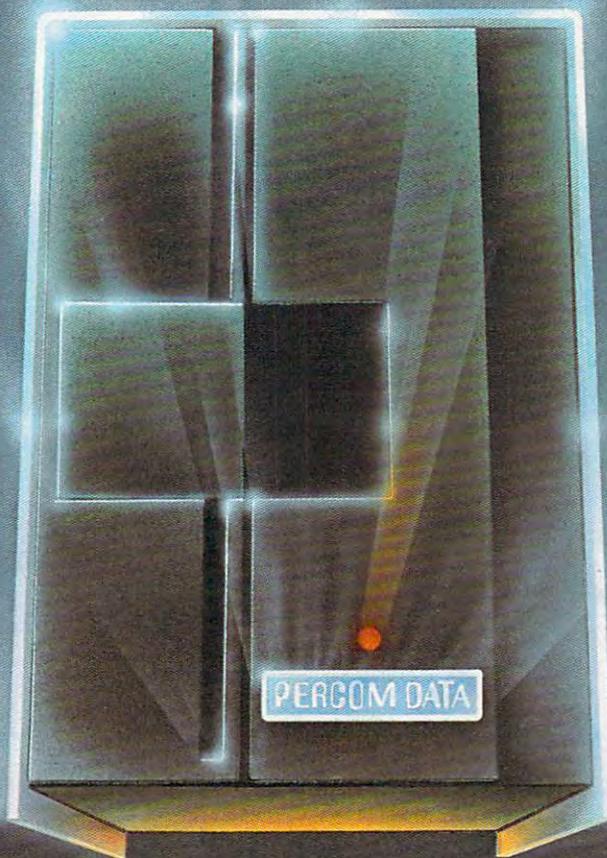
Tomy says the Tutor should be available this fall for under \$150.

Spectra Video

At the Winter CES, Spectra Video introduced its impressive SV-318 and gave **COMPUTE!** a peek at a mock-up of their forthcoming SV-328 computer. Working models of the SV-328 finally appeared at the Summer CES.

The SV-328 should satisfy those who prefer a full-stroke, professional keyboard to the half-stroke, rubber keyboard on the SV-318. It also replaces the cursor joystick with a numeric keypad, has built-in CP/M capability, 80K of RAM expandable to 256K, and an unusually large amount of ROM, 48K expandable to 96K. Why so much ROM? Besides a super-extended Microsoft BASIC, it contains a word processor and a terminal program.

The SV-328 shares all the other SV-318 features, such as 16 colors, 32 sprites, Z80A CPU, topside cartridge slot, and three-channel, eight-octave sound. Spectra Video says the SV-328 should be available within a few months for \$595.



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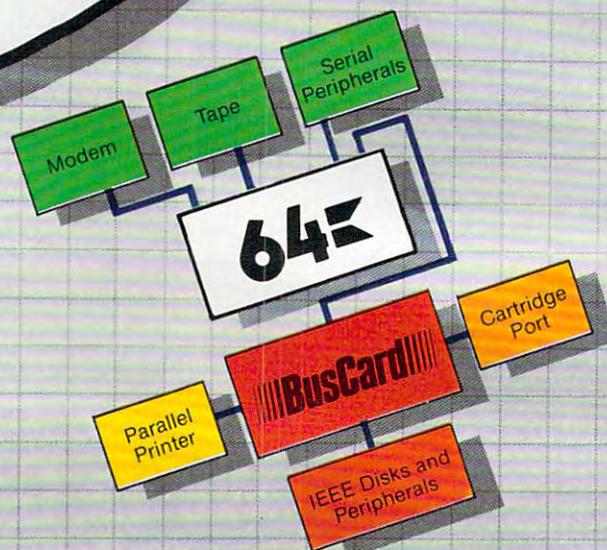
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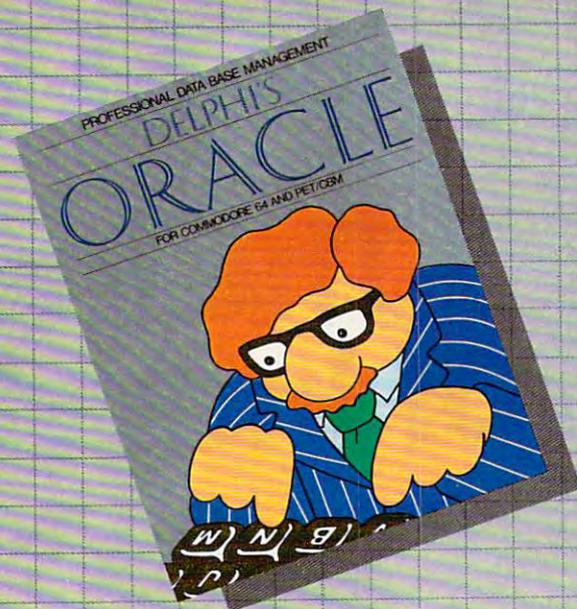
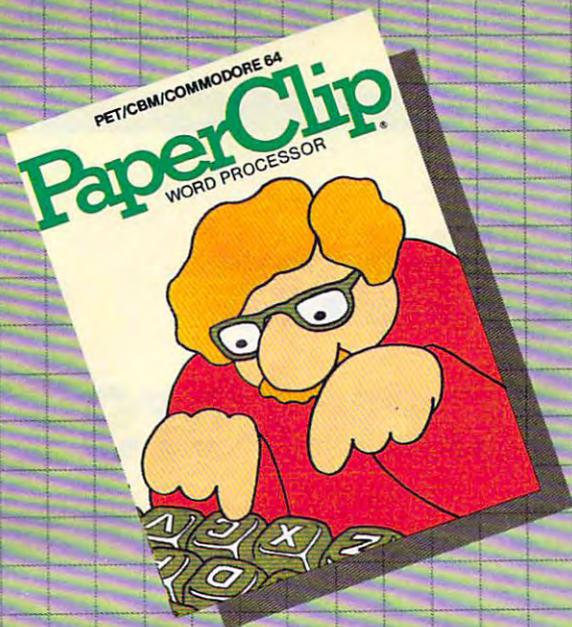
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The Predictions Of Industry Leaders

John Blackford, Assistant Features Editor

The clearest trend in the computer industry over the last few years has been its unpredictability and explosive growth. More than one company has been caught off base by falling prices, rapidly growing demand, or powerful new products – and the sight of electronics pundits eating their words has become a common one. Industry analyst Adam Osborne recently stated that a certain kind of powerful microprocessor might never be produced – on the same day that Hewlett Packard announced one. Still, thinking about the future is essential in a field where keeping ahead is practically the key to survival, so we've asked some industry leaders about the changes they see coming this year.



Portia Isaacson is the president of Future Computing, Inc., a firm that analyzes trends in the personal computer industry. We talked to her on the busy floor of the Summer Consumer Electronics Show (CES) among the nearly 100,000 people who flocked in to view the latest electronics wares.

Like many industry observers, Isaacson believes that this year will see a sharp increase in unit sales of home computers. But competition among hardware manufacturers has intensified. "The home computer business is in its infancy," says Isaacson, "and very violent shifts could take place." Because of the uncertainty of the hardware market, she believes software will play an increasing role. Consumer choice among contending brands will likely hinge on the quality of the software available for a given machine.

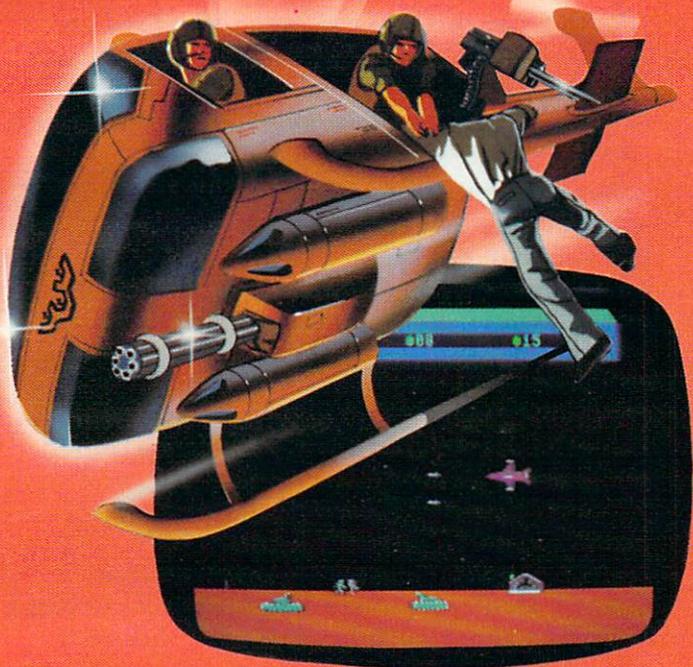
Not only games, but also more specialized software will begin to appear. "We think this is the year that educational software will take off," says Isaacson.

As software becomes more central to computer sales, companies will have to scramble to capitalize on their available programs. Major manufacturers are approaching this issue from different perspectives: Atari by selling translations of its popular games for such machines as VIC, Apple, and 64; Commodore by developing its own low-cost software; and Texas Instruments by trying to be the sole distributor of cartridge software made for its computers.

"I think Atari's decision to sell software for other machines is one of the most important strategic moves in the market this year," says Isaacson. "Atari's new computer line is also spectacular – and evolutionary." The reason, she says, is that it incorporates new features while remaining compatible with previous models, and it's designed to permit other manufacturers to develop compatible products.

Atari's willingness to support third-party development may indicate a trend that Isaacson

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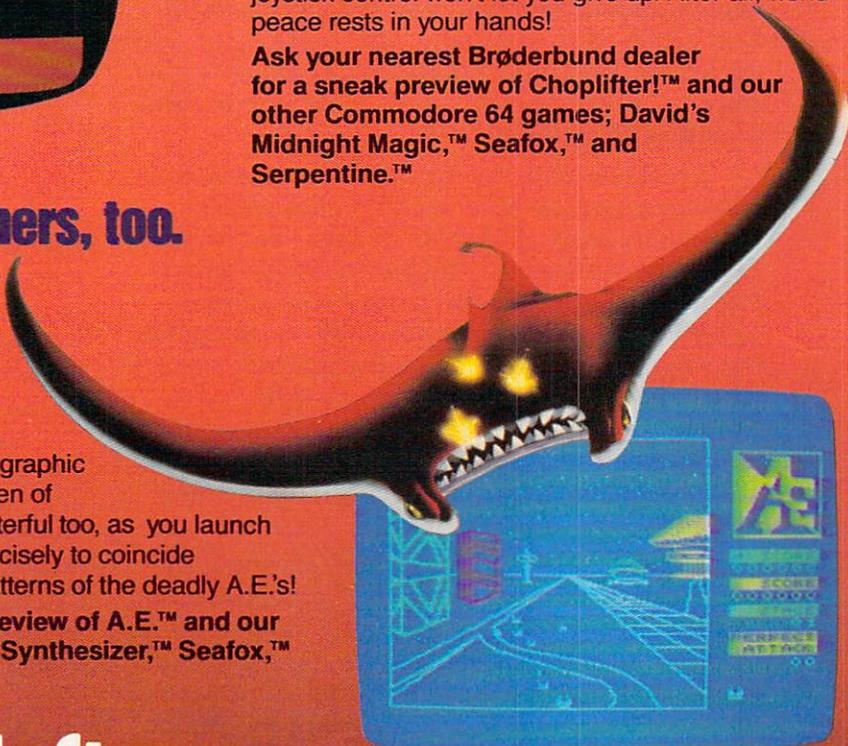
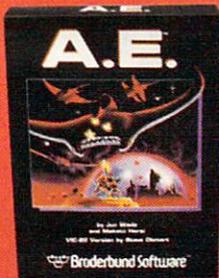
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thinks could become more pronounced in coming years – standardization of the home computer. “We think a de facto standard for home computers will be the model ultimately,” she says. “IBM will enter the personal computer business with an open standard.” That means other companies would be invited to follow that standard in developing their own compatible products.

The question, of course, is whose computer will become the standard. There are several strong contenders. IBM, which made an impressive showing with its personal business computer (the PC), is readying a smaller version for the home market. Atari has a strong new line, and says Isaacson, “the C-64 is absolutely compelling. I would give that every chance of surviving.”

Texas Instruments has taken a somewhat different approach by discouraging others from developing cartridges compatible with its computer, even to the point of taking out advertisements in trade papers threatening legal action against those who do. Isaacson feels this could undermine support for the computer, although with profit margins on hardware so narrow, software may be the only way to stay in the game. “Manufacturers aren’t making money on the product,” explains Isaacson, “so they must sell software.”

As home computer prices drop, more will be purchased by consumers who a year or so earlier would have bought a videogame machine. Still, because it takes time for any trend to develop, videogames are likely to remain popular in the near future. But eventually, “the merging of videogames and computers in the marketplace is now certain,” says Isaacson. “You could not disagree with that after this show.”

The show saw the introduction of new computer products by several companies with strong videogame lines. (For more details, see “The Fall Computer Collection: The Summer Consumer Electronics Show” in this issue.) For example, Coleco – manufacturer of the ColecoVision game machine – introduced a very inexpensive system which includes the computer, joysticks, mass storage, and printer. The game machines can be upgraded into the computer (dubbed Adam), and all Coleco game cartridges will run on the new machine.

“The Adam – Coleco’s entry – is about the most unique thing in the show,” adds Isaacson. “Coleco is emphasizing the utility of computers. They are saying that they have a nice little word processing package – and the videogames are an extra benefit.” This approach makes the product’s features easily understood by buyers. “Consumers and mass merchandisers need that simplification,” she says.



John C. Cavalier is the president of Atari Products Company, a division of Atari, Inc. This division was recently reorganized to include both home computers and videogames, a fact that underscores the company’s commitment to the home computer market.

“This will be the takeoff year for the computer,” according to Cavalier. “Our statistics indicate that by the end of 1982, a total of two and a half million computers had been sold. In 1983 alone, seven to nine million new computers will be purchased.”

Cavalier believes the computer revolution really began around 1981 and that by 1986, only five years later, at least 29 million computers will be in homes and offices throughout the United States. With roughly 60 million families now in the United States, that’s getting close to one computer for half the families in the country.

In spite of the surge in computer sales, Cavalier thinks the home computer will not begin outselling game machines this year, though it may be close.

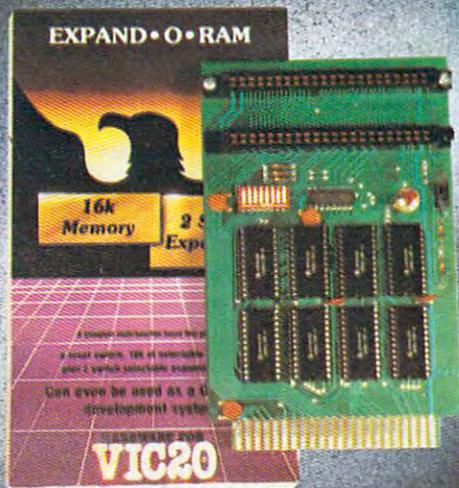
What is the significance of this explosion in computer sales? For one thing, Cavalier, like Isaacson, believes that because the competition in hardware is so fierce, manufacturers cannot depend on the computers themselves for profit. Instead, software will grow in importance as a source of revenue to computer manufacturers. “The software is where the profit is – not really hardware,” he says.

Consequently, this year Atari will increase its emphasis on software sales for both the home and educational markets. In fact, notes Cavalier, Atari’s recent introduction of its games for other popular computer brands – Commodore, Apple, Texas Instruments, and the IBM PC – should not undercut sales of his company’s computers, but will take advantage of the popularity of some of Atari’s games.

In the educational field, Atari signed an agreement with MECC, the Minnesota Educational Computer Consortium – an important source of educational programs – to offer MECC’s entire

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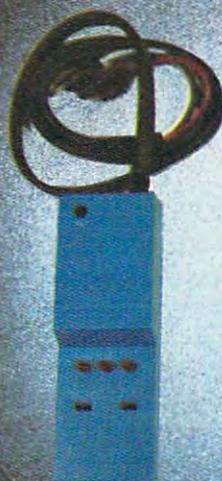
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line of software in an Atari-compatible form. This should make Atari computers more attractive to schools, some of which have favored the Apple computer because of the many educational programs available for it, including MECC's.

Although Atari is broadening its software offerings, a strong line of hardware may still be the key to attracting enough users to support the software. Atari's new computer line underscores the company's effort to move away from its image as a producer of game machines. "Until now," notes Cavalier, "I'm not sure people considered us a serious computer company."



Myrddin L. Jones is vice president of marketing for the Computer Systems Division of Commodore Business Machines, Inc. Formerly a senior vice president of marketing for North American Phillips, Jones is overseeing the sales efforts at Commodore at a time when optimism is high there.

"Systems and software is the name of the game right now," according to Jones. "Less emphasis on kilobytes and more emphasis on software is what we'll see in the coming year." Whether the applications are I.Q. development programs or home financial packages, Jones feels consumers will be increasingly aware of its possible uses when they buy a computer.

To satisfy this new consumer awareness, Commodore has recently increased development of software for its computers and released over 70 new programs. In addition, the software itself will be dropping in price. "Some of our software prices are being cut by half," notes Jones.

The programs that Commodore does develop will include more educational and applications software. The company has also released more than 600 educational and general-interest programs to the public domain and is offering these through retail outlets and dealers at \$6.95 per disk.

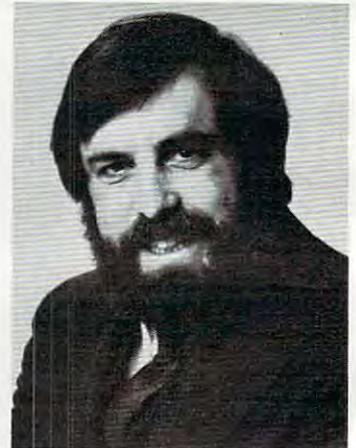
"The other trend is going to be mass merchandising," says Jones. In the past, computer manufacturers haven't always been aware of the

special needs of the large distributors. But in the months ahead, they are going to have to work closely with merchandisers. "Each organization can develop its package to suit its particular customer," says Jones. There will be more long-range planning, better awareness of the particulars of the mass market, and more contact between manufacturers and large distributors.

Because Commodore is vertically integrated — designing and producing many of its own chips while also doing most of its own manufacturing — Jones feels it can afford to sell its products for less than its competitors can. "I think it will be the vertically integrated companies that succeed," he says.

With this edge, Jones feels Commodore can gain 30 to 55 percent of the world market for home computers by the end of the decade. "It's warfare out there," he says, "economic warfare."

But to some extent, all manufacturers are facing low profits on hardware as the result of severe price cutting that took many companies by surprise. "People just can't afford to maintain the low profit margins," adds Jones, "so it will be a year of systems and consolidation. It has to be, because high volume alone isn't enough."



John Victor is president of Program Design, Inc. (PDI), a manufacturer of educational software and games such as Clipper: Around the Horn in 1850.

"This will be more a year of consolidation," says John Victor. "Most of the original trends were set back in 1981, and now we're seeing growth and shake-out. I don't think we will see any radical departures, but you will see intense competition and better execution on software packages."

One trend that Victor believes may accelerate this year is a move into the home market by educational software producers. "The home educational market is coming to the fore," says Victor. "The trend is to go out for the home market because schools don't have the money."

Victor's company will be introducing a series

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However, the market is hard to predict, and Victor is well aware that common sense cannot always be trusted in a field that has seen people succeed seemingly by doing the opposite of what appears reasonable. "If the conventional wisdom says that you shouldn't do a certain type of software, you should probably go for it."



Doug Carlston is president of Brøderbund, a producer of such popular computer games as *Apple Panic* and *Choplifter*.

The software market right now is maturing a little more gracefully than the hardware market, because software hasn't suffered from the severe price cutting that has affected hardware manufacturers, according to Carlston. Brøderbund, which started building its reputation with computer games, has since introduced games such as *Choplifter* that don't depend on shoot-em-up violence. Now, Brøderbund is trying to become a full-line software supplier, conforming to what Carlston sees as the trend of the marketplace.

Recently the company introduced *Bank Street Writer*, a word-processing program for children that is starting to look like a hot seller. By the end of the year, Carlston hopes to increase sales of nongame software from the current 42 percent to around 60 percent. He would also like to support a broad range of computer types, rather than provide software for only one or two brands.

"People don't understand that it's becoming a software-driven market," he says. The hardware producers are cutting prices so sharply that he sees hardly any profit left for them. Instead, Carlston thinks many of these companies will make money by selling software. Even so, he says, "lots of hardware companies will get weeded out."

Concludes Carlston, "There are a lot of major

players trying to get into this game who don't realize that capital isn't enough. There's still a lot of room in this business for the individual entrepreneur."

Russ Walter, an analyst of the computer industry, authored the eight-volume Secret Guide to Computers, now in its eleventh edition. Walter gives computer workshops in the summer at Wesleyan University in Connecticut.

Like PDI's Victor, Walter sees a growing effort in the coming year in educational software, especially for the very young child. "There are some nice programs now for seven-year-olds. When the younger kids see them, they want something, too," says Walter.

Overall, he anticipates boom times this year, but with some manufacturers having problems because of the intense competition. "Computers are a fad this year – that means it's going to be a very good year, though the fad will wear off eventually. At the low end of the market, I'm glad that the price is really dropping – now it's under \$100 for some models."

At that price, nearly anyone can afford a computer, and impulse buying becomes a factor. "The magic number was 600,000," he says. A lot of companies have sold more than that in 1983, and the year ahead promises even greater sales.

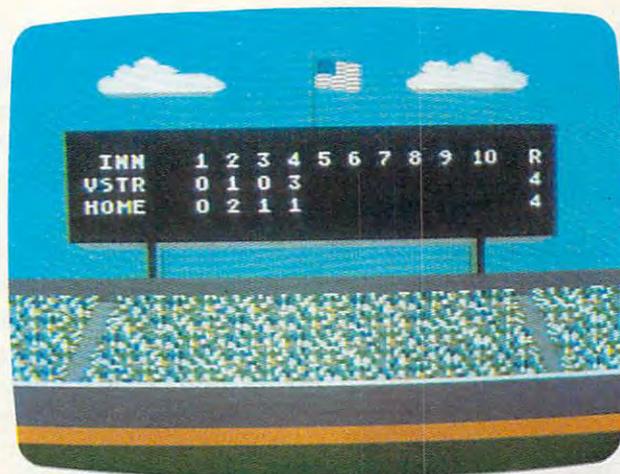
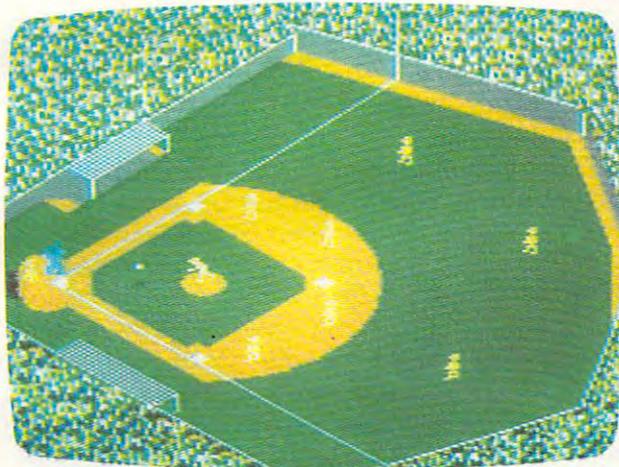
Some of the companies that Walter believes may feel the pinch in the coming months are Apple, Commodore, and Timex. Although Apple got a jump on the personal computer market, the company is now caught between lower-priced computers with similar features and the IBM Personal Computer, which has proved popular. Walter also thinks that despite its impressive price – performance features, Commodore could have trouble with the 64 if there isn't plenty of software for it by Christmas. "It remains to be seen whether the software will get generated," he adds.

Walter also believes the Timex/Sinclair 1000 – which led the way at the low end – could face a tough battle now that both the VIC-20 and TI-99/4A are selling for under \$100. But the Timex/Sinclair does have some specialized applications because of its small size and sealed keyboard. "People on boats like to use it, for example," he notes.

Despite the difficulty of predicting trends in the computer market, the people we talked to were notably consistent in their observations. Most felt that price cutting on hardware had nearly eliminated computer equipment as a source of profit. Continued growth in sales coupled with tough competition and possibly a shake-out among manufacturers was a common theme. And both manufacturers and software producers agreed that software would soon be a key area for profit, with educational programs growing in importance. ©

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WE BRING SPORTS ALIVE.

THE BEGINNER'S PAGE

Richard Mansfield, Senior Editor

Types Of Programs

Let's continue with our overview of the major categories of personal computer programs. The Operating System, the Disk Operating System, "utility" programs, and telecommunications programs all have several qualities in common, so we'll look at them as a group.

The Master Control Programs

In most home computers there are about 16000 memory cells set aside to hold the BASIC language and to hold the Operating System. These cells are ROM memory, which means that they cannot be erased: you can't put new information into them, and they'll hold their original information even after you turn off the power. What kind of information is in these ROMs?

BASIC generally occupies about 8000 cells (8K) and is the familiar language you use to write programs. The other 8K of ROM memory holds the Operating System (OS). This, like BASIC, is a special kind of program. You might think of it as a background program which allows the computer to coordinate its other activities (including BASIC programs).

BASIC includes many individual machine language subroutines with which the computer can add numbers, enter REMarks into a program, and most of the other actions that a computer takes while a BASIC program is RUNNING. However, when a program must communicate with something outside – a disk drive, a cassette drive, a printer, or the keyboard and screen – BASIC asks for help from the OS.

Body And Mind

The Operating System's primary responsibility is to keep track of communications between the "thinking" part, the brains, of the computer and the outside world. The brains are BASIC itself and the Central Processing Unit, the chip that does all the calculations. Like BASIC, the OS is made up of many machine language subroutines. These subroutines have names like LISTEN, TALK, UNLISTEN, SCAN KEYBOARD, OPEN CHANNEL, and UNTALK. You can't use these

words in a BASIC program, but whenever you PRINT, OPEN, GET, or SAVE, BASIC calls upon the OS to help coordinate and accomplish the job at hand.

It might be convenient to think of BASIC as the computer's "mind" and the OS as the "central nervous system." When your consciousness makes a decision to eat another bite of beef stew, you then turn the job over to lower, unconscious parts of your brain. That is, your nervous system takes command of the movements of your arm and guides the fork to your plate. You're watching TV or talking while your personal operating system orchestrates tasks like SCAN PLATE, OPEN MOUTH, and so forth.

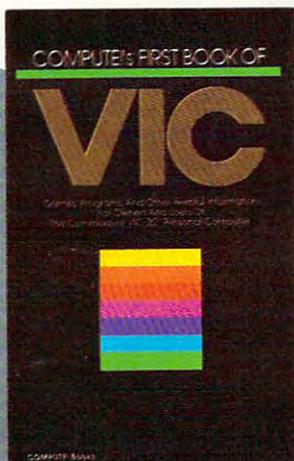
Similarly, when you first wake up you're not fully conscious. Warming yourself, stretching, opening your eyes, and all the other preparations for waking are carried out in a stupor. Your nervous system is rousing itself, and your conscious mind enters the picture at the end of a series of preliminary events. Here are some of the things that the OS does in a Commodore computer when you turn it on: establishes the normal arithmetic mode; clears out a short-term memory zone; sets up communication channels with the keyboard, screen, etc.; starts the clock and clears out the sound chip; tests all of memory; and clears the screen. Then, after the OS has finished – it all takes about a second – control is turned over to BASIC.

The Disk Unconscious

The job performed by a disk drive – it's a high-speed, automatic library – is so complex that the "intelligence" required to operate it can rival the brains of the host computer. What the OS is to the computer, the Disk Operating System (DOS) is to the disk drive. It performs all the routine chores of storage, retrieval, and organizing of the programs or pure information (data, like an address file) on disks. The internal subroutines of DOS have names like ALLOCATE BLOCK, UPDATE BLOCK MAP, FIND CHANNEL, and

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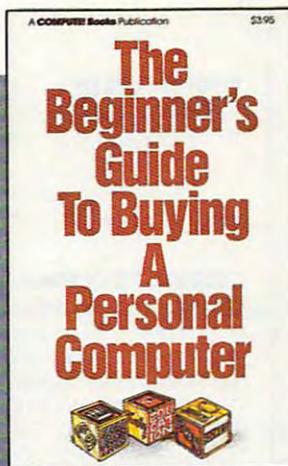
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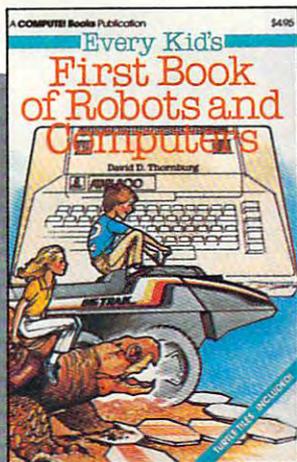
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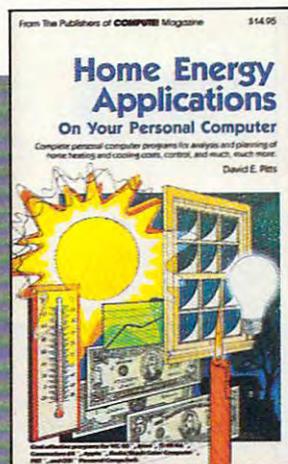


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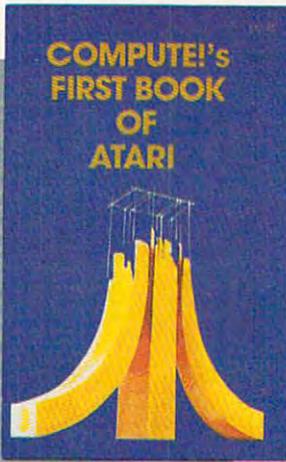
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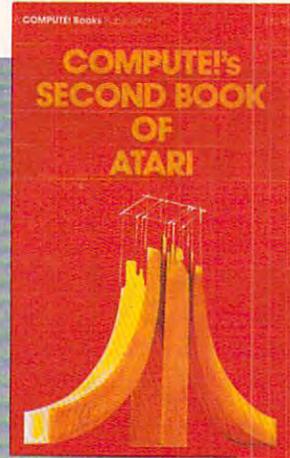


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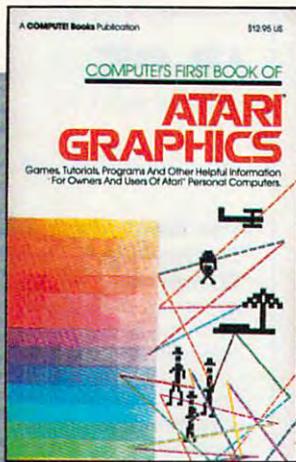


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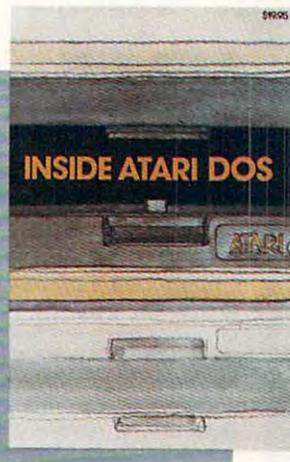


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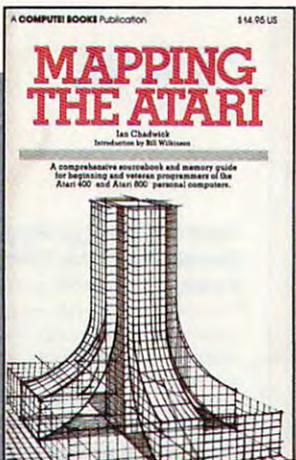


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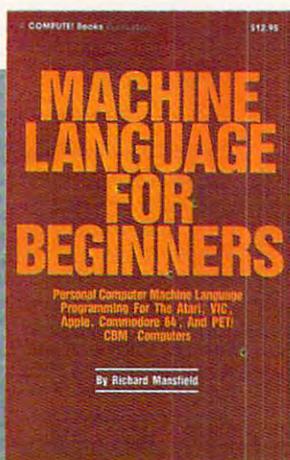


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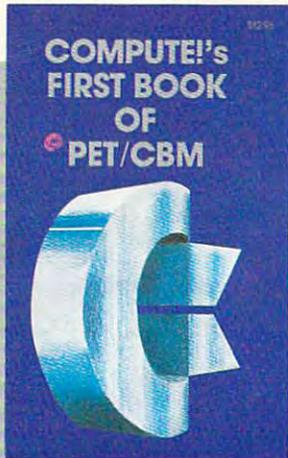


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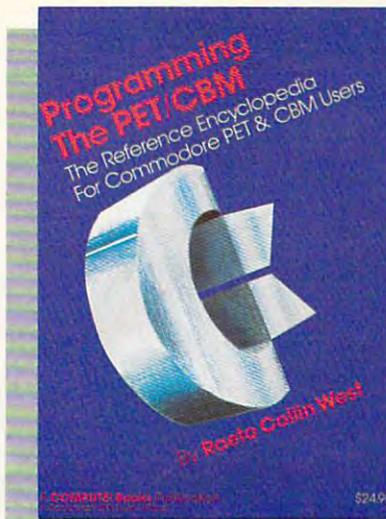
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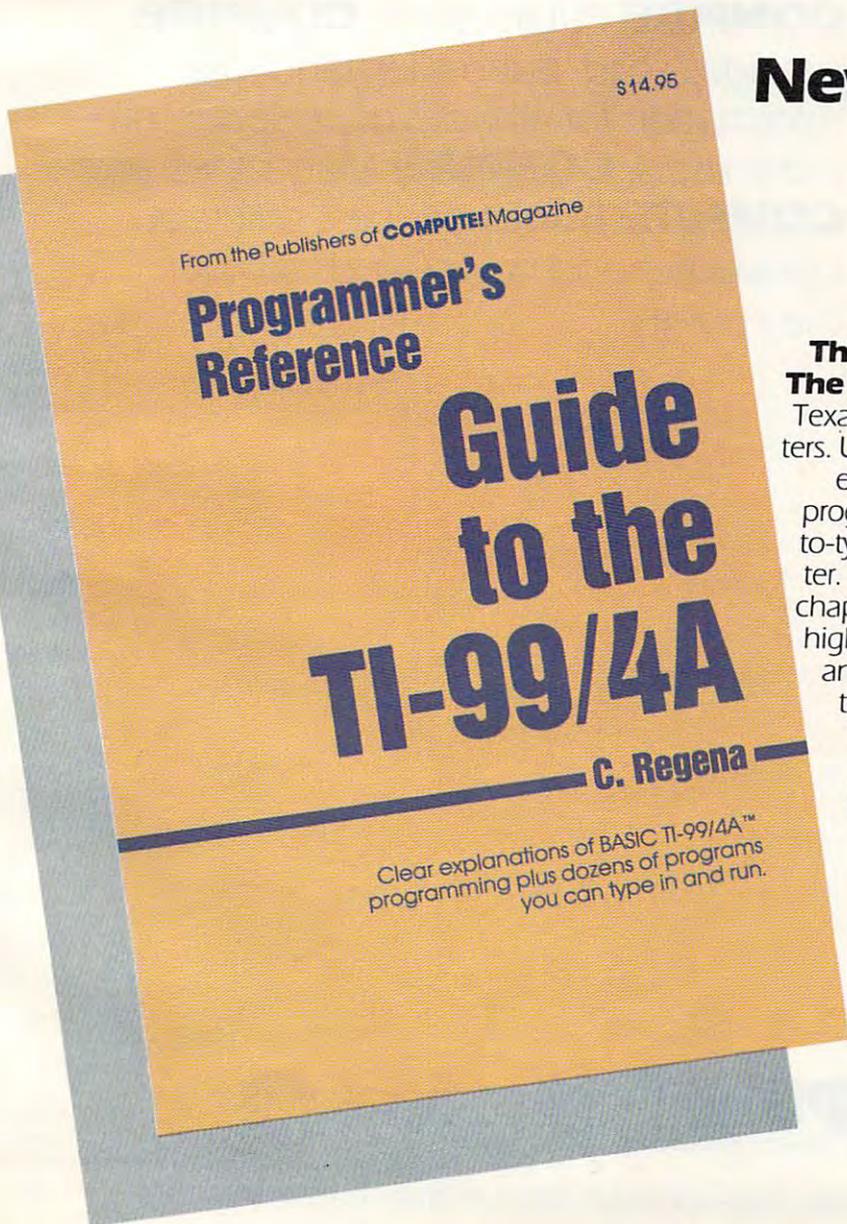
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MATCH FILE. Your request to **LOAD** a program from disk can go to **BASIC**, then to the **OS**, then to the **DOS**. Each does its part.

Where is **DOS** located? In some computers (Atari, Apple), the **DOS** program must first be loaded into the computer (using up some **RAM** memory) before you can communicate with the disk drive. An alternative used by **TI** and **Commodore**, among others, is called *distributed intelligence*. All the elements of a true computer are in the disk drive: **RAM** and **ROM** memory, a **CPU**, and associated computing chips. One of the advantages to having a **DOS** which is separate from the main computer is that you can send instructions to the disk drive such as **INITIALIZE** (prepare a blank disk to receive new information). If the drive is an "intelligent peripheral," it will then work merrily away under its own supervision and your computer is free to accept other, unrelated instructions at the same time.

By the way, if you've recently purchased a 1541 disk drive for your **VIC** or **64**, don't be confused by the name of the "DOS 5.1" program. It's not the **DOS**, it's a *utility program* which makes it easier for you to communicate with the true **DOS**.

Programmers' Bag Of Tricks

Utilities are programs that help you write programs. Most versions of **BASIC** lack some of the tools which would contribute to efficient programming. Utilities can be loaded in from tape or disk and perform a valuable function. Examples include: renumber, mass-delete, automatic line numbering, list all variables, merge two programs, repeating keys, bidirectional scrolling, trace (the active **BASIC** lines appear onscreen during a program's execution), and various graphics and sound commands.

Utilities are often grouped together and sold commercially. Alternatively, **COMPUTE!** and *COMPUTE!'s Gazette* publish several utilities every month. Watch upcoming issues for a program for the **Commodore 64** called "BASIC AID" which includes all the utilities mentioned above in addition to 22 others.

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speed, and its connections with *other* huge systems all become available to you. Your own computer acts simply as a keyboard/TV combination, a "brainless" unit sometimes referred to as a *dumb terminal*. If some of your **RAM** or **ROM** are being used, it would be called a *smart terminal* since some of the actual computing is going on at your end.

In either configuration, you telecommunicate by attaching a box called a *modem* to your computer; that makes the connection between your machine and the phone. The program which handles the communication is often called a *terminal emulator* and is usually included when you buy a modem.

Weather Forecaster

George W. Miller

This program enables you to make quite accurate local weather predictions. Written for the T/S 1000 with 16K, versions are included for computers with Microsoft and modifications for Commodore, Apple, and the Color Computer.

The National Weather Service uses computers when forecasting the weather, so why not use your home computer for your own local forecast?

You will need some easily obtainable data. Since you don't have access to a network of reporting stations or satellites orbiting the earth, about the best device available is a barometer. Everyone knows a falling barometer means bad weather is approaching, but this information coupled with wind direction, will allow you to make a fairly accurate local forecast.

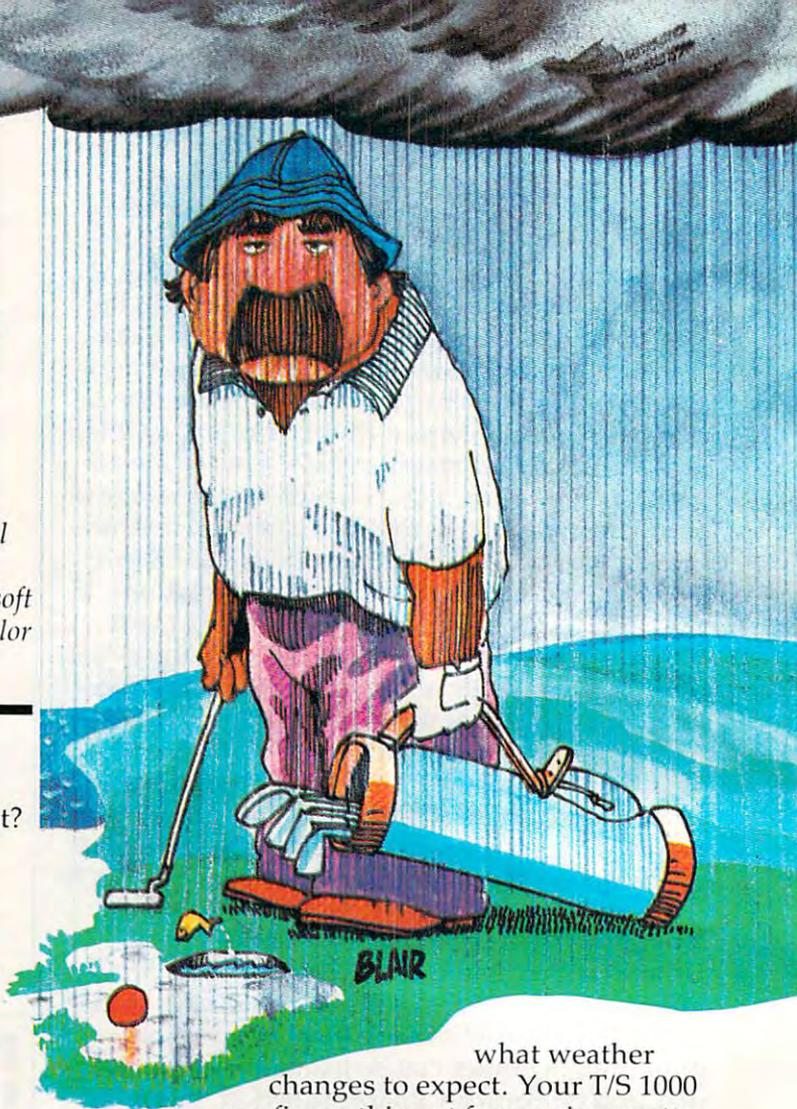
If you're able to interface with the outside world, you could even have a dedicated weather forecasting machine which can update the forecast as often as you like and provide a continuous monitor of changing weather conditions. However, our concern here is to demonstrate how you can forecast the weather with very little effort and a great deal of accuracy.

You will need a barometer, available at most hardware stores, and ideally some device to indicate wind direction, such as a weather vane. A less accurate, but still effective method is to use a compass and observe the wind yourself.

One word of warning. This is a very long program and will fill 16K RAM on the Timex/Sinclair. SAVE it often while you are making your entries. It can be very frustrating to lose the program after several hours work due to a glitch.

This program is based on very simple, but sound scientific facts. In the Northern Hemisphere, winds blow counterclockwise around a low pressure system, and clockwise around a high pressure system. So, if you stand outside, with the wind at your back, a low pressure system will be on your left. If the barometer is falling, this low is heading in your direction.

The wind direction and barometric pressure, combined with scientific observation, indicate



what weather changes to expect. Your T/S 1000 can figure this out for you in a matter of seconds, and the program will even tell you what the normal weather for the month is.

You'll have to make a visit to the local library for information on your local weather conditions, but we'll get to that in a minute.

Let's take a look at the T/S version of the program. First you'll notice a list of variables in lines 5 through 56. Enter them from the listing, *except* for line 10, which should read:

```
10 DIM A$(1,31)
```

This will allow enough room in memory to make the necessary entries in the later portions of the program. We'll change this to a larger DIMension before we're finished.

Line 59 will GOSUB 2000, which displays the title block and gives some preliminary instructions.

After displaying the title and instructions, line 2075 advises us to "PRESS ANY KEY TO CONTINUE". There is no input statement following, only the command PAUSE 40000. The way ROM is organized, any number following PAUSE that is greater than 32,767 causes the program to halt and wait for any key to be pressed. Pressing any key causes the program to drop through to line 2085. We're using the pause this way so that any user has a chance to read the mes-

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sage completely.

Line 2090 RETURNS us to the main program at line 60, and lines 60 to 95 print the menu.

Optional Extras

If you want to dress up your program a little, use the graphics mode to print the inverse form of the letter for each command, but be sure to use the regular mode for the letters in lines 105 to 125 to satisfy the argument for Y\$. Otherwise, you'll find the menu becomes clumsy as you must shift to the graphics mode for every command entry.

The menu offers a lot. For example, you can store data in RAM, generate a weather forecast, display the data you have stored, display normal conditions for your area, STOP the program, search for a specific date, and make corrections.

Now we're ready to begin working on our data file. Line 143 checks to see if there is any room left in the file. If L = 190, you have stored data for 190 days in the file, and any additional

data will generate an error. When you do reach this point, SAVE the data and program on tape if you want to refer to it later, or just enter RUN. RUN will clear all of your variables, and you can start over. To use your data file in this program you must start the program by entering GOTO 59.

The raw data is stored in string variables, in this case A\$(X), with all the data held in one variable. A\$ is a two-dimensional array, which will be 190 entries long, and will hold 31 characters in each entry. A\$(X,1 TO 2) holds the number of the month; A\$(X,3 TO 4) holds the number of the day; and A\$(X,5 TO 6) holds the year.

High and low temperatures are entered as four characters, such as +076. In order to avoid the necessity of right justifying, each entry *must* have four characters. High temperature for each entry is stored in A\$(X,7 TO 10) and the low temperature is stored in A\$(X, 11 TO 14).

The barometric pressure is stored in A\$(X,15 TO 19) as five characters, for example, 30.18.

Notes To Weather Forecaster (Microsoft Version)

Patrick Parrish, Programming Assistant

The Microsoft Version (Program 2) of Weather Forecaster will run with minor modifications on the 64, all PETs (40- or 80-column screens) with at least 16K of memory, the Color Computer, and the Apple. Programs 3, 4, and 5 are the necessary data storage routines to be typed in with Program 2 depending on which computer you have.

Commodore

If you are programming the 64 or 32K PET (you can try it with a 16K VIC, but you'll need to reformat the display for 22 columns), type in Programs 2 and 3. With the 16K PET, DIMension A\$ in line 100 to 150 rather than 365. Each day of weather data is stored in A\$(I), so with the 16K PET, you will only have enough memory to store data corresponding to 150 days under one file name.

Program 3 is written to accommodate either a disk or cassette data file. The subroutine within Program 3 beginning at line 3100 is used to detect disk errors. When a disk error is encountered, line 3103 will display four parameters: error number, error description, track accessed, and sector accessed. If a disk error does occur and you can resolve it, return to the main program menu by typing:

GOTO 110

To avoid a "file not found" error, be sure that you have previously saved the data file before you attempt to recall it.

TRS-80 Color Computer

If you have a Color Computer with at least 16K, you will need to make three changes to Program 2. First, replace PRINT "{CLR}" with CLS in lines 17 and 2010. Also, DIMension A\$ in line 100 to 150. Of course, this reserves space in memory for only 150 days of data. You may vary this limit depending on the memory available. You can use another weather file when you exceed the limit.

Program 4 is the data storage routine for the Color Computer. Type it in along with Program 2. Program 4 only lets you save or load the weather data to or from cassette. If you own a disk drive, you can easily modify this routine by reading about data files in your disk drive manual.

Apple II / Apple II Plus

If you are using an Apple, Program 2 should be typed in with the data storage routine (Program 5). Two changes are necessary in Program 2. Lines 17 and 2010 should read HOME rather than PRINT "{CLR}".

Program 5 is the data storage routine for use with the Apple disk drive. It contains a disk error trapping routine (line 3200) giving you the disk error number and the line in the program where it has occurred. If a disk error occurs that you can correct, return to the main program and re-SAVE the data so that no data is lost.



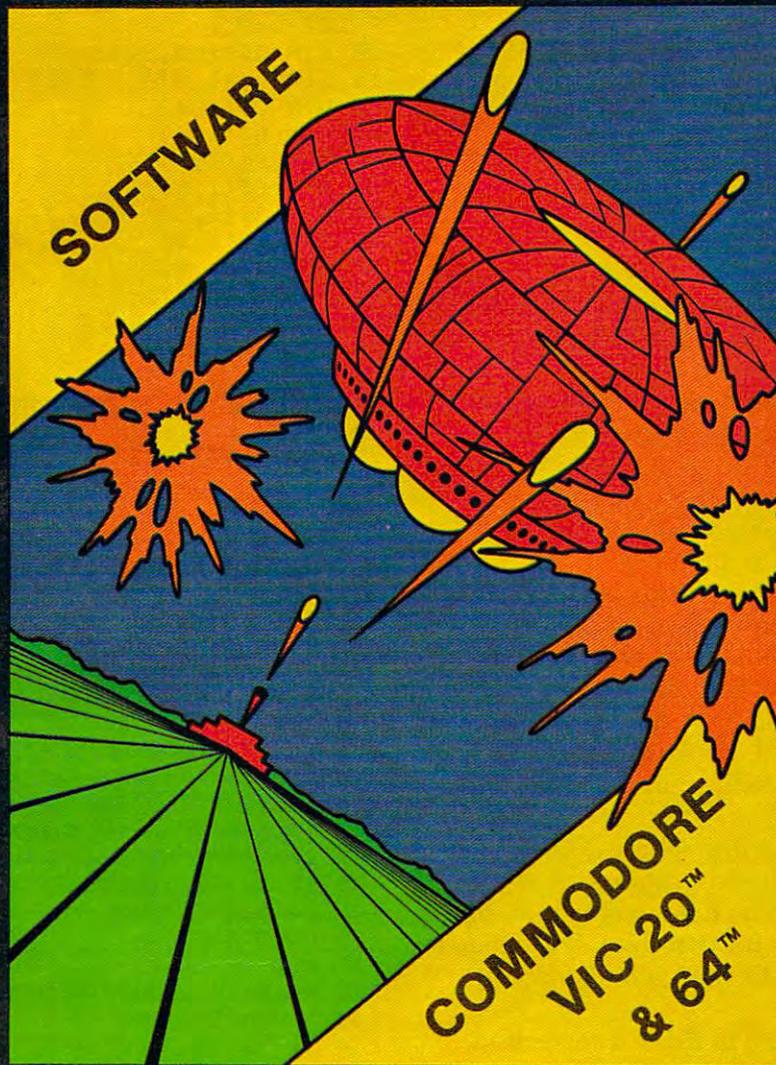
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General weather conditions are entered into A\$(X,20) from the following table:

1=FAIR
 2=CLOUDY
 3=RAIN
 4=SNOW
 5=THUNDERSHOWERS
 6=SNOW FLURRIES
 7=HEAVY RAIN

Line 235 prompts for precipitation amounts. This must be a five-character entry (such as 02.75), and is stored in A\$(X,21 TO 25).

Snowfall amounts are two characters stored in A\$(X,26 TO 27).

Wind direction is stored in A\$(X,28 TO 31) as a four-character entry with the first two characters being the wind direction from the following table:

01=N	05=S
02=NE	06=SW
03=E	07=W
04=SE	08=NW

The last two characters are wind speed and are entered as part of the code called for in line 285. Your entry would look like "0705" for a wind from the west at 5 miles per hour.

Lines 300 to 350 print out your data entries and ask if all is correct. If an error is found, line 360 restarts the entry process at line 135.

Lines 355-740 contain more inputs, calculations, and the forecasting results of your input. Line 750 returns to the main menu.

You'll have to determine the average temperatures, rainfall, and snowfall amounts for your area. A good source of this information is *The Weather Almanac*, edited by James A. Ruffner and Frank E. Bair, published by Avon Books. It's available from most libraries. Look up the city nearest you and make your substitutions in lines 940 to 1025.

The subroutine starting in line 3000 allows you to check the weather conditions on any day in your file. You enter the date in question, and the computer searches for that date. If the date is in memory, lines 3066 to 4000 will display the information.

When it's necessary to make a correction, lines 5005 to 6010 find the date in question and prompt for the correct information. Line 6005 assigns the value of N to X, and the information you've just entered is placed into the file in place of the incorrect information.

Now go back to line 10. Change your statement to DIM A\$(190,31) and enter RUN to establish and reserve space in RAM for your file. From now on, be sure to start your program with a GOTO 59, not RUN. RUN clears all variables, so you'll lose your file in RAM.

The program takes about 7 minutes to load from tape and it will use all 16K. If any changes

are necessary, go back and change line 10. You must first delete the entry, enter RUN, and then make whatever changes are needed.

Program 1: Weather Forecaster – Timex/Sinclair Version

(Note: Underlined characters should be typed in inverse video.)

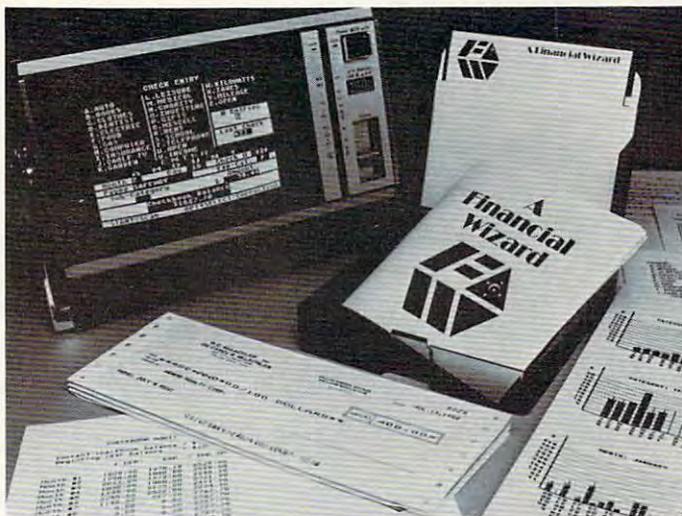
```

1 REM "WX"
2 REM DO NOT USE "RUN" - USE GOTO 59
5 LET X=0
6 LET A=0
7 LET B=0
8 LET C=0
9 LET L=0
10 DIM A$(190,31)
15 DIM B$(1,8)
20 DIM C$(1,4)
25 DIM D$(1,4)
30 DIM E$(1,5)
35 DIM F$(1,1)
40 DIM G$(1,5)
45 DIM H$(1,3)
50 DIM I$(1,4)
55 DIM J$(1,31)
56 DIM K$(1)
59 GOSUB 2000
60 CLS
65 PRINT AT 0,5;"WEATHER ANALYSIS "
70 PRINT
75 PRINT AT 5,3;"UPDATE DATA ENTER U "
80 PRINT AT 7,3;"FORECAST FROM DATA ENTE
R F "
85 PRINT AT 9,3;"DISPLAY DATA ENTER D "
90 PRINT AT 11,3;"DISPLAY NORMALS ENTER
N "
92 PRINT AT 13,3;"TO STOP ENTER S "
93 PRINT AT 15,3;"SEARCH DATE ENTER C "
94 PRINT AT 17,3;"CORRECTIONS ENTER M "
95 PRINT AT 20,0;"FUNCTION???"
100 INPUT Y$
105 IF Y$="U" THEN GOTO 135
110 IF Y$="F" THEN GOTO 380
115 IF Y$="D" THEN GOTO 700
120 IF Y$="N" THEN GOTO 900
122 IF Y$="C" THEN GOTO 3000
123 IF Y$="M" THEN GOTO 5000
125 IF Y$="S" THEN STOP
130 GOTO 95
135 CLS
140 PRINT"{11 SPACES}DATA UPDATE"
143 IF L=190 THEN PRINT"FILE FULL"
144 IF L=190 THEN PAUSE 40000
145 IF L=190 THEN GOTO 60
146 PRINT
150 PRINT"ENTER DATE (AS 12-30-82):"
155 INPUT B$(1,1 TO 8)
158 LET L=L+1
160 FOR X=L TO 190
165 LET A$(X,1 TO 2)=B$(1,1 TO 2)
170 LET A$(X,3 TO 4)=B$(1,4 TO 5)
172 LET A$(X,5 TO 6)=B$(1,7 TO 8)
175 PRINT"ENTER HIGH TEMPERATURE (AS +076)"
180 INPUT C$(1,1 TO 4)
185 LET A$(X,7 TO 10)=C$(1,1 TO 4)
190 PRINT"ENTER LOW TEMPERATURE (AS -006)"
195 INPUT D$(1,1 TO 4)
200 LET A$(X,11 TO 14)=D$(1,1 TO 4)

```

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```

205 PRINT"ENTER BAROMETER (IN INCHES)"
210 INPUT E$(1,1 TO 5)
215 LET A$(X,15 TO 19)=E$(1,1 TO 5)
220 PRINT"ENTER GENERAL WEATHER CONDITIO
N",,"1=FAIR",,"2=CLOUDY",,"3=RAIN"
223 PRINT,"4=SNOW",,"5=THUNDERSHOWERS",
"6=SNOW FLURRIES",,"7=HEAVY RAIN"
225 INPUT F$(1,1)
230 LET A$(X,20)=F$(1,1)
235 PRINT"ENTER PRECIPITATION (INCHES)"
240 PRINT"AS: 02.75"
245 INPUT G$(1,1 TO 5)
248 LET A$(X,21 TO 25)=G$(1,1 TO 5)
250 PRINT"SNOWFALL AMOUNT (AS 07)"
255 INPUT H$(1,1 TO 2)
258 LET A$(X,26 TO 27)=H$(1,1 TO 2)
260 CLS
265 PRINT"ENTER WIND DIRECTION AND SPEED
:"
270 PRINT"USE THIS CODE:",,"01=N",,"02=NE
",,"03=E",,"04=SE",,"05=S",,"06=SW"
273 PRINT,"07=W",,"08=NW"
275 PRINT
280 PRINT"ENTER DIRECTION AND SPEED",,"AS
FOUR DIGIT NUMBER ""0312""
285 INPUT I$(1,1 TO 4)
290 LET A$(X,28 TO 31)=I$(1,1 TO 4)
295 CLS
300 PRINT"DATE: ";A$(X,1 TO 6)
305 PRINT"HI TEMP: ";A$(X,7 TO 10)
310 PRINT"LO TEMP: ";A$(X,11 TO 14)
315 PRINT"BAROMETER: ";A$(X,15 TO 19)
320 PRINT"CONDITIONS: ";A$(X,20)
330 PRINT"PRECIPITATION: ";A$(X,21 TO 25
)
335 PRINT"SNOWFALL: ";A$(X,26 TO 27)
340 PRINT"WINDS: ";A$(X,28 TO 31)
342 PRINT"USE THIS CODE:",,"01=N",,"02=NE
",,"03=E",,"04=SE",,"05=S",,"06=SW"
343 PRINT,"07=W",,"08=NW"
345 PRINT
350 PRINT"IS THIS CORRECT?"

355 INPUT Z$
360 IF Z$="N" THEN GOTO 135
365 LET L=X
370 IF Z$="Y" THEN CLS
375 IF X$="Y" THEN GOTO 65
380 CLS
385 PRINT"{8 SPACES}FORECAST"
390 PRINT"ENTER BAROMETRIC PRESSURE:"
395 INPUT A
400 PRINT
405 PRINT"IS BAROMETER: ",,"1. STEADY",,"
2. SLOW RISE",,"3. RAPID RISE"
406 PRINT,"4. SLOW FALL",,"5. RAPID FAL
L"
407 PRINT"RAPID CHANGE IS ANY CHANGE ",,"
IN EXCESS OF 0.06 PER HOUR."
410 INPUT B
415 PRINT
420 PRINT"WIND FROM:"
425 PRINT,"1=N",,"2=NE",,"3=E",,"4=SE",,
"5=S",,"6=SW",,"7=W",,"8=NW"
430 INPUT C
433 CLS
435 IF A>=30.2 AND B=4 AND C>=6 AND C<=8
THEN GOTO 625
440 IF A>=30.2 AND B=1 AND C>=6 AND C<=8
THEN GOTO 620
445 IF A>=30.1 AND B=1 AND C>=6 AND C<=8
THEN GOTO 600
450 IF A>=30.1 AND B=3 AND C>=6 AND C<=8
THEN GOTO 605
455 IF A>=30.1 AND B=4 AND C>=6 AND C<=8
THEN GOTO 610
460 IF A>=30.1 AND B=5 AND C>=6 AND C<=8
THEN GOTO 615
465 IF A>=30.1 AND B=4 AND (C=4 OR C=5)
THEN GOTO 630
470 IF A>=30.1 AND B=5 AND (C=4 OR C=5)
THEN GOTO 635
475 IF A>=30.1 AND B=4 AND C>=2 AND C<=4
THEN GOTO 640
480 IF A>=30.1 AND B=5 AND C>=2 AND C<=4
THEN GOTO 645
485 IF A>=30.1 AND B=4 AND (C=3 OR C=2)
THEN GOTO 650
490 IF A>=30.1 AND B=5 AND (C=3 OR C=2)
THEN GOTO 655
492 IF A<=29.8 AND B=5 AND C>=1 AND C<=3
THEN GOTO 680
493 IF A<=29.8 AND B=5 AND C>=3 AND C<=5
THEN GOTO 675
494 IF A<=29.8 AND B=3 THEN GOTO 685
495 IF A<=30.1 AND B=4 AND C<=4 AND C>=2
THEN GOTO 660
500 IF A<=30.1 AND B=5 AND C<=4 AND C>=2
THEN GOTO 665
505 IF A<=30.1 AND B=2 AND (C=5 OR C=6)
THEN GOTO 670
600 PRINT "FAIR, LITTLE CHANGE IN TEMP",
"FOR NEXT DAY OR TWO."
601 PAUSE 40000
602 GOTO 60
605 PRINT "FAIR TODAY, RAINY AND WARMER"
,"WITHIN 48 HOURS"
606 PAUSE 40000
607 GOTO 60
610 PRINT "WARMER, RAIN WITHIN 18 TO 24"
,"HOURS"
616 PAUSE 40000
617 GOTO 60
620 PRINT "CONTINUED FAIR WITH LITTLE", "
OR NO CHANGE IN TEMPERATURE"
621 PAUSE 40000
622 GOTO 60
625 PRINT "FAIR AND WARMER FOR NEXT 48 H
OURS"
626 PAUSE 40000
627 GOTO 60
630 PRINT "RAIN WITHIN 24 HOURS"
631 PAUSE 40000
632 GOTO 60
635 PRINT "WINDY, WITH RAIN WITHIN 12", "
TO 24 HOURS"
636 PAUSE 40000
637 GOTO 60
640 PRINT "RAIN IN 12 TO 18 HOURS"
641 PAUSE 40000
642 GOTO 60
645 PRINT "WINDY AND RAIN WITHIN 12 HOURS"
646 PAUSE 40000
647 GOTO 60
650 PRINT "IN SUMMER WITH LIGHT WINDS: "
,"RAIN MAY NOT FALL FOR SEVERAL", "DA
YS"
651 PRINT "IN WINTER: RAIN WITHIN 24 HOU
RS"

```

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652 PAUSE 40000
653 GOTO 60
655 PRINT "IN SUMMER RAIN LIKELY WITHIN"
, "12 TO 24 HOURS"
656 PRINT "IN WINTER: RAIN OR SNOW WITH
INCREASING WINDS"
657 PAUSE 40000
658 GOTO 60
660 PRINT "RAIN FOR NEXT DAY OR TWO"
661 PAUSE 40000
662 GOTO 60
665 PRINT "RAIN, WITH HIGH WINDS FOLLOWE
D", "WITHIN 24 HOURS BY CLEARING "
666 PRINT "AND TURNING COLDER"
667 PAUSE 40000
668 GOTO 60
670 PRINT "CLEARING WITHIN A FEW HOURS, "
, "FAIR FOR NEXT SEVERAL DAYS"
671 PAUSE 40000
672 GOTO 60
675 PRINT "SEVERE STORM WARNING", "WINDY,
WITH RAIN OR SNOW IMMINENT"

676 PRINT "FOLLOWED WITHIN 24 HOURS BY",
"CLEARING AND COLDER"
677 PAUSE 40000
678 GOTO 60
680 PRINT "SEVERE STORM WARNING", "SEVERE
NORTHEAST GALES"

681 PRINT "HEAVY RAIN OR SNOW, FOLLOWED
IN WINTER BY A COLD WAVE"
682 PAUSE 40000
683 GOTO 60
685 PRINT "CLEARING AND COLDER"
686 PAUSE 40000
687 GOTO 60
700 CLS
705 FOR T=1 TO L
706 SCROLL
710 PRINT A$(T)
720 SCROLL
730 NEXT T
740 PAUSE 200
750 GOTO 60
900 CLS
905 PRINT "{6 SPACES}WEATHER NORMS"

925 PRINT
930 PRINT "{6 SPACES}TEMP
935 PRINT "{2 SPACES}HI LO MO{2 SPACES}R
AIN{3 SPACES}SNOW"
940 PRINT "J 38 23 30{3 SPACES}2.83
{4 SPACES}9.1"
945 PRINT "F 41 24 32{3 SPACES}2.70
{4 SPACES}9.6"
950 PRINT "M 51 31 41{3 SPACES}3.19
{4 SPACES}6.5"
955 PRINT "A 64 42 53{3 SPACES}3.02
{4 SPACES}0.3"
960 PRINT "M 75 52 63{3 SPACES}3.61
{4 SPACES}0.0"
965 PRINT "J 83 61 72{3 SPACES}3.61
{4 SPACES}0.0"
970 PRINT
975 PRINT "J 87 65 76{3 SPACES}3.61
{4 SPACES}0.0"
980 PRINT "A 85 63 74{3 SPACES}3.76
{4 SPACES}0.0"
985 PRINT "S 78 56 67{3 SPACES}3.21
{4 SPACES}0.0"
990 PRINT "O 67 45 56{3 SPACES}2.82
{4 SPACES}0.1"
995 PRINT "N 53 35 44{3 SPACES}2.66
{4 SPACES}2.1"
1000 PRINT "D 40 25 33{3 SPACES}2.94
{4 SPACES}7.7"
1005 PRINT
1010 PRINT "YR 63 43 53 37.96"
1015 PRINT
1020 PRINT "DATA FROM NWS HBG., PA."
1025 PRINT "{11 SPACES}ELEVATION 338 FT.
"
1030 PAUSE 40000
1040 GOTO 60
2000 CLS
2001 FOR I=1 TO 10
2002 PRINT
2003 NEXT I
2005 PRINT "{8 SPACES}WEATHER ANALYSIS "
2040 PAUSE 400
2050 CLS
2055 PRINT "THIS PROGRAM IS DESIGNED TO"
, "STORE A LIMITED AMOUNT OF DATA"
2056 PRINT "IN THE FILE PORTION OF THE",
"PROGRAM. IT IS SUGGESTED"
2057 PRINT "THAT FOR STORAGE OF MORE THA
N ", "SIX MONTHES A WEATHER FILE BE"
2058 PRINT "MAINTAINED."
2060 PRINT
2065 PRINT "THIS PROGRAM WILL OFFER A", "
FORECAST OF EXPECTED LOCAL"
2066 PRINT "WEATHER CONDITIONS, USING", "
BAROMETRIC PRESSURE AND WIND"
2067 PRINT "DIRECTION",,,, "YOU WILL BE S
URPRISED AT"
2068 PRINT "THE ACCURACY OF THIS METHOD,
", "YET IT IS BASED ON SOUND"
2069 PRINT "SCIENTIFIC PRINCIPLES."
2070 PRINT
2075 PRINT "PRESS ANY KEY TO CONTINUE"

2080 PAUSE 40000
2085 CLS
2090 RETURN
3000 CLS
3010 PRINT "ENTER DATE (AS 12-05-82)"
3015 INPUT B$(1,1 TO 8)
3018 FAST
3020 LET C$(1,1 TO 2)=B$(1,1 TO 2)
3025 LET C$(1,3 TO 4)=B$(1,4 TO 5)
3030 FOR A=1 TO L
3035 IF C$(1,1 TO 4)=A$(A,1 TO 4) THEN G
OTO 3050
3040 NEXT A
3042 SLOW
3045 PRINT "DATE NOT FOUND"

3046 PAUSE 40000
3047 GOTO 60
3050 CLS
3055 SLOW
3066 PRINT "DATE: ";A$(A,1 TO 6)
3070 PRINT "HI TEMP: ";A$(A,7 TO 10)
3075 PRINT "LO TEMP: ";A$(A,11 TO 14)
3080 PRINT "BAROMETER: ";A$(A,15 TO 19)
3085 PRINT "CONDITION: ";A$(A,20)
3090 PRINT "PRECIPITATION: ";A$(A,21 TO
25)

```

```

3095 PRINT "SNOWFALL: ";A$(A,26 TO 27)
4000 PRINT "WINDS: ";A$(A,28 TO 31)
4010 PAUSE 40000
4020 GOTO 60
5000 CLS
5005 PRINT "ENTER DATE TO CHANGE:"
5010 INPUT B$(1,1 TO 8)
5011 LET C$(1,1 TO 2)=B$(1,1 TO 2)
5012 LET C$(1,3 TO 4)=B$(1,4 TO 5)
5015 FAST
5020 FOR N=1 TO L
5025 IF A$(N,1 TO 4)=C$(1,1 TO 4) THEN G
OTO 5100
5030 NEXT N
5040 SLOW
5050 PRINT "DATE NOT IN FILE"
5055 PAUSE 40000
5060 GOTO 60
5100 CLS
5110 PRINT "ENTER: "
5120 PRINT TAB 5;"DATE (AS 6 DIGITS)", "
{9 SPACES}(120582)"
5125 INPUT A$(N,1 TO 6)
5130 PRINT TAB 5;"HI TEMP"
5135 INPUT A$(N,7 TO 10)
5140 PRINT TAB 5;"LOW TEMP"
5145 INPUT A$(N,11 TO 14)
5150 PRINT TAB 5;"BAROMETER"
5155 INPUT A$(N,15 TO 19)
5160 PRINT TAB 5;"CONDITION"
5165 PRINT ",1. FAIR",,"2. CLOUDY",,"3.
RAIN",,"4. SNOW",,"5. THUNDERSHOWER
S"
5167 PRINT ",6. SNOW FLURRIES",,"7. HEAVY
RAIN"
5170 INPUT A$(N,20)
5175 PRINT TAB 5;"RAIN"
5180 INPUT A$(N,21 TO 25)
5185 PRINT TAB 5;"WINDS"
5190 INPUT A$(N,28 TO 31)
5195 PRINT TAB 5;"SNOWFALL"
6000 INPUT A$(N,26 TO 27)
6005 LET X=N
6007 CLS
6010 GOTO 300

```

Program 2: Weather Forecaster – Microsoft Version

```

5 GOTO 100
7 GOSUB 17
8 FOR I=1 TO 4:PRINT:NEXT I:PRINT TAB(3);:RET
URN
10 PRINT P$;:INPUT B$:IF B$="" THEN 110
12 IF LEN(B$)<>B THEN PRINT"RE-ENTER":FOR I=
1 TO 200:NEXT I:PRINT P$;:INPUT B$
15 RETURN
17 PRINT"{CLR}":REM ON APPLE, LINE 17 IS
-17 HOME, ON CC-17 CLS
18 RETURN
20 A$(L)=A$(L)+B$:RETURN
100 DIM A$(365):GOSUB 2000
105 REM NOTE:DIMENSION A$(190) OR LESS F
OR 16K COLOR COMPUTER IN LINE 100
110 GOSUB 17
112 PRINT TAB(8)"WEATHER ANALYSIS"
115 PRINT:PRINT:PRINT TAB(4)"TO LOAD DATA
:{2 SPACES}ENTER L"
120 PRINT TAB(4)"UPDATE DATA: ENTER U"
130 PRINT TAB(4)"FORECAST FROM DATA: ENTE

```

```

R F"
140 PRINT TAB(4)"DISPLAY DATA: ENTER D"
150 PRINT TAB(4)"DISPLAY NORMALS: ENTER N
"
160 PRINT TAB(4)"TO MEMORIZE: ENTER M"
170 PRINT TAB(4)"SEARCH DATA: ENTER S"
180 PRINT TAB(4)"CORRECTIONS: ENTER C"
190 PRINT TAB(4)"TO QUIT: ENTER Q"
200 PRINT:INPUT"CHOICE ";Y$
221 IF Y$="U" THEN 250
222 IF Y$="F" THEN 400
223 IF Y$="D" THEN 700
224 IF Y$="N" THEN 900
225 IF Y$="S" THEN 1250
226 IF Y$="C" THEN 1500
227 IF Y$="M" OR Y$="L" THEN 3000
228 IF Y$="Q" THEN 2600
230 GOTO 200
250 GOSUB 17
255 PRINT TAB(11)"DATA UPDATE"
257 PRINT"ENTER:"
260 L=L+1
270 PRINT:P$="DATE (AS 01-05-83):":B=8:G
OSUB 10
275 A$(L)=LEFT$(B$,2)+MID$(B$,4,2)+RIGHT
$(B$,2)
285 P$="HI TEMP (AS +076):":B=4:GOSUB 10
:GOSUB 20
290 P$="LOW TEMP (AS -006):":GOSUB 10:GO
SUB 20
295 P$="BARO. PRES (AS 30.15):":B=5:GOSU
B 10:GOSUB 20
300 PRINT:PRINT"GENERAL WEATHER CONDITIO
NS:":PRINT"1= FAIR";
305 PRINT TAB(18)"2= CLOUDY":PRINT"3= RAI
N";TAB(18)"4= SNOW"
310 PRINT"5= THUNDERSHOWERS";TAB(18)"6=
FLURRIES"
315 PRINT"7= HEAVY RAIN"
320 P$="":B=1:GOSUB 10:GOSUB 20
325 PRINT:P$="PRECIP(INCHES-AS 02.75):":
B=5:GOSUB 10:GOSUB 20
330 GOSUB 17
335 PRINT"ENTER:":PRINT:P$="SNOWFALL AMT
(AS 07):":B=2:GOSUB 10:GOSUB 20
346 PRINT:PRINT"FOR WIND DIRECTION AND S
PEED,"
350 PRINT"USE THIS CODE:":PRINT"01=N"TAB
(12)"02=NE"TAB(24)"03=E"
355 PRINT"04=SE"TAB(12)"05=S"TAB(24)"06=
SW":PRINT"07=W"TAB(12)"08=NW"
360 PRINT:PRINT"ENTER DIRECTION AND SPEE
D AS A 4"
362 P$="DIGIT NUMBER-AS 0312":B=4:GOSUB
10:GOSUB 20
365 GOSUB 17
366 PRINT:PRINT"DATE: ";LEFT$(A$(L),6):P
RINT"HI TEMP: ";MID$(A$(L),7,4)
370 PRINT"LOW TEMP: ";MID$(A$(L),11,4)
372 PRINT"BAROMETRIC PRESSURE: ";MID$(A$
(L),15,5)
375 PRINT"CONDITIONS: ";MID$(A$(L),20,1)
376 PRINT"PRECIPITATION: ";MID$(A$(L),21
,5)
380 PRINT"SNOWFALL: ";MID$(A$(L),26,2):P
RINT"WINDS: ";MID$(A$(L),28,4)
385 PRINT TAB(3)"RECALL THE CODE: ":PRINT
"01=N"TAB(8)"02=NE"TAB(16)"03=E";
386 PRINT TAB(24)"04=SE":PRINT"05=S"TAB(8
)"06=SW"TAB(16)"07=W"TAB(24)"08=NW"

```

```

387 IF D=1 THEN RETURN
390 PRINT:INPUT"IS THIS CORRECT (Y/N) ";
B$:IF B$="N" THEN 270
392 IF C=1 THEN RETURN
395 GOTO110
400 GOSUB 17
401 PRINTTAB(12)"FORECAST":PRINT:PRINT"EN
TER:"
405 PRINT:INPUT"BAROMETRIC PRESSURE: ";A
$:A=VAL(A$)
406 IF A$="" THEN 110
410 PRINT:PRINT:PRINT"IS BAROMETER?":PR
INT"1.STEADY"TAB(16)"2.SLOW RISE"
411 PRINT"3.RAPID RISE"TAB(16)"4.SLOW FA
LL":PRINT"5.RAPID FALL"
412 PRINT:PRINT"(RAPID CHANGE IS ANY CHA
NGE IN"
413 PRINT"EXCESS OF 0.06 PER HOUR.):INP
UTB$:B=VAL(B$):IFB$=""THEN 110
417 GOSUB17:PRINT"WIND FROM: ":PRINT"1=
N", "2=NE", "3=E", "4=SE", "5=S",
PRINT"6=SW":PRINT"7=W", "8=NW"
425 INPUT C$:C=VAL(C$):IF C$=""
{2 SPACES}THEN 110
430 IFA>=30.2ANDB=4ANDC>=6ANDC<=8THEN625
440 IFA>=30.2ANDB=1ANDC>=6ANDC<=8THEN620
445 IFA>=30.1ANDB=1ANDC>=6ANDC<=8THEN600
450 IFA>=30.1ANDB=3ANDC>=6ANDC<=8THEN605
455 IFA>=30.1ANDB=4ANDC>=6ANDC<=8THEN610
460 IFA>=30.1ANDB=5ANDC>=6ANDC<=8THEN615
465 IFA>=30.1ANDB=4AND(C=4ORC=5)THEN630
470 IFA>=30.1ANDB=5AND(C=4ORC=5)THEN635
475 IFA>=30.1ANDB=4ANDC>=2ANDC<=4THEN64
0
480 IF A>=30.1ANDB=5ANDC>=2ANDC<=4THEN64
5
485 IFA>=30.1ANDB=4AND(C=2ORC=3)THEN650
490 IFA>=30.1ANDB=5AND(C=2ORC=3)THEN655
492 IFA<=29.8ANDB=5ANDC>=1ANDC<=3THEN680
493 IFA<=29.8ANDB=5ANDC>=3ANDC<=5THEN675
494 IF A<=29.8ANDB=3THEN 685
495 IFA<=30.1ANDB=4ANDC>=2ANDC<=4THEN660
500 IFA<=30.1ANDB=5ANDC>=2ANDC<=4THEN665
505 IFA<=30.1ANDB=2AND(C=5ORC=6)THEN670
600 GOSUB7:PRINT"FAIR, LITTLE CHANGE IN
TEMP":PRINT"FOR NEXT DAY OR ";
601 PRINT"TWO.":GOTO 690
605 GOSUB7:PRINT"FAIR TODAY, RAINY AND W
ARMER":PRINT"WITHIN 48 HOURS.":GOTO6
90
610 GOSUB7:PRINT"WARMER, RAIN WITHIN 24
TO 36":PRINT"HOURS.":GOTO690
615 GOSUB7:PRINT"WARMER, RAIN WITHIN 18
TO 24":PRINT"HOURS.":GOTO690
620 GOSUB7:PRINT"CONTINUED FAIR WITH LIT
TLE OR"
621 PRINT"NO CHANGE IN TEMPERATURE.":GOT
O690
625 GOSUB7:PRINT"FAIR AND WARMER FOR NEX
T 48":PRINT"HOURS.":GOTO 690
630 GOSUB7:PRINTTAB(3)"RAIN WITHIN 24 HO
URS.":GOTO 690
635 GOSUB7:PRINT"WINDY, WITH RAIN WITHIN
12 TO":PRINT"24 HOURS.":GOTO690
640 GOSUB7:PRINTTAB(3)"RAIN IN 12 TO 18
HOURS.":GOTO 690
645 GOSUB7:PRINT"WINDY AND RAIN WITHIN 1
2 HRS.":GOTO 690
650 GOSUB7:PRINT"IN SUMMER WITH LIGHT WI
NDS.":PRINT"RAIN MAY NOT FALL FOR ";
651 PRINT"DAYS.":PRINT:PRINT"IN WINTER:
RAIN WITHIN 24 HOURS.":GOTO 690
655 GOSUB7:PRINT"IN SUMMER: RAIN LIKELY
WITHIN":PRINT"12 TO 24 HOURS."
656 PRINT:PRINTTAB(4)"IN WINTER: RAIN OR
SNOW WITH":PRINT"INCREASING WINDS."
657 GOTO 690
660 GOSUB7:PRINTTAB(3)"RAIN FOR NEXT DAY
OR TWO.":GOTO 690
665 GOSUB7:PRINT"RAIN WITH HIGH WINDS FO
LLOWED":PRINT"WITHIN 24 HOURS BY ";
666 PRINT"CLEARING AND":PRINT"COOLER TEM
PERATURES.":GOTO690
670 GOSUB7:PRINT"CLEARING WITHIN A FEW
{2 SPACES}HOURS.":PRINT"FAIR FOR NEX
T SEVERAL";
671 PRINT" DAYS.":GOTO690
675 GOSUB7:PRINT"SEVERE STORM WARNING.
{2 SPACES}WINDY, ":PRINT"WITH RAIN O
R SNOW ";
676 PRINT"IMMINENT FOL-":PRINT"LOWED WIT
HIN 24 HRS BY CLEARING"
677 PRINT"AND COLDER.":GOTO690
680 IF A>=30.1ANDB=5ANDC>=2ANDC<=4THEN64
5
681 PRINT"HEAVY RAIN OR":PRINT"SNOW FOLL
OWED IN WINTER BY A":PRINT"COLD WAVE
."
682 GOTO690
685 GOSUB 7:PRINTTAB(8)"CLEARING AND COL
DER."
690 FORI=1 TO6:PRINT:NEXTI:GOSUB 2500:GO
TO 110
700 GOSUB 17
701 D=1:IF L=0THEN 708
703 X=L:FORI=1TOX:L=I:GOSUB365:PRINT:INP
UT"INPUT C TO CONTINUE ";C$
705 IF C$<>"C" THEN I=X
706 PRINT:NEXTI:L=X:D=0:GOTO110
708 D=0:PRINT"NO DATA FOUND.":FORT=1TO20
00:NEXTT:GOTO110
900 GOSUB 17
902 PRINT:PRINTTAB(9)"WEATHER NORMS"
905 PRINT:PRINTTAB(4)"TEMP"
910 PRINTTAB(2)"HI LO MO{2 SPACES}RAIN
{3 SPACES}SNOW"
915 PRINT:PRINT"J 38 23 30{2 SPACES}2.83
{3 SPACES}9.1":PRINT"F 41 24 32
{2 SPACES}2.70{3 SPACES}9.6"
920 PRINT"M 51 31 41{2 SPACES}3.19
{3 SPACES}6.5":PRINT"A 64 42 53
{2 SPACES}3.02{3 SPACES}0.3"
930 PRINT"M 75 52 63{2 SPACES}3.61
{3 SPACES}0.0":PRINT"J 83 61 72
{2 SPACES}3.61{3 SPACES}0.0"
935 PRINT:PRINT:INPUT"INPUT C FOR REST O
F YEAR":C$:GOSUB 17
937 PRINTTAB(2)"HI LO MO{2 SPACES}RAIN
{3 SPACES}SNOW"
940 PRINT:PRINT"J 87 65 76{2 SPACES}3.61
{3 SPACES}0.0":PRINT"A 85 63 74
{2 SPACES}3.76{3 SPACES}0.0"
950 PRINT"S 78 56 67{2 SPACES}3.21
{3 SPACES}0.0":PRINT"O 67 45 56
{2 SPACES}2.82{3 SPACES}0.1"
955 PRINT"N 53 35 44{2 SPACES}2.66
{3 SPACES}2.1":PRINT"D 40 25 33
{2 SPACES}2.94{3 SPACES}7.7"
960 PRINT:PRINT"YR 63 43 53 37.96 35.4"
970 PRINT:PRINTTAB(2)"DATA FROM NWS HBG.

```

```

,P.A.":PRINTTAB(2)"ELEVATION 338 FT.
980 PRINT:GOSUB 2500:GOTO 110
1250 GOSUB 17
1251 PRINT:PRINTTAB(8)"SEARCH DATE":D=1
1260 PRINT:PRINT:PRINT"ENTER DATE TO FIN
D:":P$="(AS 01-05-83) "
1265 B=8:GOSUB10:C$=LEFT$(B$,2)+MID$(B$,
4,2)
1270 X=L:FORI=1TOL:IFC$=LEFT$(A$(I),4)TH
ENFL=1:T=I:I=L:NEXTI:L=T:GOSUB365:D
=0
1273 IF FL=1 THENFL=0:L=X:GOSUB2500:GOTO
110
1275 NEXT I:PRINT:PRINT"DATE NOT FOUND":
GOTO 690
1500 GOSUB 17
1505 PRINTTAB(11)"CORRECTIONS":C=1
1510 PRINT"ENTER DATE TO CHANGE:":P$="(A
S 01-05-83) "
1512 B=8:GOSUB10:C$=LEFT$(B$,2)+MID$(B$,
4,2)
1570 X=L:FORI=1TOL:IFC$=LEFT$(A$(I),4)TH
ENFL=1:T=I:I=L:NEXTI:L=T:GOSUB275
1571 IF FL=1 THEN FL=0:L=X:GOSUB2500:GOT
O110
1575 NEXTI:PRINT:PRINT"DATE NOT IN FILE"
:GOTO690
2000 GOSUB 17
2005 FORI=1TO8:PRINT:NEXTI:PRINTTAB(8)"W
EATHER ANALYSIS":FORI=1TO1000:NEXTI
2010 PRINT"{CLR}":REM APPLE-2010 HOME, O
N CC-2010 CLS
2020 PRINTTAB(4)"THIS PROGRAM IS DESIGNE
D TO"
2030 PRINT"STORE ON DISK OR TAPE A YEAR'
S":PRINT"WORTH OF DATA IN THE FILE"
;
2035 PRINT"EN-":PRINT"TITLED 'WEATHER F
ILE'. IT IS"
2037 PRINT"SUGGESTED THAT FOR STORAGE OF
":PRINT"MORE THAN ONE YEAR OF DATA,
A"
2040 PRINT"SEPARATE WEATHER RECORD BE MA
IN-":PRINT"AINED."
2055 PRINT:PRINTTAB(4)"THIS PROGRAM WILL
OFFER A "
2060 PRINT"FORECAST OF EXPECTED WEATHER"
:PRINT"CONDITIONS USING BAROMETRIC"
2100 PRINT"PRESSURE AND WIND DIRECTION."
2130 PRINT:GOSUB2500:RETURN
2500 INPUT"{3 SPACES}INPUT C TO CONTINUE
":C$:RETURN
2600 GOSUB 17:FORI=1TO9:PRINT:NEXTI:PRIN
T"HAS THE DATA BEEN"
2610 INPUT"MEMORIZED (Y/N)":H$:IFH$="N"
HEN110
2620 END
2999 REM BE SURE TO INCLUDE PROG 3,4, OR
5 AS NEEDED BEGINNING AT LINE 3000

```

Program 3: 64 And PET (40 or 80 column) Data Storage Routine

```

3000 REM C64, PET(40 OR 80 COLUMN) CASSE
TTE AND DISK FILE HANDLING ROUTINE
3002 PRINT"{CLR}":FORI=1TO4:PRINT:NEXTI:
INPUT"DISK OR CASSETTE (D/C) ":E$
3004 IFES<>"D"ANDES<>"C"THEN3002

```

```

3005 IFES="D"THEN3020
3010 F$="WEATHER FILE":D1=0:G$="":GOTO30
40
3020 F$="@0:WEATHER FILE":D1=1
3040 IFY$="M"THEN3080
3050 IFD1=1THENG$=",S,R"
3060 OPEN1,1+7*D1,8*D1,F$+G$:GOSUB3100
3070 INPUT#1,L:FORI=1TOL:INPUT#1,A$(I):N
EXTI:GOSUB3100:CLOSE1:GOSUB3100:GOT
O110
3080 IFD1=1THENG$=",S,W"
3085 OPEN1,1+7*D1,1+7*D1,F$+G$:GOSUB 310
0
3090 PRINT#1,L:FORI=1TOL:PRINT#1,A$(I):N
EXTI:GOSUB3100:CLOSE1:GOSUB3100:GOT
O110
3100 IF O=0 THEN OPEN 15,8,15:O=1
3103 INPUT#15,A,B$,C,D:IF A THEN PRINT A
,B$,C,D:STOP
3110 RETURN

```

Program 4: Color Computer Data Storage Routine

```

3000 REM COLOR COMPUTER CASSETTE LO
AD AND SAVE ROUTINE
3010 PRINT"PLACE WEATHER FILE TAPE
IN":PRINT"THE RECORDER AND REW
IND."
3020 IF Y$="L" THEN 3070
3030 PRINT:PRINT"PRESS RECORD AND P
LAY":INPUT"PRESS <ENTER> WHEN
READY":C$
3040 OPEN"0",#-1,"WEATHER FILE"
3050 PRINT #-1,L:FORI=1TOL:PRINT #-
1,A$(I):NEXTI
3060 CLOSE #-1:GOTO110
3070 PRINT:PRINT"PRESS PLAY, PLEASE
"
3080 INPUT"PRESS <ENTER> WHEN READY
":C$
3090 OPEN"1", #-1,"WEATHER FILE"
3100 INPUT #-1,L:FORI=1TOL:INPUT #-
1,A$(I):NEXTI
3110 CLOSE #-1:GOTO110

```

Program 5: Apple Data Storage Routine

```

3000 REM APPLE DISK SAVE OR LOAD
3010 HOME : PRINT
3015 ONERR GOTO 3200
3020 D$ = CHR$(4)
3022 PRINT D$;"OPEN WEATHER FILE": IF
Y$ = "M" THEN 3040
3024 PRINT D$;"READ WEATHER FILE"
3026 INPUT L: FOR I = 1 TO L: INPUT A$
(I): NEXT I
3030 GOTO 3060
3040 PRINT D$;"WRITE WEATHER FILE"
3050 PRINT L: FOR I = 1 TO L: PRINT A$
(I): NEXT I
3060 PRINT D$;"CLOSE WEATHER FILE": POKE
216,0: GOTO 110
3200 HOME : VTAB 5: PRINT "ERROR # "; PEEK
(222);" OCCURRED AT LINE "; PEEK (
219) * 256 + PEEK (218)
3210 VTAB 10: PRINT "HINT: HAVE YOU PR
EVIOUSLY SAVED THE": PRINT "DATA F
ILE TO DISK?"
3220 PRINT D$;"CLOSE WEATHER FILE": GOTO
690

```

Questions Beginners Ask

Tom R. Halfhill, Features Editor

*Are you thinking about buying a computer for the first time, but don't know anything about computers? Or maybe you just purchased a computer and are still a bit baffled. Each month in this column, **COMPUTE!** will tackle some questions commonly asked by beginners.*

Q I keep seeing printers and computers advertised with features such as "full ASCII character set" or "ASCII keyboard," etc. What does ASCII mean?

A ASCII stands for "American Standard Code for Information Interchange." Basically, it's a way of encoding characters (letters, numbers, punctuation, special symbols) into standardized numbers that can be understood by any computer or computer device. ASCII was invented to allow all types of computers, terminals, keyboards, printers, modems, disk drives, and other peripherals to easily communicate with each other. It's like the "Morse code" for computing.

The "ASCII character set" is a table of all the letters, numbers, punctuation marks, and other symbols that any computing device might need to communicate with another. Each character in the ASCII table is represented by a number ranging from 0 to 127. For instance, the ASCII code number for the letter "A" is 65; the code for the number "0" is 48; the code for an exclamation mark ("!") is 33. (Many computer manuals and books have an appendix with a table of the ASCII codes.)

When a computer sends something to be printed on a printer, for example, the characters are converted to ASCII numbers by the computer, transmitted along the printer cable, and then recognized by the printer as the original characters. Thus, when a printer is advertised as having a "full ASCII character set," it means the printer is capable of recognizing and printing any standard ASCII character.

Likewise, a "standard ASCII keyboard" means that the computer or terminal keyboard can type any ASCII character. This is especially important for computers or terminals that will be used for telecomputing (hooking up to distant

computers over telephone lines). Some of the ASCII codes are "control codes" – they transmit a command encoded as a character. For example, the ASCII code "7" stands for "bell." It rings a built-in bell or buzzer found on most computers and terminals. ASCII code "13" means "carriage return" and is like pressing the RETURN or ENTER key on the keyboard.

The subject of character codes can become very complicated, because even computers which have ASCII keyboards and which communicate with outside devices in ASCII do not necessarily use ASCII internally.

Atari computers, for example, use ASCII for letters and punctuation, but deviate from ASCII for the control codes – such as 155 for carriage return (versus 13 in true ASCII) and 253 for the bell, as opposed to ASCII's 7.

Commodore computers send control characters as ASCII, but the codes for the lowercase alphabet (normally 97-112) are offset by 64. This can cause problems when you try to hook up a standard ASCII printer (usually upper- and lowercase come out reversed).

Apple computers use true ASCII and can even send lowercase, although you can't display lowercase on an unmodified Apple II. Both the Texas Instruments TI-99/4A and the TRS-80 Color Computer use true ASCII.

Any computer can be made to send and receive true ASCII with a hardware or software interface. That's one of the functions of "terminal software" in telecomputing: a special program translates the computer's output to universal ASCII.

Q What exactly is a "port," as in "user port," or "serial port," or "input/output port"?

A A "port" is simply a slot or a jack on a computer where external devices may be plugged in. It's similar to the jacks on a stereo receiver which allow you to add on speakers, tape decks, turntables, and other accessories.

There are many different types of ports, and often they are incompatible among different computers. That's one reason why you can't plug an Apple disk drive directly into a Commodore 64, or an Atari cassette recorder into a VIC-20.

However, some standards have been established for ports, at least unofficially. The two main types of input/output ports are known as "serial" and "parallel." In personal computing, the prevailing standard for serial ports is the "RS-232C" interface; for parallel ports, it's the "Centronics" interface. Most computers have one or sometimes both of these ports. Those which do not, require an additional adapter or interface box to make them compatible with the wide range of external devices designed to work with these interfaces.

The "user port" on Commodore 64 and VIC-20 computers can be used as both a serial and a parallel port for input/output. As a serial port, it fits almost all of the RS-232C standards. As a parallel port, it does not conform to the Centronics standard, but can be used for similar purposes.

Another type of port familiar to home computerists is the joystick port. The Atari-type joystick port seems to have become the de facto industry standard. It is found on the Atari 2600 VCS game machine, the Atari 400/800/1200XL computers, the Commodore 64 and VIC-20, and several other home computers introduced within the past year. Although most commonly used as an input port (joysticks, paddles, and light pens), this controller port also is capable of output. Some Atari users even wire two of their joystick ports together to make a parallel port for a printer. ©

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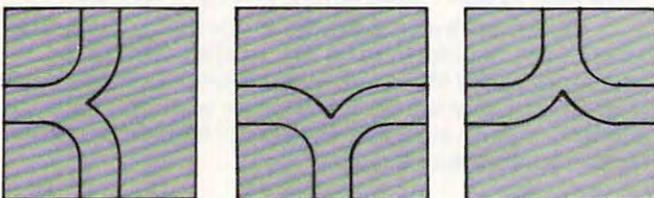
Last month, in Part I, we explored the general notion of the ideal, involving computer game. This article now concludes with some hands-on, specific programming for an Atari version of the example game.

Laying Track At The Expert Level

If you are playing the expert game, there are a lot of track-laying options open to you, for you are allowed to create switches.

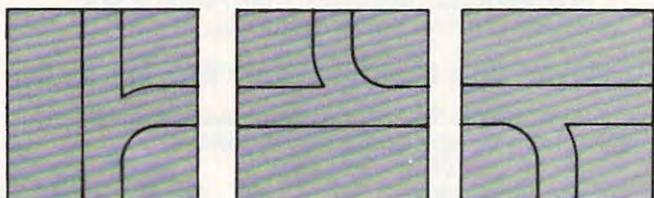
Simple Switches. To create switches, hold down the joystick button when you push or pull the joystick. You will get the following results.

If, with the button held down, you push the joystick in the direction that would normally lay a straight track unit, a Y-switch will be laid:



push right push straight ahead pull toward you

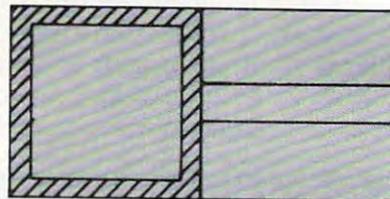
If, with the button held down, you push the joystick in the direction that would normally curve the track to one side or the other, one spur of the switch will go straight ahead, while the other spur will curve in the direction you pushed.



push right push straight ahead pull toward you

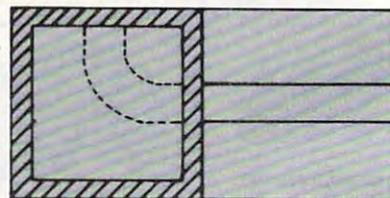
Laying Complex Switches. The most complicated switching operation is when you want the

track to branch from another direction. If, with the button held down, you push the joystick back in the direction you came from, which would normally let you re-lay the last track unit, a low hum comes from the television.



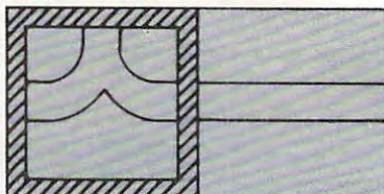
Push the button and then push the joystick back in the direction you came from.

While that low hum is sounding, the program will wait for you to push the joystick in one of the three valid directions (straight or curved to either side). The new switch will branch from whatever direction you chose.



push straight ahead

Now a high-pitched sound will come from the television. This means that the program is waiting for you to choose one of the two remaining valid directions. The switch will branch toward the direction you choose.



push left

GO WITH THE WINNER

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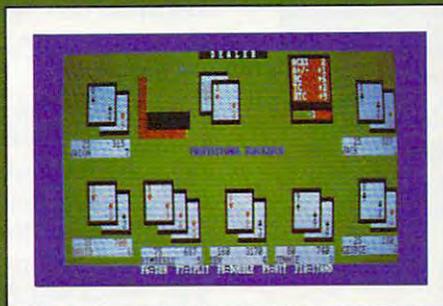


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IBM PC* REQUIREMENTS: 48K RAM, disk drive, PC-DOS*, 80-character display. Color and monochrome versions supplied with each package.

APPLE II** REQUIREMENTS: DOS 3.3, 48K RAM, disk drive, 40-character display. OSBORNE I™ REQUIREMENTS: Standard Osborne I package.

ATARI** 400/800/1200 REQUIREMENTS: 48K RAM and one disk drive.

Display shows actual photograph of IBM PC version. Apple and Atari color graphics and Osborne monochrome graphics are similar. Versions for TRS-80** and other brands will be available shortly.

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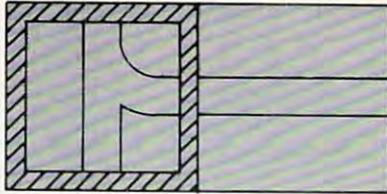
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pull toward you

The high-pitched sound will end. You can then change your mind, of course, and lay a different switch or a simple track unit – nothing is definite until you push START. But while those tones are sounding, you can choose only valid switching options, until you have completed the switch.

As you can see, there are only three possible switches – a left switch, a right switch, and a Y-switch. All switch units are laid by pressing down the button while moving the joystick. Only when you want a switch to branch *from* another direction does it take more than one step to lay a switch unit.

This sounds harder, and it is – but it also gives you more freedom when you come to track you have already laid. You still can do only crossovers and curved bypasses of the other player's track, but you can now *join* the spur you are working on to another segment of your own track.

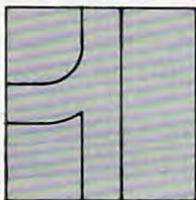
For instance, say you are laying a unit of track in the square shown below.



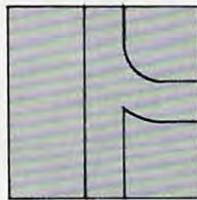
new track

your old track

At the beginner level, you could lay only a straight unit, creating a crossover. But at the expert level, you can also choose a left curve or a right curve, which would create one of the following switches:

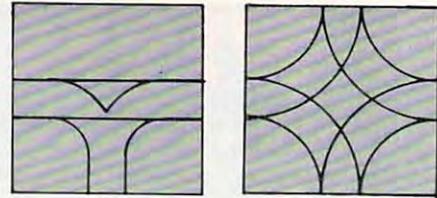


left curve



right curve

Please notice that you don't have to push a button to create one of these switches. In fact, the program will ignore the button if you are about to cross an existing track segment, for each switch can only branch into two spurs.



illegal switches

This means that every switch that creates a new spur must end with a switch that rejoins the spur to the main line.

To keep things from getting too cluttered in your layout, you can create a total of only eight switch-pairs if you are playing alone, or four switch-pairs for each player in a two-player game. So if you try to push the button to create a ninth (or fifth) switch, the program will ignore the button.

Play Options

How can you tell a spur from the main line? The only difference is the way the spur *ends*. If the spur ends by joining directly to the beginning of the very first track unit laid, it is the main line. If the spur ends by creating a switch to join it to any track segment, then that spur is *not* the main line.

"Railroader" keeps track of how many spurs there are, and will not let you join the last spur back to the main line with a switch, unless you have already joined the main line back to the first track unit. And if you press OPTION with any spurs left open, without being joined back to the main line, Railroader will automatically make one spur the main line by joining it to the first track segment, and then will join all the other spurs to the nearest segment of the main line by using switches.

- *Choosing Which Spur to Build On.* When you have more than one spur, of course, you get to decide *which* spur you are adding to. You do this by pressing the SELECT button at the beginning of your turn. Railroader remembers the location of every uncompleted spur end, and each time you press SELECT the cursor moves from one spur end to the next. Even if you have already laid a track unit in that turn, but have not yet pressed START, you can press SELECT and Railroader will erase the unit you just laid, then move the cursor square to the end of the next uncompleted spur.

- *Crossovers and Bypasses.* Just because you *can* join one track to another with switches at the expert level doesn't mean you have to. You can still create a crossover or curving bypass by pushing the joystick in the direction that would normally lay those track units.

- *Erasing with Switches.* What about erasing track units by pushing the joystick back in the

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direction you came from? You can still do that, but when you come to a switch, Railroader will not let you erase it until you have erased all of *both* spurs leading away from that switch. When you have erased all of one spur, up to the switch, then push SELECT until you are at the uncompleted end of the other spur, and erase that line of track up to the switch. Now Railroader will let you erase the switch. (*Notice*, though, that this works only if the spur has not been completed. If you come to a switch whose other end is already joined to the main line, pushing SELECT won't get you to the uncompleted end of that spur, since it *has* no uncompleted end.)

● **Illegal Moves.** Now that you can use switches to join onto existing lines of track, there are fewer illegal moves to worry about, right? Unfortunately, it isn't so. You *still* can't join your spur to the other player's track. And now you can't cross over or bypass any track unit that contains a switch, either your own or the other player's! This means that you will end up erasing more often, as you or the other player occasionally get one of your spurs in a box.

● **Ending the Expert-level Session.** Just push OPTION. If you left any loose ends, Railroader will clean them up, just as in the beginning level. If you left a spur in a box, however, from which Railroader can't legally escape without erasing, the program will put the cursor at the uncompleted end of that spur, so you can erase that line of track back to a point where either you or Railroader can legally complete the spur.

Running The Trains

When you end your track-laying session (or if you chose "Run Trains" instead of "Lay Track" at the beginning of the game), Railroader will ask you whether you want to use the layout you just created or load one from cassette or diskette. If you choose diskette, you will be asked the file name.

When Railroader saves a layout, the file that holds the data also remembers whether there was one player or two. When you decide to run trains on a layout, you do not get to choose one or two players – Railroader will run two trains if there are two tracks, one train if there is only one track.

If there is only one train, it is twice as long as each of the trains in a two-player game. (Since two trains use up twice as much CPU time as one train, this makes it so that one- and two-train games run at the same speed.) You cannot stop or speed up, but you can *slow down* your train by holding down your joystick button. When you let go, the train immediately resumes normal speed.

You can control the switches with your joystick. Of course, if the spur you are on is merely joining onto another line, with no choice of direc-

tion, you have no choice. But if your train could go either way, Railroader remembers whether you last pushed your joystick left or right. Other directions are ignored. If you last pushed left, your train will take the left-hand track at every switch it comes to until you push right. It doesn't matter *when* you push the joystick, except that once your engine has passed the switch, Railroader will not change that switch; instead, the program will assume you have changed the *next* switch.

Of course, if the train layout you are playing on was created at the beginner level, there are no switches. There will probably be crossovers and bypasses, however, which will make running the train more interesting.

Two-Player Scoring

If there are two players, Railroader keeps a score. You get one point for each track unit you pass through (which encourages you to stay at top speed); two points for each switch you cross over, and ten points if your opponent crashes into you. (You get no points for crashing into your opponent.) Only relative scores are kept – the difference between your scores. Your engines change color, depending on which of you is ahead. The leader has a brighter, warmer-colored engine; the other player has a darker engine, in cooler colors. The actual number of the difference in scores between the two players is not displayed until the end. This means that when you are playing noncompetitively, or with young children, they do not have to be aware of "winning" or "losing" – the color changes can be purely decorative.

The game ends when one player or the other pushes OPTION, or when the difference between the two players is greater than 255.

Programming Hints: Creating The Screen

The easiest way to create the train layout is to use an alternate character set with a multicolor character mode, if your computer will allow it, though direct pixel manipulation will also work. On the Atari, for instance, you would probably use ANTIC mode 4, which provides a screen 24 characters high and 40 characters wide (just like Graphics 0). You might then divide the screen into four-character by four-character blocks, giving you a grid of six blocks vertically by ten blocks horizontally. (Any arrangement that comes out even will do.) Obviously, these blocks correspond to the "square" track units.

Individual characters might look like the seven characters depicted in Figure 1.

These characters might be combined into an up-right curving block of track as shown in Figure 2.

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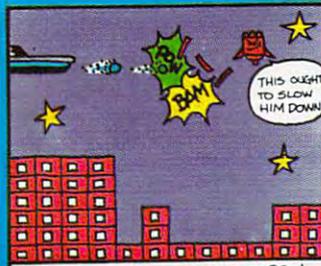
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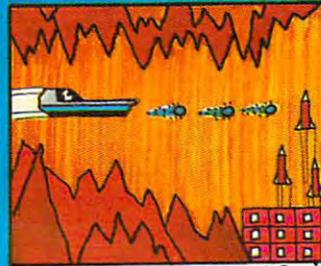
AS I PATROLLED THE SKIES OF REPTON, I CAME ACROSS A MINE LAYER LITTERING MY PATH WITH MINES...



"ALERT" FLASHED ACROSS MY RADAR SCREEN, I HAD TO FIND THAT DRAYN FAST BEFORE HE STOLE ANY MORE PRECIOUS POWER



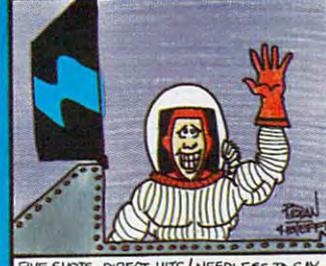
THEN I SAW A NOVA CRUISER, I SPED AHEAD TO DESTROY HIM. I WAS SMART, AS SOON AS I SHOT, UP WENT MY FORCE SHIELD.



DESPITE MY GALLANT EFFORTS, REPTON'S POWER HAD BEEN DRAINED... I FOUND MYSELF FACED WITH CODE ARMAGEDDON!



IN THE QUARRIORS' UNDERGROUND CITY, I VOWED TO CONTINUE TO FIGHT FOR REPTON! I MADE MY WAY TO THE TOWER...



FIVE SHOTS, DIRECT HITS! NEEDLESS TO SAY I SAVED REPTON AND LIVED TO TELL ABOUT IT. NO WONDER I'M... CAPTAIN STAR!!

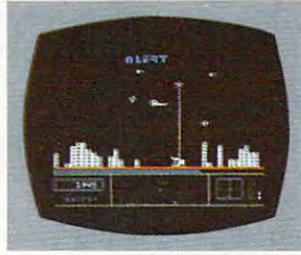
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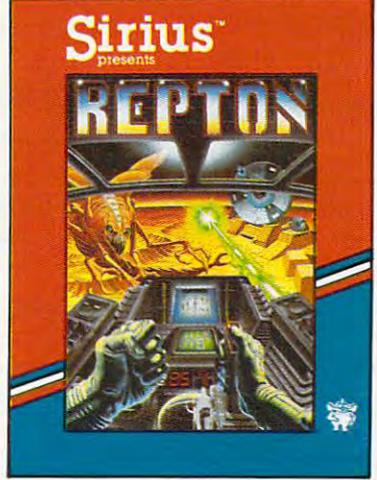
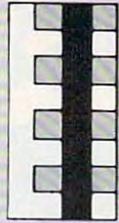


Figure 1. Seven Multicolor Characters

CHAR 1

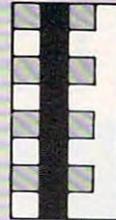
00	01	11	01
00	00	11	00
00	01	11	01
00	00	11	00
00	01	11	01
00	00	11	00
00	01	11	01
00	00	11	00



Left half of vertical straight track

CHAR 2

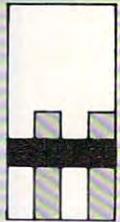
01	11	01	00
00	11	00	00
01	11	01	00
00	11	00	00
01	11	01	00
00	11	00	00
01	11	01	00
00	11	00	00



Right half of vertical straight track

CHAR 3

00	00	00	00
00	00	00	00
00	00	00	00
00	00	00	00
00	01	00	01
11	11	11	11
00	01	00	01
00	01	00	01



Top of horizontal straight track

CHAR 4

00	01	00	01
00	01	00	01
11	11	11	11
00	01	00	01
00	00	00	00
00	00	00	00
00	00	00	00
00	00	00	00



Bottom of horizontal straight track

CHAR 5

00	00	01	00
00	00	00	01
00	01	00	11
00	00	01	11
00	00	11	01
00	00	11	00
00	01	11	01
00	00	11	00



Left side of up-right curve

CHAR 6

00	00	00	00
00	00	00	00
00	00	00	00
00	00	00	00
00	00	00	01
00	00	11	11
01	11	00	01
11	01	00	01



Top of up-right curve

CHAR 7

11	01	00	00
11	00	01	00
01	00	00	01
00	01	00	11
00	00	01	11
01	00	11	01
00	01	11	00
00	11	01	00



Inside of up-right curve

You might notice that the four corners of every block are never used, and depending on the track layout within each block, many other characters are blank. You could fill these blank spaces with almost anything. In fact, since the place where the corners of four blocks join will always be blank, you might put buildings, foliage, water, or practically anything into these spaces before the game begins, giving a sense of the space remaining to be filled.

How Many Characters Will It Take?

Surprisingly few characters will be needed to create the track itself. On the Atari, for instance, if the rails are drawn using color register 2 at location 710, then the second player's track can use the same characters, but entered in inverse mode. In inverse mode, the color of the rails will come from color register 3 at location 711.

There are two possible straight tracks: vertical and horizontal. Each requires two characters. The four possible curves (up-left, up-right, down-left, and down-right) require 12 more characters. There are 12 switches – four Y-switches, four left-hand switches, and four right-hand switches – but they might be able to use some pieces from the curves and straight tracks, so that only 32 new characters

would be needed to make them. Bypasses and crossovers require another eight characters.

That means that 68 characters are required to make every essential track element – leaving you 60 characters for drawing buildings, foliage, ponds, or anything else you might want to add.

Putting Together The Blocks

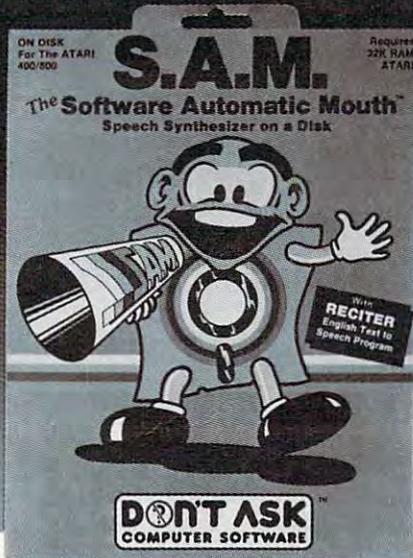
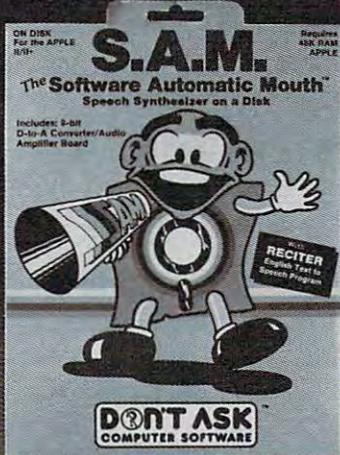
How many total blocks would you need? For one player, you would need two straightaways, four curves, one crossover, two bypasses, four Y-switches, four left-hand switches, and four right-hand switches. For two players, double that and add six new blocks for situations where two different-colored tracks are present on the same block (two crossovers and four bypasses). That gives you a total of 48 blocks, each consisting of 16 characters.

Blocks could be stored as a two-dimensional or three-dimensional numeric array, and your program could POKE them into screen memory:

```
500 FOR I=0 TO 3
510 FOR J=0 TO 3
520 POKE SCREEN + PLACE + (40*I) + J, BLOCK
      (UPLEFT,I,J)
530 NEXT J:NEXT I:RETURN
```

In this subroutine, BLOCK is a three-dimensional

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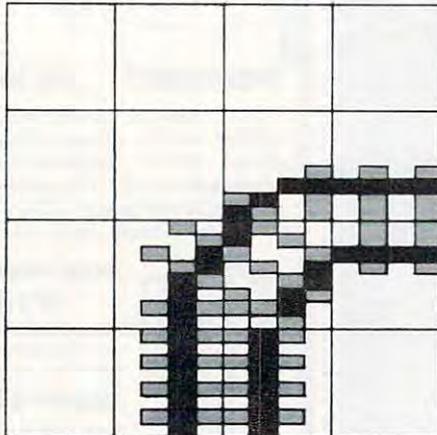


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Figure 2.

Block Of 16 Characters Forming An Up-Right Curve



array, in which the first subscript defines which block it is, the second defines the row of the block, and the third defines the character on the row. The characters in Block 7 would be defined like this:

```
BLOCK(7,0,0) BLOCK(7,0,1) BLOCK(7,0,2) BLOCK(7,0,3)
BLOCK(7,1,0) BLOCK(7,1,1) BLOCK(7,1,2) BLOCK(7,1,3)
BLOCK(7,2,0) BLOCK(7,2,1) BLOCK(7,2,2) BLOCK(7,2,3)
BLOCK(7,3,0) BLOCK(7,3,1) BLOCK(7,3,2) BLOCK(7,3,3)
```

ULEFT is the variable holding the number of the block that draws an up-left curve. SCREEN holds the address of the start of screen memory. PLACE holds the offset of the block's starting address from SCREEN: 40 is added to PLACE for each new line, and 1 for each new character.

The same sort of thing could be done with string arrays, using POSITION and PRINT commands:

```
500 FOR I=0 TO 3
510 POSITION COLUMN,LINE+I
520 PRINT BLOCK$(ULEFT,I)
530 NEXT I:RETURN
```

Atari users could dimension one long string – DIM BLOCK\$(767) – and then use POSITION and PRINT commands like this:

```
500 FOR I=0 TO 3
510 POSITION COLUMN,LINE+I
520 PRINT BLOCK$(ULEFT+(I*4),ULEFT+(I*4)+3)
530 NEXT I:RETURN
```

You don't have to settle for the 24-row by 40-column screen, either. Even with coarse scrolling, instant vertical wraparound can be achieved by making the last 24 rows of screen memory identical with the first 24 rows, and then page-flipping instead of scrolling at the very top and bottom of screen memory. As players lay track at the top or bottom of the screen, they might notice a slight delay as the program POKEs the blocks into two places in screen memory instead of one, but during the actual scrolling there will be little if any hesitation.

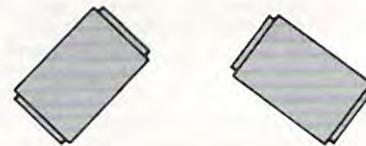
Moving The Train

If you want to have a smoothly moving train, you'll need to use player/missile graphics. You'll get best results with machine language subroutines for movement. The train can still be run with BASIC, however, and the illusion of speed can be maintained if you move the train in increments of, say, half a screen character – two horizontal pixels or four vertical pixels at a time, each way. Movement is a little jerky, but it is fast.

Animation will be a little tricky. On straight tracks it is simple enough – you need only four positions for each car – two, if the front and back of the car are identical, so that it doesn't matter which way it is facing. If your engine and train cars are identical, except for color, it is all the simpler, since one shape will control each position for all the cars.



There is nothing wrong with using only straight vertical and horizontal movements – the curving tracks are abrupt enough so that the train won't "leave" the track. However, for smooth movement you may want intermediate positions:



Another animation technique is to use part of your character set to generate trains, with characters representing track sections with train cars on them. By POKeing "train car" characters into screen memory and then restoring the old values afterward, you can get longer, four-colored trains – but with jerkier movement.

You will also need to decide how to handle collisions. Stop one train? Let them pass through each other? Design an explosion?

The answers to these and many other questions are best left to your own creativity. After all, there are hundreds of ways to design elegant programs to bring this game to life. Solving the problems to create *your* version of Railroader is half your fun.

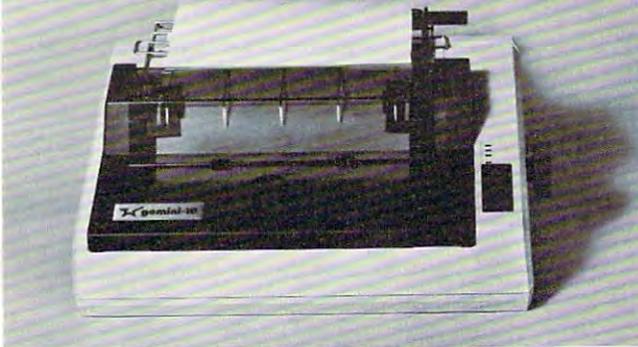
The other half is making layout after layout. No two games will ever be the same; and as generations of model railroaders can tell you, actually

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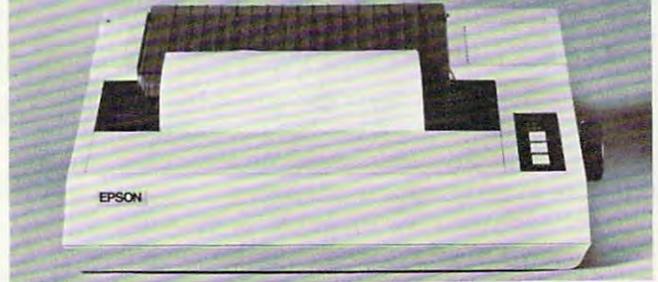


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running the trains is just an extra, like the orchestra doing a quick encore when the concert is over.

Variations

After you've carried out this game design (no doubt improving on it many times along the way), you might try one of these variations:

- *Traffic*. One player designs a system of one-way and two-way streets, setting up stoplights. Then up to five players use paddles to drive cars on the streets, getting "tickets" for disobeying laws and losing even more points for crashing, while the program systematically changes the red and green traffic lights.

- *Treasure Map*. Using a font of old-fashioned map characters, a player designs a treasure map; when the game is played, the program randomly or systematically assigns certain treasures and dangers to certain locations.

- *Houseplan*. The player uses the joystick to build the walls of a house, and the keyboard to put in doors and windows and furnish the house.

Does It Matter?

After all, it's only a game. It's only play. It's only supposed to make money, isn't it? Like the movies. The success of a game is measured in dollars per week. It couldn't possibly be art.

But it is art. Computer games are created by human beings, using the computer, the television screen, and the sound speaker as their medium. And like other artists, computer gamemakers – let's call them *videowrights* – find that their medium is at once limiting and liberating.

The videowright has only a tiny fraction of the painter's palette to work with. The scan lines and color clocks of the TV set force the videowright to paint in discrete dots, while memory limitations discourage extravagant use of color and images. Yet painters cannot make their paintings move.

Novelists and playwrights can create far deeper characters, far more intricate plots than the videowright, but novelists cannot make you see, and playwrights cannot bring off the fantastic milieu of the videogame.

Above all, the videowright can create an art that the audience takes part in. When you play a videogame, you become part of the act. It's as if you went to the movies and, without stopping the flow of the film, you got to decide what Clint Eastwood or Katharine Hepburn would say next; as if you went to the theatre, and were given a script and put into the play; as if you went to a concert and got to control the program as it went along.

World-Making

Despite their differences, all the arts have some

things in common. I believe that this is the most important:

The audience voluntarily comes to dwell in the world that the artist has created.

Playing *Joust* and *Dig-Dug* is more than racking up points. It's dwelling for a time in a world that you can't visit any other way. There are dangers; there are laws; there are strategies for survival; there are rewards for achievement. There is a beginning, an ending. You have more than one chance to make good.

Audience Or Artist

My children are still so young that they don't know that it takes years of training to dance or sing or act out plays or write books. Geoffrey is halfway through writing a novel. Emily improvises plays all day. When the kids like the music they hear, they dance. When they want to sing, they sing, and never mind the melody. And we have enough drawings and paintings to paper a good-sized office building.

We wouldn't dream of telling children that baseball and basketball were only for grownups – they can only go to the ballpark and watch. It's no better to limit them to being in the audience of videogames. Even though it's the most participatory of the arts, the barrier between maker and audience shouldn't be so vast.

Of course, people don't always want to be creative. More often than not, I prefer to play. I like dwelling in some of those worlds that videowrights have made for me.

But when I want a more creative kind of entertainment, I'd like to be able to sit down at the computer and build, the way my children and I build with wooden blocks and plastic bricks. I can always write my own program if I want to, of course. But that's like cutting down a tree and sawing it into blocks and sanding them in order to play with building blocks. Doing it once is fine, but you wouldn't want to have to do it every time. ©

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DRAGON

Steven R. McCloskey



De Potter

Here's a short but exciting game for the VIC-20. Joystick required. Version for the Atari included.

You are a hungry fire-breathing dragon trying to catch some lunch. You're also fighting time as you chase assorted foods up and down ladders and across corridors.

Using a joystick to control the pursuit of your wily prey, you must breathe fire to consume the apples, pretzels, and other delights by pressing your fire button. But be careful. The feast moves around randomly to avoid the stream of fire.

You are allotted 60 seconds, and if you eat something your score is the amount of time left. If you do this within 60 seconds, you start over but only with 55 seconds and so on down to 10 seconds. If you make a catch within the final 10 seconds, you're back to 60 again. As a warning, the border will change colors when only 5 seconds remain.

If you fail to make your catch in the allotted time, the game ends with an option to play again. Also, "Dragon" records the high score.

Program 1: Dragon – VIC Version

```
20 POKE36879,233:PRINT"{CLR}{11 DOWN}
   {8 RIGHT}DRAGON!"
30 POKE52,28:POKE56,28:CLR
40 FORI=7168TO7679:POKEI,PEEK(I+25600):N
   EXT
50 POKE36869,255
60 FORC=7432TO7551:READA:POKEC,A:NEXT
65 DATA8,42,28,127,28,42,8,0,8,127,93,28
   ,127,73,28,28
70 DATA187,0,238,0,187,0,238,0,127,65,12
   7,65,127,65,127,65
80 DATA85,255,85,0,0,0,0,170,255,170,0
   ,0,0,0,28,8,28,8,28,8,28,8,28,8,2
   8,8,28,8
90 DATA28,3,3,18,58,126,252,72,108,192,1
   92,72,92,126,63,18,54,28,28,73,127,28
   ,93,127,8
95 DATA0,56,124,230,198,206,124,56,68,17
```

```
0,170,146,170,68,186,0,32,16,108,254,
254,254,124,40
97 DATA255,255,255,255,255,255,255,255
99 PRINT"{CLR}":POKE36879,233:X=7701:FOR
T=1TO23:POKEX,47:POKEX+30720,1:X=X+22
:NEXT
100 X=7724:FORT=1TO21:POKEX,35:POKEX+307
20,2:X=X+1:NEXT
105 X=7766:FORT=1TO19:POKEX,35:POKEX+307
20,2:X=X+22:NEXT
110 X=7746:FORT=1TO19:POKEX,35:POKEX+307
20,2:X=X+22:NEXT
115 X=8164:FORT=1TO21:POKEX,35:POKEX+307
20,2:X=X+1:NEXT
120 X=7768:FORY=1TO6
125 FORA=1TO2:FORT=1TO21:POKEX,35:POKEX+
30720,2:X=X+1:NEXTT:X=X+1:NEXTA
130 X=X+22:NEXTY
135 X=7747:FORY=1TO7
140 FORT=1TO19:POKEX,36:POKEX+30720,1:X=
X+22:NEXTT
145 X=X+(-415):NEXTY
170 V=0
180 W=0:H=60:POKE7701,47:POKE7723,47:POK
E7701+30720,1:POKE7723+30720,1
185 POKEQ+2,0
190 TIS="000000":D=8152:Z=43:Y=-22:P=0:T
=190:N=130:E=30720:L=-22:O=0:K=39:R=
36
195 S=7756:J=37151:POKEJ+3,255:POKEJ+3,1
27:G=0:P=0:POKE36879,233:Q=36874:N=1
5:POKEQ+4,N
200 A=INT(RND(1)*4)+1:B=INT(RND(1)*3)+1:
B=B*3
215 IFA=1THENM=+22:C=44:G=36
220 IFA=2THENM=-22:C=44:G=36
225 IFA=3THENM=-1:C=46:G=32
230 IFA=4THENM=+1:C=45:G=32
235 IFPEEK(S+M)=35THEN200
245 POKES,G:POKES+E,1:S=S+M:POKES,C:POKE
S+E,4
250 IFY=0THEN300
255 POKEQ,T+(Y-2)
300 X=PEEK(J+1)AND128:JE=-(X=.):X=PEEK(J
):JS=-(XAND8)=.
305 JW=-(XAND16)=.:JN=-(XAND4)=.:FB=
-(XAND32)=.
307 POKEQ,0:POKEQ+3,0
309 IFFBTHENI=D+L:GOTO800
```



GWENDOLYN.

THERE ARE SOME THINGS YOU KEEP SEARCHING FOR, BEYOND REASON.

Kidnapped in revenge and locked in hatred somewhere deep beneath your castle, is your princess.

Gwendolyn.

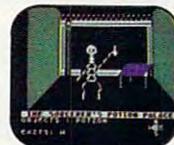
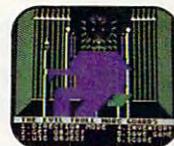
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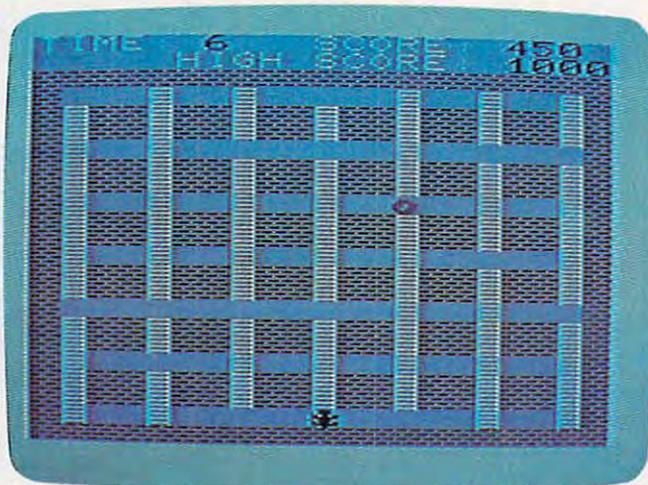
But for her, you would endure anything, wouldn't you?

Gwendolyn—a non-violent, intermediate graphic adventure game, written by Marc Russell Benioff, Atari 40K Disk \$27.95, Artworx Software Co., Inc., 150 N. Main St., Fairport, N.Y. 14450. For a free catalog of Artworx Software for the Atari, Apple, VIC-20 & Commodore 64 computers, write or call 800-828-6573.



These are just three of over ninety exciting screens.

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In the VIC version of "Dragon," the hungry monster climbs up and down ladders and across shelves in search of food.

```

310 IFJNTHENY=-22:L=-22:K=39:Z=43:R=36:G
OTO330
315 IFJETHENY=1:Z=41:L=1:R=32:K=37:GOTO3
30
320 IFJSTHENY=22:L=22:K=40:R=36:Z=34:GOT
O330
325 IFJWTHENY=-1:L=-1:K=38:R=32:Z=42:GOT
O330
327 Y=0
330 IFPEEK(D+Y)=35THENY=0
335 IFY=LORY=-1THENF=32:GOTO345
340 F=36
345 POKED,F:POKED+E,1:D=D+Y:POKED,Z:POKE
D+E,0:IFY=0THEN350
347 POKEQ,T+Y
350 PRINT"{HOME}{WHT}TIME:{BLK}";H-INT(T
I/60);"{LEFT}":PRINT"{HOME}
{10 RIGHT}{WHT}SCORE:{BLK}";W
352 PRINT"{HOME}{DOWN}{5 RIGHT}{WHT}HIGH
SCORE:{BLK}";V
355 IFTI/60>=HTHEN400
360 IFTI/60>=H-5THENPOKE36879,238
365 B=B-1:IFB=0THEN200
370 GOTO215
400 POKEQ+4,0:POKED,F:POKED+E,1:POKES,G:
POKES+E,1:IFW>VTHENV=W
410 PRINT"{HOME}{BLK}{6 SPACES}GAME
{2 SPACES}OVER{28 SPACES}":FORT=1TO1
000:NEXT
420 PRINT"{HOME}{WHT}PRESS ANY KEY TO PL
AY HIGH SCORE:{BLK}";V
430 GETA$:IFA$=""THEN430
440 PRINT"{HOME}{44 SPACES}":GOTO180
800 IFPEEK(I)=35THEN810
802 POKEI,K:POKEI+E,7:POKEQ+2,T+(0*5):O=
O+1:IFO=10THEN814
804 I=I+L
806 IFI=STHEN900
808 GOTO800
810 IFPEEK(I)=35AND0=0THEN310
812 I=I-L
814 POKEQ+2,T+(0*5)
815 POKEI,R:POKEI+E,1:I=I-L:O=O-1:IFO=0A
NDU=1THENPOKED,R:POKED+E,1:U=0:GOTOL
85
816 IFO=0THENPOKEQ+2,0:GOTO310
818 GOTO814
900 POKEI,33:POKEI+E,7:FORM=180TO235STEP
2:POKEQ+2,M:NEXT

```

```

901 POKEQ+4,N:FORM=180TO235STEP2:POKEQ+2
,M:FORN=1TO10:NEXTN:NEXTM:POKEQ+2,0
902 POKEQ+4,0:W=W+(H-INT(TI/60)):H=H-5:I
FH=5THENH=60
904 U=1:O=O+1:GOTO 814

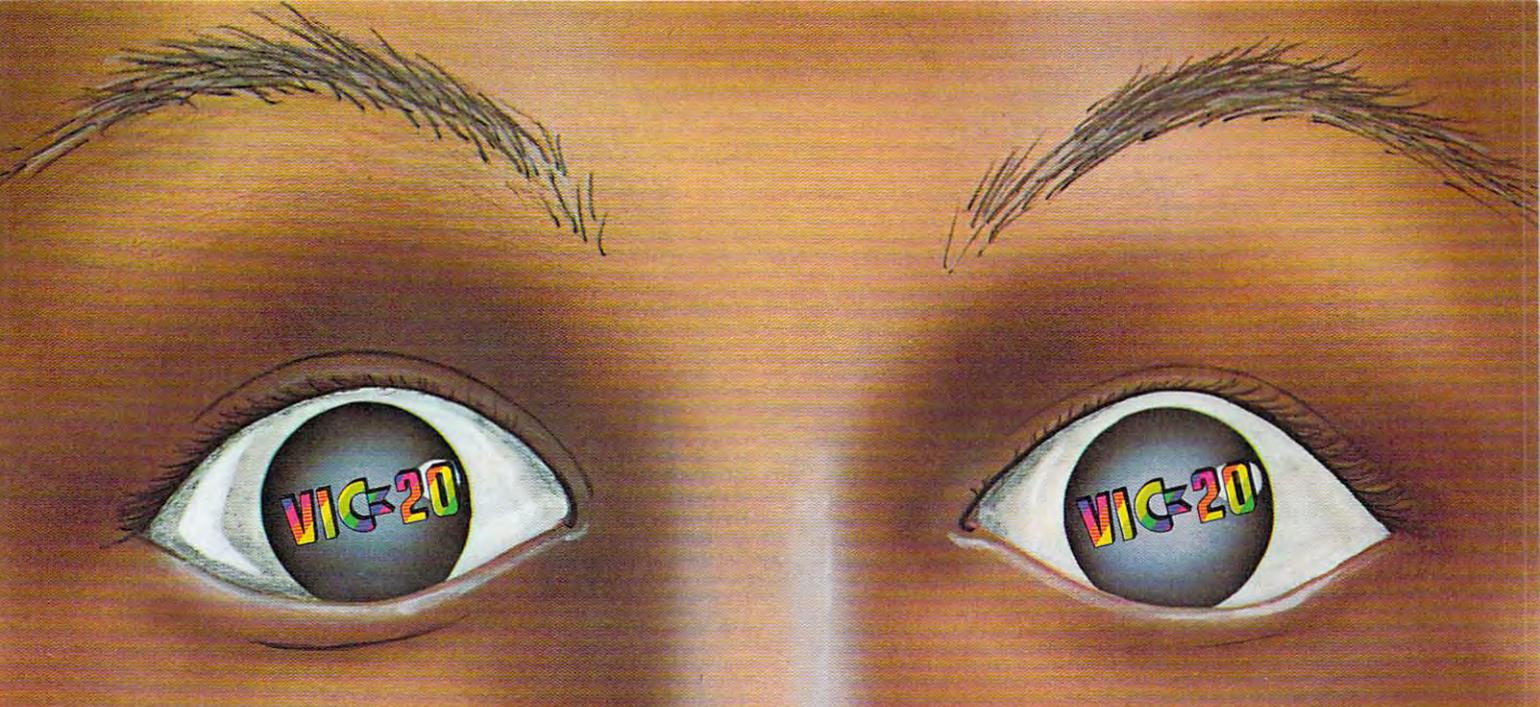
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Program 2: Dragon - Atari Version

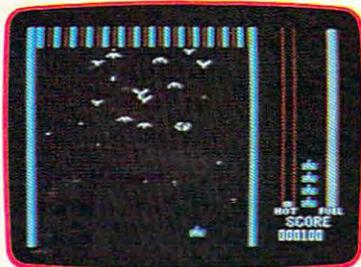
```

10 GRAPHICS 17:SETCOLOR 1,0,12:SETCO
LOR 0,3,4
20 SETCOLOR 4,9,8:SETCOLOR 2,7,4:POS
ITION 7,10:PRINT #6;"DRAGON"
30 FOR I=15 TO 0 STEP -0.2:POKE 712,
104+48*F:F=1-F:FOR W=I*4 TO I*2 S
TEP -1:SOUND 0,W,10,I:NEXT W:NEXT
I
40 CHSET=(PEEK(106)-8)*256:IF PEEK(C
HSET+8)=8 THEN POKE 756,CHSET/256
:GOTO 99
45 FOR I=128 TO 471:POKE CHSET+I,PEE
K(57344+I):NEXT I
50 POKE 756,CHSET/256
60 FOR C=0 TO 127:READ A:POKE CHSET+
C,A:NEXT C
61 DATA 0,0,0,0,0,0,0,0
65 DATA 8,42,28,127,28,42,8,0,8,127,
93,28,127,73,28,28
70 DATA 187,0,238,0,187,0,238,0,127,
65,127,65,127,65,127,65
80 DATA 85,255,85,0,0,0,0,0,170,255,
170,0,0,0,0,0,28,8,28,8,28,8,28,8
,8,28,8,28,8,28,8
90 DATA 28,3,3,18,58,126,252,72,108,
192,192,72,92,126,63,18,54,28,28,
73,127,28,93,127,8
95 DATA 0,56,124,230,198,206,124,56,
68,170,170,146,170,68,186,0,32,16
,108,254,254,254,124,40
97 DATA 255,255,255,255,255,255,255,
255
99 PUT #6,125:SCR=PEEK(88)+256*PEEK(
89):FOR I=2 TO 22:POKE SCR+19+I*2
0,143:NEXT I
100 FOR T=0 TO 18:POKE SCR+40+T,3:NE
XT T
105 FOR T=0 TO 18:POKE SCR+60+T*20,3
:NEXT T
110 FOR T=0 TO 18:POKE SCR+78+T*20,3
:NEXT T
115 FOR T=0 TO 18:POKE SCR+440+T,3:N
EXT T
120 X=SCR+80:FOR Y=1 TO 6
125 FOR A=1 TO 2:FOR T=1 TO 19:POKE
X,3:X=X+1:NEXT T:X=X+1:NEXT A
130 X=X+20:NEXT Y
135 FOR X=0 TO 4:FOR Y=0 TO 18:POKE
SCR+60+Y*20+X*4+1,68:NEXT Y:NEXT
X
170 V=0
180 W=0:H=60:REM POKE SCR+21,15:POKE
SCR+41,15
185 REM
190 POKE 20,0:POKE 19,0:D=SCR+430:Z=
138:Y=-99:P=0:T=190:E=-1:L=-20:O
=0:K=7:R=4:POKE 712,9*16+8
195 S=SCR+70:G=0:P=0:N=15
200 A=INT(RND(1)*4)+1:B=INT(RND(1)*3
)+1:B=B*3
215 IF A=1 THEN M=+20:C=12:G=68
220 IF A=2 THEN M=-20:C=12:G=68
225 IF A=3 THEN M=-1:C=14:G=0
230 IF A=4 THEN M=+1:C=13:G=0

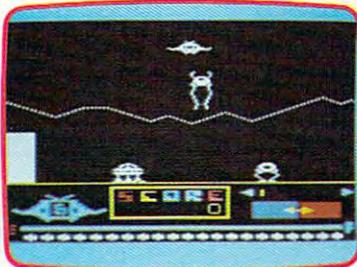
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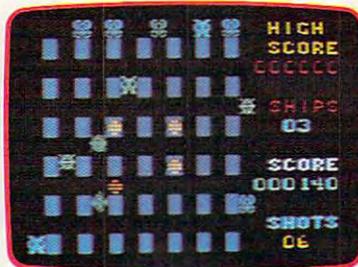
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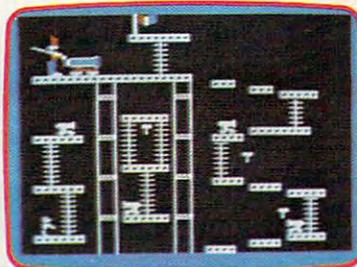
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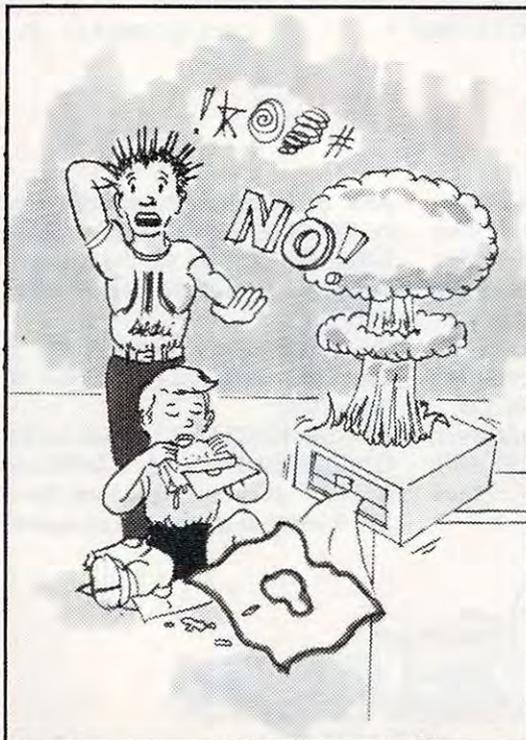
```

235 IF PEEK(S+M)=3 THEN 200
245 POKE S,G:S=S+M:POKE S,C
250 IF Y=0 THEN 300
255 SOUND 0,T+Y,2,8
300 ST=STICK(0)
307 SOUND 0,0,0,0
309 IF STRIG(0)=0 THEN I=D+L:GOTO 80
310 IF ST=14 THEN Y=-20:L=Y:K=135:Z=
139:R=68:GOTO 330
315 IF ST=7 THEN Y=1:Z=137:L=1:R=0:K
=133:GOTO 330
320 IF ST=13 THEN Y=20:L=Y:K=136:R=6
8:Z=130:GOTO 330
325 IF ST=11 THEN Y=-1:L=-1:K=134:R=
0:Z=138:GOTO 330
327 Y=(Y-99)
330 IF PEEK(D+Y)=3 THEN Y=0
335 IF Y=1 OR Y=-1 THEN F=0:GOTO 341
340 F=68
341 IF Y=0 THEN 347
345 POKE D,F:D=D+Y:POKE D,Z:IF Y=0 T
HEN 350
347 SOUND 0,T+Y,12,8
350 POSITION 1,0:? #6;"time ";H-INT(
(PEEK(20)+256*PEEK(19))/60);" ";
:POSITION 10,0:? #6;"SCORE ";W
355 TI=PEEK(20)+256*PEEK(19):IF TI/6
0>=H THEN 400
360 IF TI/60>=H-5 THEN SETCOLOR 4,3,
8
365 B=B-1:IF B=0 THEN 200
370 GOTO 215
400 SOUND 0,0,0,0:POKE D,0+F*(ABS(Y)
=20):POKE S,G:IF W>V THEN V=W
410 COLOR 32:PLOT 0,0:DRAWTO 19,0:PL
OT 0,1:DRAWTO 19,1:POSITION 0,0:
? #6;" GAME Over "
420 POSITION 1,1:? #6;"press START t
o play":POSITION 0,23:? #6;"HIGH
SCORE ";V
430 IF PEEK(53279)=7 THEN 430
440 COLOR 32:PLOT 0,0:DRAWTO 19,0:PL
OT 0,1:DRAWTO 19,1:GOTO 180
500 INPUT A:A=A-7680:Y=INT(A/22):X=A
-Y*22:? Y*20+X:GOTO 500
800 IF PEEK(I)=3 THEN 810
802 POKE I,K:POKE 710,PEEK(53770):SO
UND 0,0*5,0,8:O=O+1:IF O=10 THEN
814
804 I=I+L
806 IF I=S THEN 900
808 GOTO 800
810 IF PEEK(I)=3 AND O=0 THEN 310
812 I=I-L
814 POKE 710,0*5
815 POKE I,R:I=I-L:O=O-1:IF O=0 AND
U=1 THEN POKE D,R:U=0:POKE 710,1
16:GOTO 185
816 POKE 710,116:IF O=0 THEN SOUND 0
,0,0,0:GOTO 310
818 GOTO 814
900 POKE I,129:Y=-99:FOR M=0 TO 100
STEP 10:SOUND 0,M,12,8:POKE 710,
PEEK(53770):NEXT M
901 FOR M=140 TO 0 STEP -2:SOUND 0,M
,0,M/10:POKE 710,PEEK(53770):NEX
T M:SOUND 0,0,0,0:POKE 710,116
902 W=W+(H-INT((PEEK(20)+256*PEEK(19)
)/60)):H=H-5:IF H=5 THEN H=60
904 U=1:O=O+1:GOTO 814
999 GOTO 999

```

ATARI 400/800 USERS

HOW TO SURVIVE A BOMBING.



If you have irreplaceable programs on executable disks, you need to protect your investment with a back-up. Not only against the common elements that can ruin your programs, but also against unforeseen and unusual dangers...like a spilled drink or an overly zealous puppy.

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All in all, the easy-to-use and easy-to-install (you just pop it in) Happy 810 Enhancement Kit, with optional Compactor (loading up to 4-6 programs per disk) is the ideal safeguard for Atari 810 users. So pick one up at your local computer store or call us directly for more information.

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First Math

Steve Hamilton

This math game for children features graphics, color, and sound. In addition to displaying the correct answer after a child has entered an incorrect one, there's a small fanfare for ten consecutive correct answers. Versions for VIC, 64, TI, Radio Shack Color Computer, and Apple.

I was introduced to home computing last May when I bought the VIC-20. I got one partly for my two boys, so they would grow up with some knowledge about a computer. Since the older boy was just approaching kindergarten, I thought it would be at least a year or so before he would be ready to operate the VIC. He was ready long before I had anticipated.

The following is a simple math exercise that I developed for him. In this program, the user is given a choice of exercises: addition, subtraction, multiplication or division. Then, a choice of upper and lower limits is specified for each of the two numbers in each question. Since the computer will generate random numbers, the parameters you choose will become the limits for each number pair. This is how you can adjust the difficulty level.

BEFORE TYPING...

If you're new to computing, please read "How To Type COMPUTE!'s Programs" and "A Beginner's Guide To Typing In Programs."

Program 1: First Math – VIC Version

```
10 POKE36879,111:PRINT"{CLR}{RVS}
  {9 DOWN}{CYN}{6 RIGHT}FIRST MATH":FOR
  I=1TO2000:NEXTI:D=0
30 PRINT"{CLR}{4 DOWN}TO ADD :TYPE +"
50 PRINT"{DOWN}TO SUBTRACT :TYPE -"
70 PRINT"{DOWN}TO MULTIPLY :TYPE *":PRIN
```

```
T"{DOWN}TO DIVIDE :TYPE /":PRINT"
  {3 DOWN}YOUR CHOICE=?{2 SPACES}";
83 GETA$:IFA$<>CHR$(42)ANDA$<>CHR$(43)AN
  DA$<>CHR$(45)ANDA$<>CHR$(47) OR A$=""
  THEN83
84 PRINT"{LEFT}"A$:INPUT"{DOWN}HIGHEST N
  UMBER";UL:INPUT"{DOWN}LOWEST NUMBER";
  R1
90 R=UL+1-R1
95 C=INT(RND(1)*R)+R1:B=INT(RND(1)*R)+R1
100 IFA$=CHR$(43)THENDEF FNA(X)=B+C
110 IFA$=CHR$(45)THEN DEF FNA(X)=B-C
120 IFA$=CHR$(42)THEN DEF FNA(X)=B*C
125 IFA$=CHR$(47)ANDC=0 THEN 95
130 IFA$=CHR$(47)ANDINT(B/C)<>B/C THEN95
135 IFA$=CHR$(47) THEN DEFFNA(X)=B/C
140 PRINT"{CLR}{2 SPACES}NO. OF ANSWERS"
150 PRINT"CORRECT IN A ROW="D:IF D=10 TH
  EN 295
180 E=FNA(X):PRINT:PRINT B;A$;C;"=";:INP
  UTF:IFF<>ETHEN 250
210 PRINT"{7 RIGHT}{3 DOWN}CORRECT"
211 POKE7931,46:POKE7932,46:POKE7975,74:
  POKE7976,75
212 POKE38651,7:POKE38652,7:POKE38695,7:
  POKE38696,7
219 FORT=1TO1000:NEXTT:D=D+1:IFD=10 THEN
  PRINT"{BLK}":GOTO 140
240 GOTO95
250 PRINT"{DOWN} THAT IS NOT CORRECT"
260 PRINTB;A$;C;"=";E
261 POKE7931,46:POKE7932,46:POKE7975,85:
  POKE7976,73
262 POKE38651,7:POKE38652,7:POKE38695,7:
  POKE38696,7
270 FORT=1TO3500:NEXTD=D=0:GOTO 140
295 POKE7931,46:POKE7932,46:POKE7975,74:
  POKE7976,75
296 POKE38651,1:POKE38652,1:POKE38695,1:
  POKE38696,1
299 POKE36878,15:FORT=255TO128STEP-1
301 POKE36879,T:POKE36876,T
304 FORT1=1TO5:NEXTT1:NEXTT:FORT=128TO25
  5
309 POKE36879,T:POKE36876,T
312 FORT1=1TO5:NEXTT1:NEXTT
323 POKE36878,0:POKE36879,27
325 PRINT"{4 DOWN}{RIGHT}PLAY AGAIN (
  {RVS}Y{OFF}/{RVS}N{OFF}) ? ";
327 GET A$:IF A$="" THEN 327
328 IF A$="Y" THEN 10
330 PRINT"{CLR}{BLU}":END
```

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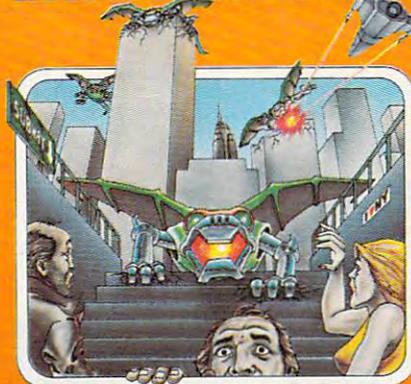
Joystick controller required.

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A GAME ON CARTRIDGE FOR THE COMMODORE 64™

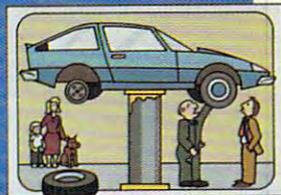
SAVE NEW YORK



Joystick controller required.

CAR COSTS

A HOME APPLICATION PROGRAM



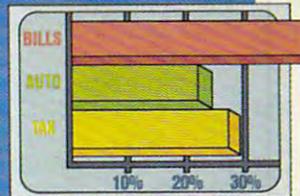
LOAN ANALYZER

A HOME APPLICATION PROGRAM



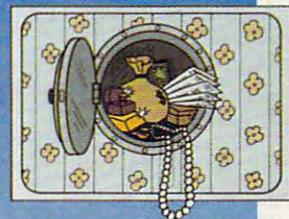
HOUSEHOLD FINANCE

A HOME APPLICATION PROGRAM



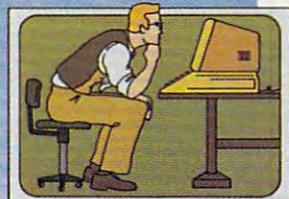
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DECISION MAKER

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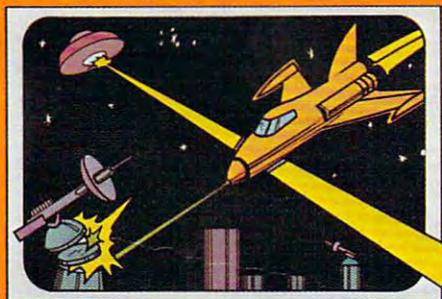


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ASTROBLITZ

A GAME ON CARTRIDGE FOR THE COMMODORE 64™



Joystick controller required.

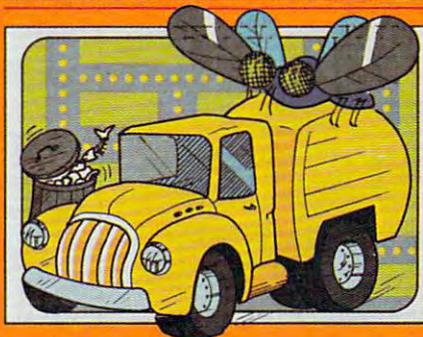
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A GAME ON CARTRIDGE FOR THE COMMODORE 64™



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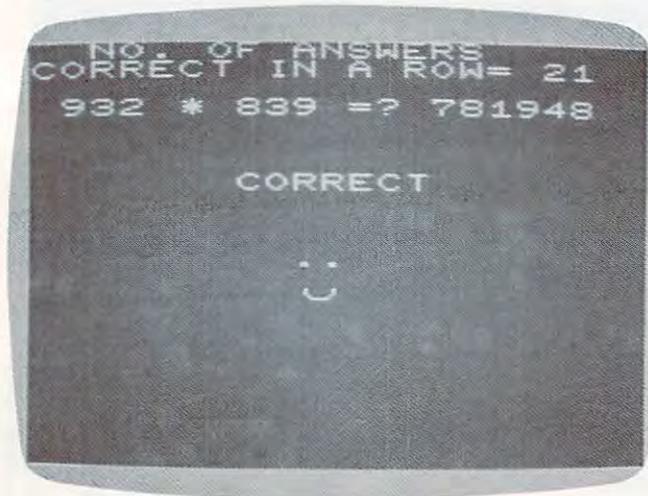
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You get a happy face for a correct response in "First Math" - VIC version.

Program 2: First Math - 64 Version

```

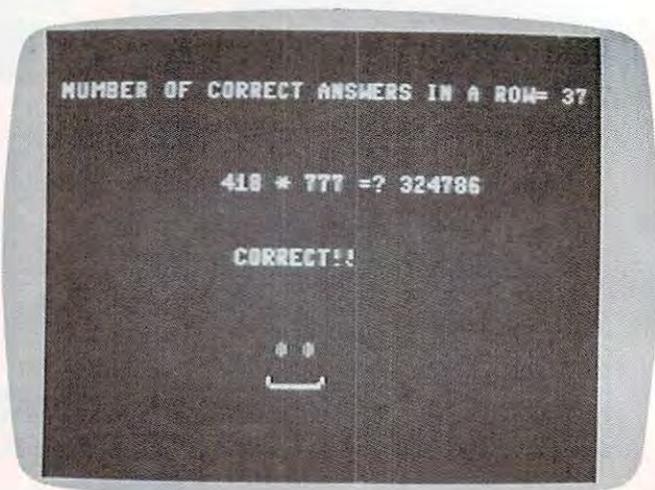
5 GOTO 10
6 POKE 1720,81:POKE1722,81:POKE1799,74:P
  OKE1800,67:POKE1801,67
7 POKE 1802,67:POKE 1803,75
8 POKE55992,4:POKE55994,4:POKE56071,7:PO
  KE56072,7:POKE 56073,7:POKE 56074,7
9 POKE 56075,7:RETURN
10 POKE53280,7:POKE53281,6:PRINT"{CLR}
  {RVS}{9 DOWN}{CYN}{10 RIGHT}F I R S T
  {3 SPACES}M A T H":D=0
20 FOR I=1 TO 2000:NEXT I
30 PRINT"{CLR}{4 DOWN}{3 RIGHT}IF YOU WA
  NT TO ADD, TYPE +"
50 PRINT"{DOWN}{3 RIGHT}IF YOU WANT TO S
  UBTRACT, TYPE -"
70 PRINT"{DOWN}{3 RIGHT}IF YOU WANT TO M
  ULTIPLY, TYPE *"
72 PRINT"{DOWN}{3 RIGHT}IF YOU WANT TO D
  IVIDE, TYPE /"
75 PRINT"{3 DOWN}{3 RIGHT}YOUR CHOICE=?
  {2 SPACES}";
83 GETA$:IFA$=""THEN83
84 IF A$<>CHR$(42)AND A$<>CHR$(43)AND A$<>
  CHR$(45)AND A$<>CHR$(47)THEN83
85 PRINT"{LEFT}"A$:INPUT"{2 DOWN}
  {3 RIGHT}HIGHEST NUMBER";UL:INPUT"
  {DOWN}{3 RIGHT}LOWEST NUMBER";R1
90 R=UL+1-R1
95 C=INT(RND(1)*R)+R1:B=INT(RND(1)*R)+R1
100 IFA$=CHR$(43)THENDEF FNA(X)=B+C
110 IFA$=CHR$(45)THEN DEF FNA(X)=B-C
120 IFA$=CHR$(42)THEN DEF FNA(X)=B*C
125 IF A$=CHR$(47) AND C=0 THEN 95
130 IF A$=CHR$(47) AND INT(B/C)<>B/C THE
  N 95
135 IF A$=CHR$(47) THEN DEF FNA(X)=B/C
140 PRINT"{CLR}{3 DOWN} NUMBER OF CORREC
  T ANSWERS IN A ROW="D:IF D=10 THEN 2
  95
180 E=FNA(X):PRINT:PRINT"{3 DOWN}
  {11 RIGHT}";B;A$;C;"=";:INPUTF:IFF<>
  ETHEN 250
210 PRINT"{13 RIGHT}{3 DOWN}CORRECT!!"
211 GOSUB 6

```

```

219 FORT=1TO1000:NEXTT:D=D+1:IFD=10 THEN
  PRINT"{BLK}":GOTO 140
240 GOTO95
250 PRINT"{DOWN}{5 RIGHT}...THAT IS NOT
  CORRECT"
260 PRINT"{11 RIGHT}{DOWN}";B;A$;C;"=";E
261 POKE1720,81:POKE1722,81:POKE1799,85:
  POKE 1800,67:POKE1801,67
263 POKE 1802,67:POKE 1803,73
265 POKE55992,4:POKE55994,4:POKE56071,7:
  POKE56072,7:POKE 56073,7:POKE 56074,
  7
267 POKE 56075,7
270 FORT=1TO3500:NEXTD:D=0:GOTO 140
295 GOSUB 6:POKE 54276,17:POKE 54277,30:
  POKE 54278,200:POKE 54296,15
299 POKE 54272,220:FORT=120 TO 1 STEP-1
301 POKE 54273,T:POKE 53281,T
304 FORT1=1TO5:NEXTT1:NEXTT:FORT=1 TO120
309 POKE54273,T:POKE53280,T
312 FORT1=1TO5:NEXTT1:NEXTT
323 POKE54276,0:POKE54273,0:POKE54272,0:
325 PRINT"{6 DOWN}{8 RIGHT}PLAY AGAIN (
  {RVS}Y{OFF}/{RVS}N{OFF} ) ? ";
327 GET A$:IF A$="" THEN 327
328 IF A$="Y" THEN 10
330 SYS 2048:END

```



64 version.

Program 3: First Math - TI-99/4A Version

```

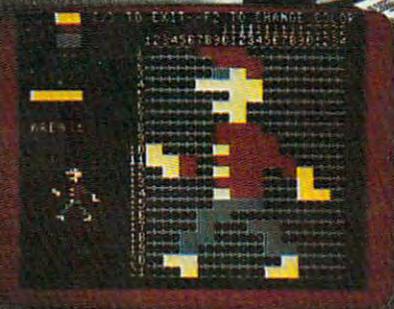
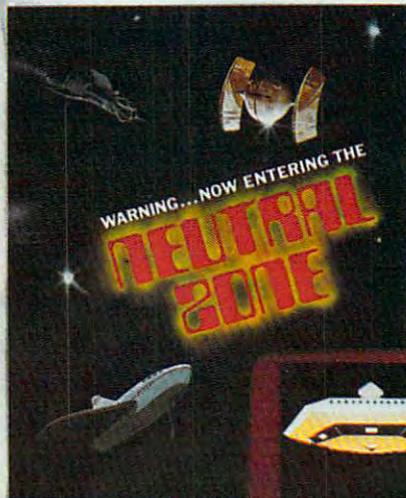
100 GOTO 330
110 REM MISTAKE IN INPUT
120 CALL HCHAR(6,18,32,10)
130 GOTO 950
140 FOR I=1 TO LEN(H$)
150 V=ASC(SEG$(H$,I,1))
160 CALL HCHAR(ROW,COL+I,V)
170 NEXT I
180 RETURN
190 ROW=14
200 COL=4
210 H$=CHR$(128)&CHR$(129)&CHR$(130)
  &CHR$(142)
220 GOSUB 140
230 ROW=15
240 H$=CHR$(131)&CHR$(132)&CHR$(133)
  &CHR$(141)&CHR$(143)
250 GOSUB 140

```

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```

260 ROW=16
270 IF CORRECT=0 THEN 300
280 H$=CHR$(134)&CHR$(135)&CHR$(136
)&CHR$(140)
290 GOTO 310
300 H$=CHR$(137)&CHR$(138)&CHR$(139
)&CHR$(140)
310 GOSUB 140
320 RETURN
330 RANDOMIZE
340 GOSUB 1560
350 CALL CLEAR
360 FOR J=5 TO 8
370 CALL COLOR(J,16,5)
380 NEXT J
390 CALL SCREEN(4)
400 PRINT TAB(4);"F I R S T
(4 SPACES)M A T H": : : : : :
: : : :
410 CALL SOUND(500,262,2,330,2,392,
2)
420 CALL SOUND(500,262,2,349,2,440,
2)
430 CALL SOUND(500,262,2,330,2,392,
2)
440 CALL SOUND(500,247,2,349,2,392,
2)
450 CALL SOUND(800,262,2,330,2,392,
2)
460 FOR I=1 TO 300
470 NEXT I
480 CALL CLEAR
490 D=0
500 CALL SCREEN(12)
510 PRINT "TO ADD{12 SPACES}:TYPE +"
: :
520 PRINT "TO SUBTRACT{7 SPACES}:TY
PE -": :
530 PRINT "TO MULTIPLY{7 SPACES}:TY
PE x": :
540 PRINT "TO DIVIDE{9 SPACES}:TYPE
/": : :TAB(6);"YOUR CHOICE ? "
;
550 CALL KEY(0,A,ST)
560 IF (A<>43)*(A<>88)*(A<>45)*(A<>
47)THEN 550
570 IF A<>88 THEN 590
580 A=120
590 PRINT CHR$(A): : : : : :
600 INPUT "HIGHEST NUMBER ? ":UL
610 PRINT
620 PRINT
630 INPUT "LOWEST NUMBER ? ":LL
640 R=UL+1-LL
650 C=INT(RND*R)+LL
660 B=INT(RND*R)+LL
670 IF (A=120)+(A=45)+(A=47)THEN 70
0
680 F=B+C
690 GOTO 790
700 IF (A=120)+(A=47)THEN 730
710 F=B-C
720 GOTO 790
730 IF A=120 THEN 780
740 IF C=0 THEN 650
750 IF INT(B/C)<>B/C THEN 650
760 F=B/C
770 GOTO 790
780 F=B*C
790 CALL CLEAR

```



TI happy face for correct response.

```

800 CALL SCREEN(10)
810 ROW=3
820 COL=2
830 H$="CORRECT ANSWERS IN A ROW ="
840 GOSUB 140
850 COL=29
860 H$=STR$(D)
870 GOSUB 140
880 FOR I=1 TO 50
890 NEXT I
900 IF D=10 THEN 1390
910 ROW=6
920 COL=6
930 H$=STR$(B)&CHR$(A)&STR$(C)&CHR$
(61)&CHR$(63)
940 GOSUB 140
950 H$=""
960 C$=""
970 K=0
980 CALL KEY(0,E,ST)
990 IF ST=0 THEN 980
1000 IF E=13 THEN 1090
1010 IF ((E<48)+(E>57))*(E<>45)THEN
110
1020 H$=CHR$(E)
1030 C$=C$&H$
1040 ROW=6
1050 K=K+1
1060 COL=18+K
1070 GOSUB 140
1080 GOTO 980
1090 E=VAL(C$)
1100 IF E<>F THEN 1230
1110 CORRECT=1
1120 GOSUB 190
1130 COL=11
1140 ROW=15
1150 H$="C O R R E C T ! !"
1160 GOSUB 140
1170 FOR I=1 TO 200
1180 NEXT I
1190 REM SMILE
1200 D=D+1
1210 IF D=10 THEN 790
1220 GOTO 650
1230 REM INCORRECT
1240 CORRECT=0

```

