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$2.95
March
1984
Issue 46
Vol. 6, No. 3
£2.25 UK $3.25 Canada
02193
ISSN 0194-347X

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March 1984 Vol. 6, No. 3

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NOTE: See page 180 before typing in programs.

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AP Apple **AT** Atari, **P** PET/CBM, **V** VIC-20, **C** Radio Shack Color Computer, **64** Commodore 64, **TS** Timex/Sinclair, **TI** Texas Instruments, **PCjr** IBM PCjr, **PC** IBM PC, **AD** Coleco Adam, *All or several of the above.

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COMPUTE! The Journal for Progressive Computing (USPS: 537250) is published monthly by COMPUTE! Publications, Inc., P.O. Box 5406, Greensboro, NC 27403 USA. Phone: (919) 275-9809. Editorial Offices are located at 324 West Wendover Avenue, Greensboro, NC 27408. Domestic Subscriptions: 12 issues, $24. Send subscription orders or change of address (P.O. form 3579) to **COMPUTE!** Magazine, P.O. Box 914, Farmingdale, NY 11737. Second class postage paid at Greensboro, NC 27403 and additional mailing offices.

ISSN 0194-357X.

EDITOR'S NOTES

In a surprise announcement, Commodore President and Chief Executive Officer Jack Tramiel resigned on Friday, January 13. Tramiel's reported replacement, Marshall F. Smith, is expected to assume his duties in late February. Smith is currently president and chief executive officer of the U.S. unit of a Netherlands-based company, Thyssen-Bornemisza. To Commodore, Smith brings a track record of experience in major manufacturing operations and finance. His U.S. operation had 1982 sales approaching $1 billion. Smith does not have computer industry experience—it had been anticipated that Commodore Chairman Irving Gould would stress other variables in his selection.

The end of an era? Tramiel's resignation was met with surprise and some consternation within Commodore. His direct, aggressive style has been a critical factor in driving Commodore to its position of preeminence in the low-priced personal computer market. Tramiel was quoted as saying the company needed a "professional executive" to head it, given that the company has now reached the billion dollar sales mark.

What price stability? Commodore has had a series of senior management turnovers during the years of its growth as a personal computer manufacturer. All have been subordinate to Tramiel, and most who were brought in at the level of president had short-lived tenures. Tramiel's aggressive, active intervention in most facets of the company's operations and planning caused some internal conflict, visible externally in the high turnover.

Growth of the sort that Commodore has experienced can be damaging to a poorly run company, yet Commodore weathered its growth well, given that its annualized sales have increased by a factor of roughly 25 times in the last six or seven years. At the same time, Commodore has experienced some hardware problems, the most recent example centering around last fall's delays and disputed defects in the company's 1541 disk drive. Mr. Smith will bring to this situation experience in multisite manufacturing operations, and seasoned talent as the head of a company of roughly comparable revenues.

Tramiel, perhaps not considering himself a "professional executive," did run the company with a ruthless understanding of the marketplace. The year of the computer (1983) in many ways became the year of Commodore in the low-end market, as Tramiel's aggressive product introduction and pricing forced Texas Instruments out of the market and, at least temporarily, damaged Atari's position.

While we can now anticipate more internal stability at Commodore, and perhaps streamlined manufacturing operations, our concern will be the impact of Tramiel's absence on the company's aggressive stance. We've already heard rumors of a push to increase prices. Depending on the extent of such increases, Commodore might well find itself moving away from a market it opened up, and eventually trading market share to competition from overseas. Time will, of course, tell. We wish Mr. Tramiel well, and thanks for those 25 years of Commodore. And we welcome Mr. Smith, who's taking on a two-fisted job.

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COMPUTE!'s GAZETTE
for VIC 20, Atari, Commodore 64 Personal Computers
COMPUTE! Books

Corporate office:
324 West Wendover Avenue
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Mailing address: COMPUTE!
Post Office Box 5406
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Subscription Orders

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COMPUTE! Subscription Rates (12 Issue Year):

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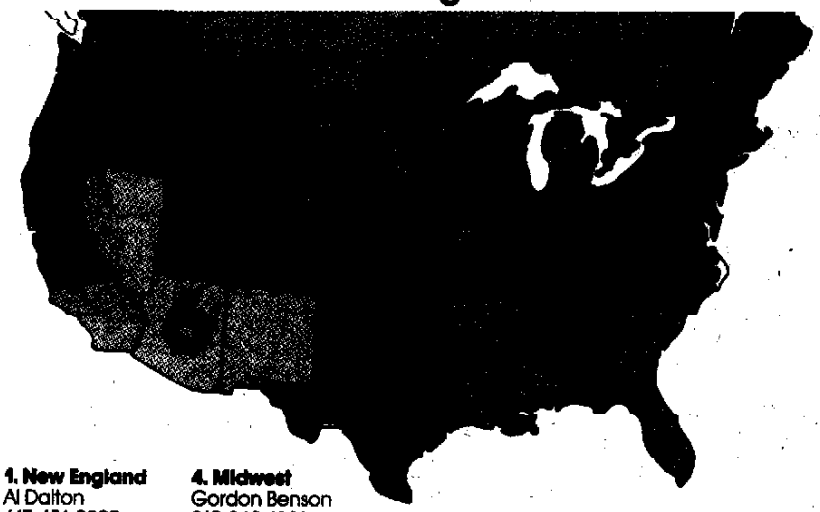

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READERS' FEEDBACK

The Editors and Readers of COMPUTE!

Can Your Computer Tattoo A TV?

I am considering purchasing a VIC or 64, and I plan to use the family TV with the computer. Do the images from a computer damage a TV by leaving imprints on the screen?

Timothy J. Prusinski

The problem you are describing is known as image burn-in. *It usually affects a video unit on which the same message is displayed continuously in the same place on the screen. This practice causes uneven wear in the screen's phosphor coating, which eventually results in the message being visible on the screen even when the unit is turned off. Using your TV with a computer will not cause image burn-in, unless you leave your computer on and continually display the same pattern on your TV for a very long time—several days, at least.*

Easy Memory For The 64?

I recently purchased a 64, and discovered that only about 38K of BASIC RAM are available for my use. I have found a POKE that increases it by 5888 bytes. After turning your 64 off, then on, try the following:

```
PRINT FRE(0)
POKE 56, 137
PRINT FRE(0)
```

After entering these commands in the direct mode, the first result was –26627. After the POKE, the result was –32515, a difference of 5888 bytes.

My question is, why does it do this? Does it have any harmful side effects?

Jeff Lewis

The memory location you POKEd (byte 56) is one of two bytes (55 and 56) that tell the operating system the highest address used by BASIC.

*As you discovered, these locations can be POKEd with new values. By POKEing location 56, you told the 64's operating system that the top of BASIC memory had been changed. The normal values for 55 and 56 are 0 and 160 respectively, signaling that the top of BASIC memory is 40960 (0+256*160). If you POKEd a value higher than 160 into location 56, you would be telling the computer it has more memory than it actually does.*

When you POKEd 56 with a value of 137, you actually lowered the top of BASIC memory, which decreased the amount of RAM available for use. This is a legal POKE, and might be used, for example, if you wanted to protect a machine language program in high memory.

This won't damage your computer. To reset the pointers to normal, simply turn your 64 off, then back on. However, POKEing values into the memory pointers can cause strange RUNs if you're using a BASIC program.

TI-99/4A And COMPUTE!

I would like to know if you will still be writing games and other programs for the TI-99/4A, even though Texas Instruments has discontinued production.

Curtis Tsui

We'll continue to support the TI-99/4A.

Mysterious Commodore SYS

Our users group, Richmond Area Commodore Enthusiasts, would like to find out all about the SYStem commands. We know that SYS 64802 will cold start the VIC. Is there any publication, book, or article that has a list of all the SYS commands? Our computer manuals give the definition of the SYS command, but other than a few examples, offers nothing further.

E. M. Rexrode

The SYS command is used to transfer control from a BASIC program to a machine language program. The format for the SYS command is SYS NNNNN, *where* NNNNN *is any memory location. The computer will start executing the machine language at the address specified by NNNNN.*

SYS is user-controlled. That is, in the VIC and the 64, you can SYS to any memory location between 1 and 65535. The memory location can be the start of a machine language program in user RAM, or an ML routine within BASIC or Kernal ROM. The SYS command is not a prewritten package of routines.

There is only one SYS command, but it can access many routines within the computer (such as "cold start," which simulates turning the computer on). To learn these addresses you need a map of your computer's memory. These maps are found in various COMPUTE! Books such as COMPUTE!'s First Book of VIC,


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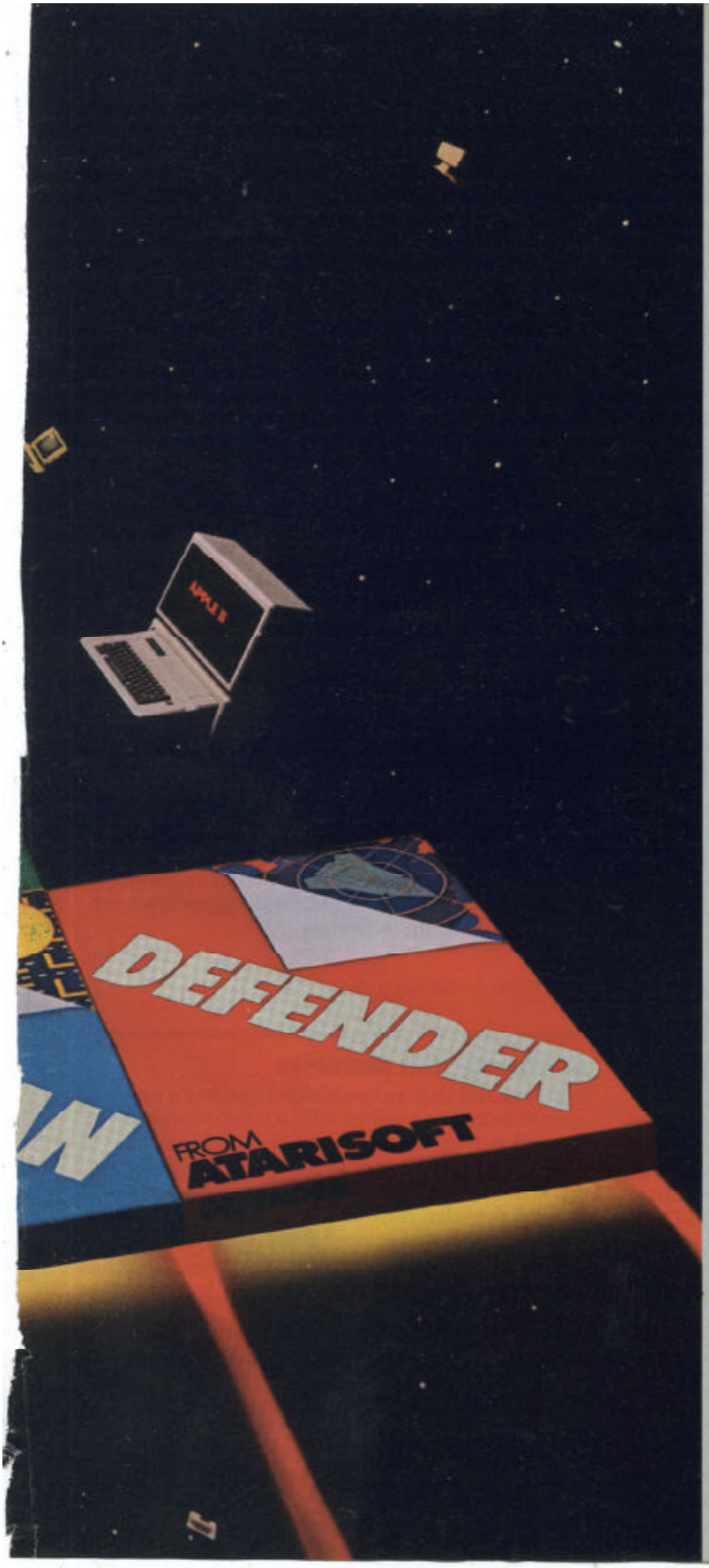

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Modern Memory: The Future Of Storage Devices

Selby Bateman, Assistant Editor, Features

Big business is already using microfloppies, Winchester discs, and laser technology for data storage. As some of these innovations filter down to the home computer market, your tape recorder could become as obsolete as a paper tape punch.

Linda Helgerson was up to her ears in floppy discs. Something had to be done. Three or four hundred of the 5¼-inch discs were stored in her home—row upon row of mailing lists, bibliographical data, and spreadsheet analyses.

"I just didn't have enough storage. My mailing list itself was on five floppies that had to be merged," says Helgerson. "There's just no way I could manage that amount of data using floppies."

After a careful study of her needs, she purchased a 10-megabyte hard disc drive. The result has been dramatic. Since she put her mailing list on the hard disc system, she has added another 6000 names, and there's still plenty of room to spare.

Mass Storage Isn't For Everyone

As head of her own northern Virginia consulting company, which is run out of her home, Helgerson admittedly has extraordinary storage needs. The two TRS-80 Model 3 computers which serve her business, Quarry Hill, Inc., also double as teaching tools, game machines, and word processors for her two teenage daughters.

Helgerson is one of a growing minority of personal computer users who are finding that their needs are not met by minifloppy disc or cassette tape storage systems. Newer, faster, larger-capacity storage devices aren't yet available for home computer users. But industry observers are seeing the first real stirrings of interest in those products among the more adventurous home computer owners.

Whether you need a different storage system now or not, it's worth knowing about *perpendicular recording*, *microfloppy discs*, *interactive videodiscs*, and *Winchester disc drives*. They'll be increasingly important to future home computing.

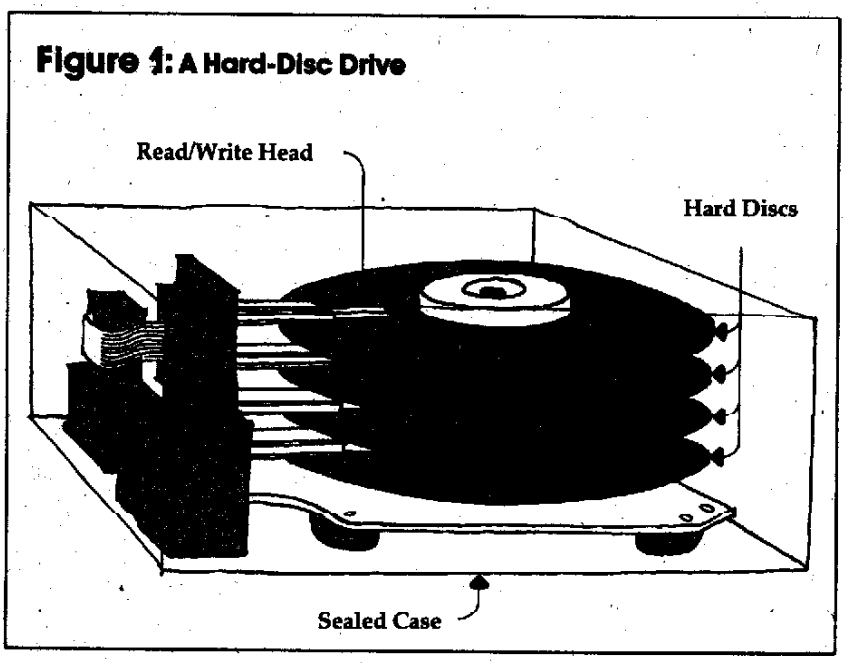
First, The Bad News

For those who have mass storage needs like Linda Helgerson's or who are dedicated computer hackers itching to use the latest technological innovations, there is some bad news and some good news.

The bad news, says Jim Porter, editor of the respected annual market study *Disk/Trend Report*, is that advances like microfloppy discs and inexpensive hard discs for the home market are at best several years away. And even then, Porter is doubtful there will be a large enough body of computer users who will want the products.

The good news, he adds, is that somebody

Figure 1: A Hard-Disc Drive



somewhere is probably working right now on the product you want. "I really think in the small computer area almost every whim will be responded to. And if something has a following there, then the response will be fairly prompt. I've seen it over and over again. It's hard to see how any niche will not be checked out."

Before we look at some of the most important trends in storage, consider where 99 percent of us are today.

Tape Or Disc Most Common

Virtually all home computer users now have either a tape drive system or a floppy disc drive. Both of these devices use a magnetic coating that records the electronic signal from a computer. When you tell the computer to store something on either tape or disc, it writes on the magnetic medium by magnetizing small areas in a form of binary notation, magnetic ones and zeros. Once these areas are magnetized, they have a self-locking mechanism which preserves the integrity of the stored information.

As computer owners quickly find out, a tape recorder is the least expensive memory storage device. But what you save in money you pay for in time. In order to find something, the tape must physically pass in front of the stationary read-write head so the recorder can check each byte of data, in a sequential search.

Computer users did not relish waiting while the tape drive did its work, and that led to the introduction of disc drives for home use.

First developed by IBM in 1965 in an 8-inch format, then adapted by Shugart in 1976 to the familiar 5¼-inch size, floppy discs have quickly become the medium of choice for microcomputer data storage. The floppy disc (or diskette) is a random access device, in which both the read/write head and the disc move. In its protective paper sleeve, the disc is inserted into a disc drive, where it spins at about 300 revolutions per minute while the head seeks out the requested information anywhere on the surface of the disc.

Hard Choices

A typical 5¼-inch minifloppy disc might contain as much as 350–400K (kilobytes, or 358,400–409,600 characters) if the tracks on which information is stored are on both sides of the disc and densely packed. Many 5¼-inch discs are single-sided, single-density, and hold about half that much.

Compare that to the hard disc drive, often called a Winchester drive, which Linda Helgerson purchased. Storage capacity for that drive is 10Mb (10 megabytes, more than 10 million characters) of data.

Hard disc drives cost more (Helgerson's was close to $2000) and have been used almost exclusively in business settings, where large quantities of information must be stored and retrieved quickly. As their name implies, hard discs are rigid. They are made of aluminum (also in 8-inch and 5¼-inch sizes) and are permanently sealed inside a case. Although some hard discs can be removed from the drive, most cannot. The hard disc spins at faster speeds (usually 3600 rpm) than a floppy, and the read/write head actually floats just above the disc rather than directly contacting it as with floppies. Hard discs also have faster access times.

More Interest Than Need

Why not use a hard disc for your home computer?

"We've had more than just casual inquiries about hard discs for the Atari 800," says Bob Gerwer, vice president of marketing for Percom Data of Dallas, Texas. "The people who originally bought the 800 were genuine hackers. And the ones who bought it for four or five hundred bucks have got a lot invested in it. Now, some of those people are interested in hard discs."

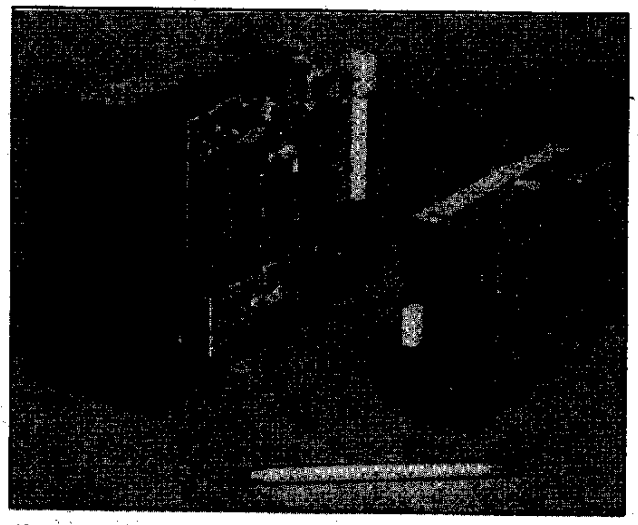
Kevin Burr, director of communications for Shugart, a company that has been a leader in the original equipment manufacturing (OEM) industry, reports that his organization has also seen some limited interest in hard disc drives for the home market.

"But it's not a dramatic increase of interest,"

he cautions. "A home user typically does not need that kind of capacity. I think it's more of a novelty rather than a strong need from those users."

Hard Discs More Delicate

At the Tandon Corporation, which during 1983 reportedly had about a 60 percent market share of the $4.3 million 5¼-inch floppy disc drive industry, marketing manager Bob Abraham concurs with Burr about the immediate future of hard discs in the home.



Shugart's 3½-inch SA300 (right) is a single-sided microfloppy drive offering 500K bytes of capacity. It is compatible with the standard 5¼-inch minifloppy disc drives.

"The hard disc just doesn't lend itself to the home environment. I think the industry as a whole has to learn and to educate the user about the care and feeding and handling of hard disc systems. It's really a very different ball game."

One of the problems with a hard disc system for home use is that since the head floats just above the disc, it jars easily and is susceptible to crashes. When a floating head is only .0001 of an inch from a disc, a human hair takes on the dimensions of a felled sequoia. Even a puff of smoke could cause a head crash.

"I guess I would have to say that in the long term, there will be ruggedness built-in. The drives will be well-protected and shock-mounted," says Abraham. "And to a large extent, there will be a greater degree of user education. People will just learn that they'll have to be a little more careful with those kinds of things."

Microfloppies For The Home

While industry observers are less than optimistic about the future of hard discs in the home, that is not the case for the microfloppy disc.

"There's a great deal of movement in the industry toward smaller devices that won't sacrifice performance," says Tandon's Abraham.

Adds Shugart's Kevin Burr, "The home market is going to be the key audience for the microfloppy. That's why it was developed."

Microfloppies, floppy discs either 3, 3¼, or 3½ inches in diameter, have been a hotly debated topic in the microcomputer industry for several years. Disagreements center not on whether microfloppies are a good idea, but on what size should be standard. The question is still open, but the 3½-inch microdisc appears to have an edge.

A Standard Is Emerging

"We feel the standard has now been reached, particularly with the recent signing of Apple and Gavilan in a 3½-inch format," says Burr. "And IBM is rumored to be following suit.

"It is probably already the de facto standard in terms of volume and production. Shugart and Sony are the only two manufacturers currently shipping products in volume. We have a lot more products out there than anybody else."

By the end of 1983, Shugart alone expects to have shipped about 10,000 microfloppy products.

Several Advantages

There are several reasons why microdiscs are attractive for home computer data storage. Because of the ability to pack data magnetically in a more compact area, microfloppies can already equal the storage capacities of 5¼-inch or even 8-inch discs. They are less susceptible to temperature and humidity changes and, when packaged in hard plastic-and-metal casings, are less prone to damage. They are particularly suited for use in portable computers where space is at a premium.

While the question of a standard size and available software for the microdiscs may hold back development slightly, there is every indication that microdiscs are on the way to the home. But how soon?

"There will be only a gradual build-up in the total number of microfloppies shipped," cautions industry analyst Jim Porter. "And as for their use with the home computer, for the next several years microfloppy drives are not likely to be lower in cost than equivalent quantities of minifloppy drives."

Vertical Recording Devices

Advances in magnetic media technology will also help to prepare the way for microfloppies. One of the most promising new developments is in perpendicular, or vertical, recording.

Significant increases in storage capacity can be achieved by aligning the magnetic particles on a disc in a vertical pattern rather than in the longitudinal arrangement presently used. While

proponents of vertical recording maintain that products will be on the market within the next year, how soon can owners of home computers expect to find them in stores?

"You're not likely to see perpendicular recording used in products in the home for quite a while," says Jim Porter. "It's probable that flexible disc drives using perpendicular recordings will be shipped by early 1985 in limited quantities. But they'll be the furthest thing from mainstream. There will not be many producers, and the technology is likely to be fussy for quite a while. It probably will end up mainstream, but I think you should be thinking in terms of the end of the decade."

One of the leaders in vertical recording is the Minnesota-based firm, Vertimag Systems. Later this year, the company plans to market a vertical recording system with over six and a half megabytes per 5¼-inch disc. "We're just at the beginning of this technology," says a Vertimag spokesperson. "Just imagine what it will be five or ten years from now."

Although there are very few American companies in the perpendicular recording field, the Toshiba Corporation of Japan is expected to market a vertical recording system, probably sometime in 1985.

An Interactive Dragon On Videodisc

Last year while on a trip, Kent Wood, who directs the Videodisc Innovations Project at Utah State University, glanced into a videogame arcade and saw most of the machines deserted. Around one of the consoles, however, stood a crowd of people watching a new game called *Dragon's Lair*. With color video quality far superior to the surrounding games, *Dragon's Lair* offered 38 short action-adventure scenes with a total of 200 different decisions confronting the player before victory could be achieved.

The crowd around the machine that day didn't surprise Wood. The colorful animated game is based on a Pioneer PR-7820 interactive videodisc system. About 14 minutes of the 30-minute capacity of *Dragon's Lair* is interactive. That is, decisions that a player makes cause the laser beam that reads data off the disc to jump to different positions on the disc itself.

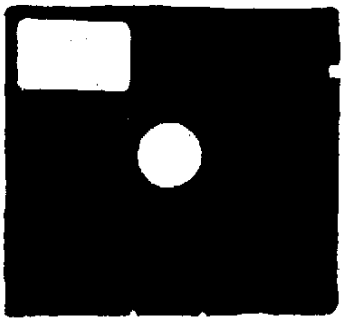
Wood doesn't believe he saw just a crowd around a game machine that day. He believes he saw the future. The next step will be low-cost videodisc systems that will be brought into homes as peripherals for personal computers as well as part of overall home information and entertainment centers.

But first, he says, people must have a greater understanding of the possibilities.

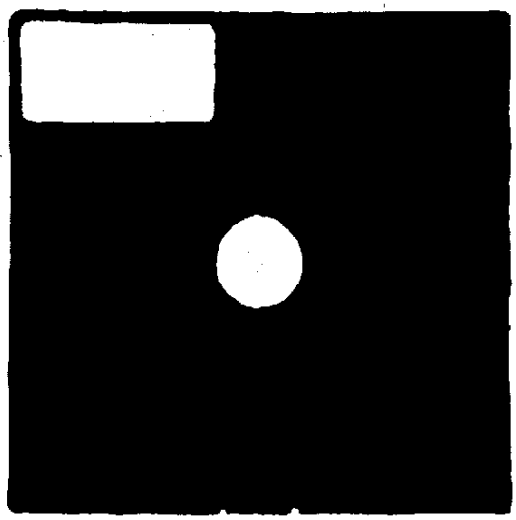
"As the level of sophistication increases in the home market about the potential of interactive video, it will overcome the people limitation. When we compare 1984 with what we had when we started in 1977 and 1978, the technology has advanced remarkably. And it will continue, though not quite as fast."

Figure 2: Common Disc Types

3½-Inch Microdisc



5¼-Inch Floppy Disc



8 Inch Floppy Disc

Reading The Pits

One of the most promising forms of videodisc technology is optical recording. A laser writes on the disc by burning tiny pits into the surface. A second laser then reads the pits. No head comes in contact with the disc, so wear is reduced. And videodiscs can hold immense amounts of information, say, 4000 megabytes (4 gigabytes, more than 4 billion bytes). An entire set of encyclopedias can be put on a videodisc.

But to be truly interactive, a videodisc must be able to withstand repeated rewritings, just as magnetic disks do. In burning a pit into the surface of a videodisc, however, the laser eats away some of the material.

Magneto-opticals is one of the possible solutions.

Erasing With A Laser

In magneto-opticals, the laser is used to heat a special coating until it reaches the Curie point (named for Madame Curie), the temperature at which magnetic materials revert to a neutral magnetic orientation. Information is added or erased in this manner. A second, weaker laser, using a polarized filter, then reads the materials. Wedding the laser to magnetic media in this way means vastly reduced wear on the videodisc and allows repeated rewritings.

"It's a strange kind of marriage between optical technology and magnetic technology," says Porter. "Many companies have been working in the area, such as IBM, Phillips, Xerox, and several Japanese companies."

While magneto-opticals and another laser-writing experiment called *phase-change* have been demonstrated in the laboratory, Porter says there are quite a few difficulties in making them producible. Commercial products using either technology are at least several years away.

Videodisc For The Commodore 64

Videodisc systems are being used on a growing basis with computers for job training, education, and data base archives. There are a number of compatible systems currently being marketed, but they can be expensive.

For owners of Commodore 64 computers who want to go interactive, Micro-Ed, Incorporated of Minnesota offers a product called Lasersoft, an interactive videodisc microcomputer instructional system aimed at the low-end market.

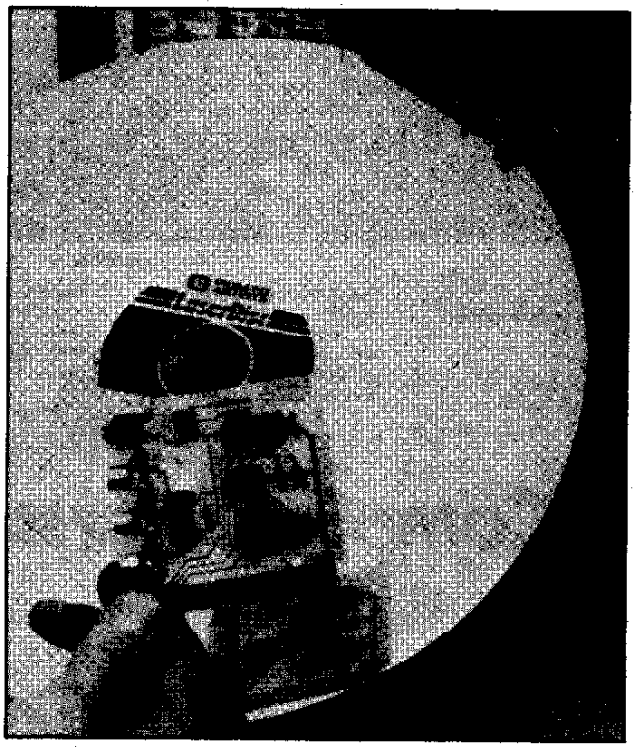
The system is designed to work with a Commodore 64 with 1541 disc drive, a color monitor, Pioneer 8210 videodisc player, and the Micro-Ed controller box, which links the computer and the videodisc player. The company plans to make the controller box available for other computers as well.

Marketed at under $200, the controller box enables the computer to access at random any of the thousands of frames on the videodisc and present them on the monitor. (Micro-Ed, Incorporated, P.O. Box 444005, Eden Prairie, MN 55344, (612) 944-8750.)

LaserDisc Interface For Apple

Another company, Anthro-Digital, Inc., offers a $275 Omniscan LaserDisc interface which connects an Apple computer to a Pioneer, Sylvania, or Magnavox LaserDisc. Omniscan allows the computer to duplicate the functions of the videodisc control panel, but under programmed control. (Anthro-Digital, Inc., P.O. Box 1385, Pittsfield, MA 01202, (413) 448-8278.)

Judith Paris, who edits the quarterly trade publication *Videodisc/Videotex*, believes that the increase in use of videodisc players as microcomputer peripherals depends on the availability of inexpensive generic interfaces and software to control the videodisc player.



Anthro-Digital, Inc.'s Omniscan LaserDisc interface for use with an Apple computer and appropriate videodisc systems.

She estimates that by the end of the 1980s, government agencies and the armed forces will often be using interactive video systems for archival purposes and training devices. Increasingly, large companies are moving to more sophisticated use of integrated information systems with interactive video.

A Solid Market Base

"The videodisc industry is still in search of its identity," says Paris. "But the fact that government is pushing it, and that business systems are developing a lot of uses that will have an impact on home use, means that it will really start coming into its place."

Jim Porter agrees. "There are companies putting together hardware using videodiscs and computers for business to make data bases, store digitalized material for character-by-character retrieval, and sometimes for the creation of im-

ages. These include a lot of training areas and management functions.

"I really doubt that there's much real demand to have, say, the *Encyclopaedia Britannica* available on your personal computer. It's going to take a lot of experimentation and entrepreneurial effort to find out just what people will want to buy."

A Cloudy Crystal Ball?

In forecasting computer industry trends, the future must often be measured in months, not years or decades. That can turn even the best crystal ball cloudy. As Porter notes, in the free-market competition of the microcomputer field, anything can happen.

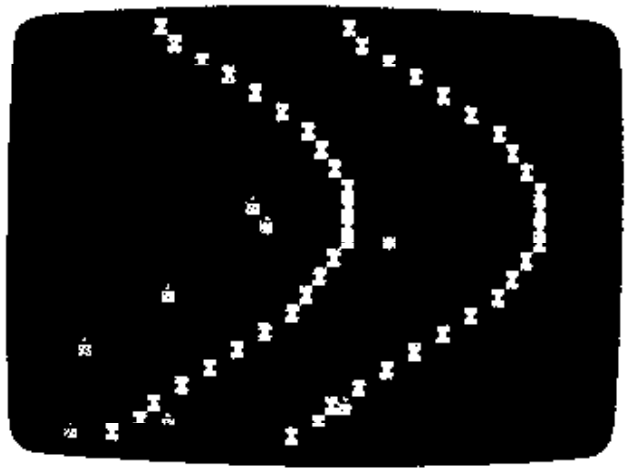
"So-called predictive research is usually not worth the powder to blow it up," he says. "When someone is asked to put up money to buy some specific thing and then that individual establishes his own priorities as to where he's going to spend his money, that's a lot different from saying 'Would you like to have....?' in a questionnaire."

Personal computer owners should have plenty of opportunity to show what they do and don't want in the field of mass storage devices, he concludes. "There are literally hundreds of small operations out there that will do these things. And if they've got what people want, it'll blossom."

ROADER

Your driving skills and endurance are put to the test as you careen around curves and dodge highway hazards in "Roader." Versions for Commodore 64, VIC, Atari, TI-99/4A, Apple, IBM PC, and TRS Color Computer. See the "Automatic Proofreader" article on page 60 before typing in VIC, 64, or Atari versions.

Brian Foley



The car speeds down an ever-narrowing roadway in the Commodore 64 version of "Roader."

The object of "Roader" is to control a car on a winding road while dodging obstacles. As you drive farther, the road becomes more and more narrow, making a crash more likely. The longer you stay on the road, the higher your score.

When you RUN the program, the computer will wait for you to set the level of difficulty, from one to four. One is for the beginner, two is faster, with a more twisted road. Three selects a slower speed and a less curvy road, but one which has obstacles. Four selects a fast, curvy road with obstacles. With these four levels of difficulty, Roader should be challenging for everyone.

If you hit the side of the road or crash into an obstacle, you'll hear three explosions. The width of the road and your score then appear on the screen.

The car can be steered with a joystick (port 2 on the 64) or with the keyboard. Push the C key to move it left, and the M key to move it right. The instructions for keyboard control are in line 50 of Program 1 and can easily be changed to any other characters of your choice.

Program 1: Roader For The 64

```
0 PRINTCHR$(142):POKE52,48:POKE56,48:CLR
                                        :rem 149
1 POKE53280,1:POKE53281,1:PRINT"{CLR}
  {RED}{10 DOWN}{10 RIGHT}JUST A MOMENT P
  LEASE"                                :rem 31
2 GOSUB260                              :rem 74
3 POKE53280,15:POKE53281,15             :rem 244
4 PRINT"{CLR}{3 DOWN}{5 RIGHT}{RED}ENTER
  {SPACE}:{7}";:PRINT"{3 DOWN}"TAB(12)"
  {BLK}1{4} FOR {WHT}NOVICE{7}"         :rem 121
5 PRINT"{3 DOWN}"TAB(12)"{BLK}2{4} FOR
  {SPACE}{WHT}PRO{7}":PRINT"{3 DOWN}"TA
  B(12)"{BLK}3{4} FOR {WHT}EXPERT{7}"
                                        :rem 157
6 PRINT"{3 DOWN}"TAB(12)"{BLK}4{4} FOR
  {SPACE}{WHT}PERFECT{7}":PRINT"
  {3 DOWN}"TAB(12)"{BLK}5{4} TO {WHT}QU
  IT{7}"                                :rem 225
7 GETB$:IFB$=""THEN7                    :rem 147
8 J=VAL(B$):IFJ<1ORJ>5THEN7             :rem 157
9 L=54272:IFJ=5THENPOKE53272,21:SYS2048
                                        :rem 66
10 IFA$="N"THEN14                       :rem 184
11 PRINT"{CLR}{WHT}{6 DOWN}{6 SPACES}USE
   {SPACE}C AND M KEYS TO MOVE LEFT AND R
   IGHT RESPECTIVELY"                   :rem 178
12 PRINT"{DOWN}YOU CAN ALSO USE THE JOYST
   ICK IN PORT 2"                       :rem 143
13 FORS=1TO3000:NEXTS                   :rem 62
14 PRINTCHR$(147)                       :rem 224
15 POKE650,255:N=1516                   :rem 138
16 POKE53280,11:POKE53281,11            :rem 32
17 I=.1:IFJ=2ORJ=4THENI=.2:N=1518:rem 212
18 AM$="DDDDDDDDDDDDD"                  :rem 144
22 FORQ=1TO4                            :rem 225
23 FORC=13TO0STEP-1                     :rem 157
25 FORA=1TO7.2STEPI                     :rem 188
26 Y=COS(A)                             :rem 117
27 F=F+1:R=RND(0)                       :rem 188
28 IFPEEK(N+40)=65ORPEEK(N-1)=65ORPEEK(N+
   1)=65ORPEEK(N-40)=65THEN110          :rem 39
29 PRINTTAB(10*Y+13),"{8}A","{BLK}",LEF
   T$(AM$,C);"{8}A{WHT}":IFR>.5THEN40
                                        :rem 168
30 IFJ=1ORJ=2THEN40                     :rem 151
32 IFF>25THENX=INT(25*RND(1)):POKE1944+X+
   L,3:POKE1944+X,66                    :rem 192
40 IFF>=25THENPOKEN+L,1:POKEN,64:FORT=1TO
   50:NEXTT:POKEN+L,0:POKEN,68          :rem 123
42 IFPEEK(N+40)=65ORPEEK(N-1)=65ORPEEK(N+
   1)=65ORPEEK(N-40)=65THEN110          :rem 35
```

Notes For The VIC, Atari, TI, Apple, IBM PC, And Color Computer Versions

"Roader" is a fast and exciting game, which puts you, the driver, on a difficult raceway. You must control your car skillfully, negotiating sharp turns while avoiding the pylons along the side of the road and the obstacles that appear randomly in levels 3 and 4.

In the VIC and Atari versions, your car is steered with the C and M keys. The TI-99/4A version of Roader uses the < and > keys or joystick 1, while the Apple version uses paddle (0). The TRS-80 Color Computer and the IBM PC versions use the left and right arrow keys to control the movement of the car.

The arrow keys on the TRS-80 Color Computer and the IBM PC should be tapped briskly, and not held down. The Caps Lock key on the IBM PC must be off for proper steering. If you use the joystick with the TI-99/4A version, be sure to release the ALPHA LOCK key.

```
43 IFF>=25THENP=PEEK(56320):D=15-(PAND15)
                                        :rem 120
44 IFD=4THENN=N-1:GOTO51                :rem 235
45 IFD=8THENN=N+1:GOTO51                :rem 238
46 IFD=6THENN=N+20:GOTO51               :rem 40
47 IFD=10THENN=N+41:GOTO51              :rem 77
49 GETB$                                :rem 179
50 N=N+(B$="C")-(B$="M")                :rem 150
51 IFPEEK(N)=66ORPEEK(N+40)=66ORPEEK(N-1)
   =66ORPEEK(N+1)=66THEN110             :rem 150
80 NEXTA:NEXTC:NEXTQ                    :rem 110
110 POKEN,67:POKEN+L,2                  :rem 52
120 POKEN-1,67:POKEN-1+L,7              :rem 246
130 POKEN+1,67:POKEN+1+L,7              :rem 243
140 POKEN+40,67:POKEN+40+L,15           :rem 137
150 POKEN-40,67:POKEN-40+L,15           :rem 142
160 V=54296:W=54276:A=54277:H=54273:L=542
    72                                  :rem 86
170 FORX=45TO0STEP-1:POKEV,X:POKEW,129:PO
    KEA,15 :POKEH,40:POKEL,200:NEXT
                                        :rem 30
180 POKEW,0:POKEA,0:F=0:D=0             :rem 89
190 POKE198,0:PRINT"THE ROAD IS ";C;"FEET
     WIDE"                              :rem 191
200 PRINT"SO YOUR SCORE IS ";INT(10000/C)
                                        :rem 70
210 PRINT"PLAY AGAIN (Y/N)?...OR FIRE BUT
    TON"                                :rem 141
215 P=PEEK(56320):FR=PAND16:IFFR=0THEN14
                                        :rem 150
220 GET A$:IFA$=""OR(A$<>"Y"ANDA$<>"N"AND
    FR<>0)THEN215                       :rem 22
230 IFA$="Y"THEN14                      :rem 247
240 IFA$="N"THEN0                       :rem 187
260 POKE56334,PEEK(56334)AND254         :rem 225
270 POKE1,PEEK(1)AND251                 :rem 55
280 FORI=0TO511:POKEI+12288,PEEK(I+53248)
    :NEXT                               :rem 232
290 POKE1,PEEK(1)OR4                    :rem 163
300 POKE56334,PEEK(56334)OR1            :rem 64
310 POKE53272,(PEEK(53272)AND240)OR12
                                        :rem 41
320 FORC=12800TO12839:READZ:POKEC,Z:NEXT
                                        :rem 252
330 DATA153,255,189,60,60,189,255,153
                                        :rem 94
340 DATA255,255,255,60,60,255,255,255
                                        :rem 89
350 DATA24,60,126,255,255,255,255,255
                                        :rem 89
360 DATA154,82,0,27,216,0,74,137        :rem 83
365 DATA255,255,255,255,255,255,255,255
                                        :rem 204
370 RETURN                              :rem 133
```

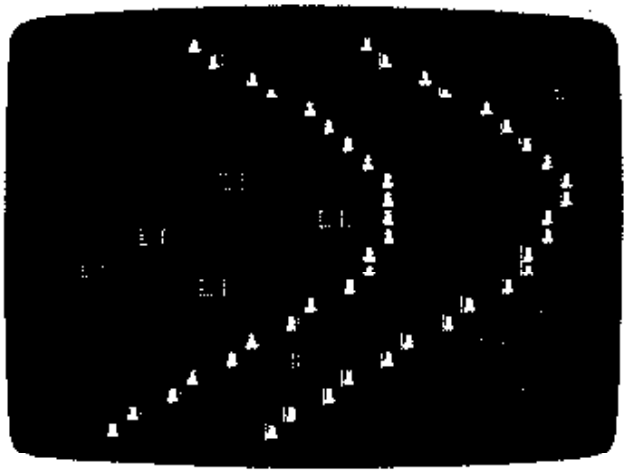
Program 2: VIC Roader

```
0 POKE56,28:POKE52,28:CLR               :rem 225
1 POKE36879,110:PRINT"{CLR}{WHT}{10 DOWN}
  JUST A MOMENT PLEASE"                 :rem 141
2 GOSUB280                              :rem 76
3 POKE36879,59                          :rem 13
4 PRINT"{CLR}{3 DOWN}{BLK}ENTER:";:PRINT"
  {2 DOWN}"TAB(6)"{BLK}1{BLK} FOR {RED}NO
  VICE"                                 :rem 250
5 PRINT"{2 DOWN}"TAB(6)"{BLK}2{BLK} FOR
  {RED}PRO":PRINT"{2 DOWN}"TAB(6)"{BLK}3
  {BLK} FOR {RED}EXPERT"                :rem 13
6 PRINT"{2 DOWN}"TAB(6)"{BLK}4{BLK} FOR
  {RED}PERFECT":PRINT"{2 DOWN}"TAB(6)"
  {BLK}5{BLK} TO {RED}QUIT"             :rem 235
7 GETB$:IFB$=""THEN7                    :rem 147
8 J=VAL(B$):IFJ<1ORJ>5THEN7             :rem 157
9 L=30720:IFJ=5THENPRINT"{CLR}":END
                                        :rem 231
10 IFA$="N"THEN14                       :rem 164
11 PRINT"{CLR}{BLK}{6 DOWN}USE C AND M KE
   YS TO{3 SPACES}MOVE LEFT AND RIGHT"
                                        :rem 158
13 FORS=1TO3000:NEXTS                   :rem 62
14 PRINTCHR$(147)                       :rem 224
15 POKE650,255:N=7908                   :rem 149
16 REM POKE36879,25                     :rem 30
17 I=.1:IFJ=2ORJ=4THENI=.2:N=7905:rem 218
19 AM$="!!!!!!!!!!"                     :rem 252
22 FORQ=1TO4                            :rem 225
23 FORC=9TO0STEP-1                      :rem 114
25 FORA=1TO7.2STEPI                     :rem 188
26 Y=COS(A)                             :rem 117
27 F=F+1:R=RND(1):IFF>23THENPOKE36878,15
                                        :rem 111
29 PRINTTAB(5*Y+6);"{BLU}$";"{BLK}";LEFT$
   (AM$,C);"{BLU}$":IFR>.5THEN40        :rem 23
30 IFJ=1ORJ=2THEN40                     :rem 151
32 IFF>23THENX=INT(23*RND(1)+1):POKE8142+
   X+L,2:POKE8142+X,37                  :rem 15
40 IFF>=23THENPOKEN+L,0:POKEN,35:FORT=1TO
   90:NEXTT:POKEN+L,0:POKEN,39          :rem 120
42 IFPEEK(N)=36ORPEEK(N+22)=36ORPEEK(N-1)
   =36ORPEEK(N+1)=36THEN110             :rem 138
49 GETB$                                :rem 179
50 N=N+(B$="C")-(B$="M")                :rem 150
51 IFPEEK(N)=37ORPEEK(N+22)=37ORPEEK(N-1)
   =37ORPEEK(N+1)=37THEN110             :rem 142
80 NEXTA:NEXTC:NEXTQ                    :rem 110
110 POKEN,38:POKEN+L,2                  :rem 50
120 POKEN-1,38:POKEN-1+L,7              :rem 244
```

```
NJ 370 A=PEEK(764):IF A<>43 AND A<>35
      THEN 370
EB 380 IF A=43 THEN ? #6;"{CLEAR}":N=S
      CR+246:GOTO 140
AG 390 ? #6;"{CLEAR}";GOTO 30
HI 400 GRAPHICS 1+16:POSITION 0,12:? #
      6;"JUST A MOMENT PLEASE"
AH 405 ST=(PEEK(106)-8)*256
IP 410 FOR K=0 TO 511:POKE ST+K,PEEK(5
      7344+K):NEXT K:POKE 756,ST/256
NL 415 READ Y:IF Y=-1 THEN RETURN
MM 420 FOR X=Y TO Y+7:READ Z:POKE X+ST
      ,Z:NEXT X:GOTO 415
PB 430 DATA 24,153,255,189,60,60,189,2
      55,153
DL 440 DATA 32,255,255,255,60,60,255,2
      55,255
DK 450 DATA 40,24,60,128,255,255,255,2
      55,255
BM 460 DATA 48,154,82,0,27,216,0,74,13
      7
BA 470 DATA 56,255,255,255,255,255,255
      ,255,255,-1
PA 1500 FOR I=1536 TO 1595:READ A:CK=C
      K+A:POKE I,A:NEXT I
FJ 1510 IF CK<>7887 THEN PRINT "Error
      in data--check typing."
KJ 1520 RETURN
PJ 1536 DATA 24,165,88,133,203,105
9G 1542 DATA 20,133,205,165,89,133
9M 1548 DATA 204,105,0,133,206,162
PL 1554 DATA 23,160,19,177,205,145
PJ 1560 DATA 203,136,16,249,24,165
BK 1566 DATA 205,133,203,105,20,133
FD 1572 DATA 205,165,206,133,204,105
PD 1578 DATA 0,133,206,202,208,227
MC 1584 DATA 160,19,169,0,145,203
JC 1590 DATA 136,16,251,104,96,0
```

Program 4: Roader For The TI-99/4A

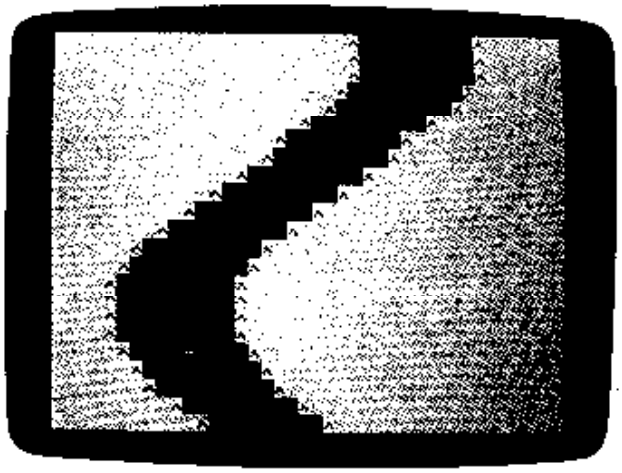
```
100 F=12
110 GOTO 200
120 FOR VOL=1 TO 30 STEP 10
130 CALL SOUND(-1000,-7,VOL)
140 CALL SCREEN(INT(VOL/2.5)+1)
150 F=19-F
160 CALL COLOR(9,F,1)
170 NEXT VOL
180 CALL COLOR(9,7,1)
190 RETURN
200 CALL CHAR(99,"223E2A08087A3E2A")
210 CALL CHAR(100,"447C54100A2E3F7F
    ")
220 CALL CHAR(101,"00080C1E1E3E3F7F
    ")
230 CALL CHAR(104,"0018181818C3C300
    ")
240 CALL CHAR(120,"FFFFFFFFFFFFFFFF
    ")
250 CALL CHAR(128,"00FF00FF00FF00FF
    ")
260 CALL COLOR(9,5,1)
270 CALL COLOR(10,14,1)
280 CALL COLOR(11,9,1)
290 CALL COLOR(12,2,1)
300 CALL COLOR(13,9,2)
310 CALL CLEAR
320 CALL SCREEN(15)
330 PRINT
340 PRINT TAB(8);"c R O A D E R c"
350 FOR T=1 TO 6
360 PRINT
```



"Roader," TI version.

```
370 NEXT T
380 PRINT "STEER WITH THE < AND > K
    EYS"
390 PRINT
400 PRINT TAB(6);"OR USE JOYSTICK #
    1"
410 FOR T=1 TO 5
420 PRINT
430 NEXT T
440 FOR I=110 TO 120 STEP .5
450 CALL SOUND(-150,I,2)
460 NEXT I
470 FOR I=120 TO 110 STEP -.3
480 CALL SOUND(-150,I,2)
490 NEXT I
500 FOR T=110 TO 120 STEP .8
510 CALL SOUND(-75,T,2)
520 NEXT T
530 GOSUB 120
540 CALL SCREEN(15)
550 CALL COLOR(9,5,1)
560 FOR T=1 TO 250
570 NEXT T
580 CALL CLEAR
590 CALL COLOR(9,8,2)
600 OSKILL=1
610 PRINT TAB(2);"ENTER YOUR SKILL
    LEVEL..."
620 FOR T=1 TO 3
630 PRINT
640 NEXT T
650 PRINT TAB(4);"ENTER :"
660 PRINT
670 PRINT
680 PRINT TAB(8);"1 FOR NOVICE"
690 PRINT
700 PRINT TAB(8);"2 FOR PRO"
710 PRINT
720 PRINT TAB(8);"3 FOR EXPERT"
730 PRINT
740 PRINT TAB(8);"4 FOR PERFECT"
750 FOR D=1 TO 3
760 PRINT
770 NEXT D
780 CALL KEY(1,K,S)
790 RANDOMIZE
800 IF S=0 THEN 780
810 IF K<>18 THEN 840
820 SKILL=OSKILL
```

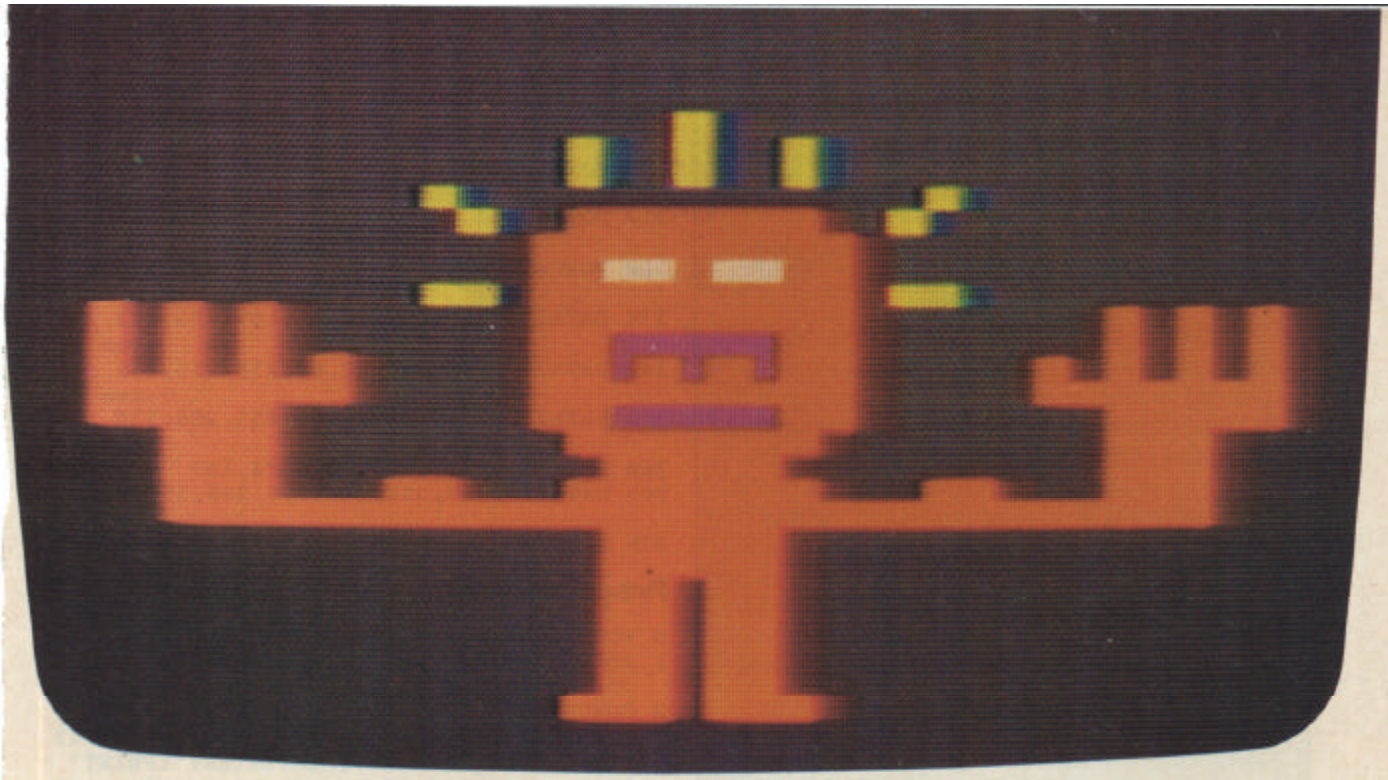
```
830 GOTO 860
840 SKILL=-(K=19)-(K=7)*2-(K=8)*3-(
    K=9)*4
850 IF SKILL=0 THEN 780
860 OSKILL=SKILL
870 PRINT
880 PRINT TAB(8);"HERE WE GO!!!"
890 PRINT
900 PRINT
910 FOR T=1 TO 400
920 NEXT T
930 CALL CLEAR
940 CALL SCREEN(3)
950 I=.1
960 IF (SKILL<>2)*(SKILL<>4)THEN 98
    0
970 I=.2
980 N=24
990 J=0
1000 OLDN=24
1010 B$="xxxxxxxx"
1020 FOR C=1 TO 4
1030 PRINT TAB(18);"h";B$;"h"
1040 NEXT C
1050 FOR Q=1 TO 4
1060 FOR C=9 TO 4 STEP -1
1070 IF C<>9 THEN 1090
1080 B$="xxxxxxxx"
1090 FOR A=0 TO 6.25 STEP I
1100 Y=COS(A)
1110 J=J+1
1120 PRINT TAB(8*Y+10);"h";B$;"h"
1130 IF (RND>.5)+(SKILL=1)+(SKILL=2
    )THEN 1160
1140 IF J<25 THEN 1160
1150 CALL HCHAR(23,28*RND+2,128)
1160 CALL GCHAR(20,N,G)
1170 CALL HCHAR(19,OLDN,120)
1180 IF (G=104)+(G=128)+(G=32)THEN
    1390
1190 CALL HCHAR(20,N,99)
1200 OLDN=N
1210 CALL KEY(0,K,S)
1220 IF S<>0 THEN 1240
1230 CALL JOYST(1,XR,YR)
1240 N=N+(K=44)-(K=46)+XR/4
1250 NEXT A
1260 B$=SEG$(B$,1,C-2)
1270 FOR D=110 TO 129-C STEP .5
1280 CALL SOUND(-150,D,2)
1290 NEXT D
1300 NEXT C
1310 NEXT Q
1320 CALL CLEAR
1330 CALL SCREEN(11)
1340 PRINT TAB(5);"YOU MADE IT, MAR
    IO !!"
1350 FOR T=1 TO 10
1360 PRINT
1370 NEXT T
1380 GOTO 1480
1390 CALL HCHAR(20-1,N,101)
1400 CALL HCHAR(20,N,100)
1410 GOSUB 120
1420 CALL SCREEN(3)
1430 FOR T=1 TO 500
1440 NEXT T
1450 CALL CLEAR
1460 CALL COLOR(9,8,2)
1470 GOTO 1310
1480 FOR I=1 TO 500
1490 NEXT I
1500 CALL CLEAR
1510 CALL SCREEN(15)
1520 PRINT TAB(6);"YOUR SCORE IS";J
    *10*SKILL
1530 FOR T=1 TO 5
1540 PRINT
1550 NEXT T
1560 PRINT TAB(8);"? PLAY AGAIN ?"
1570 PRINT
1580 PRINT
1590 PRINT TAB(4);"<FIRE BUTTON> OR
     <S>"
1600 PRINT TAB(8);"- FOR SAME LEVEL
    "
1610 PRINT
1620 PRINT TAB(4);"<C> - TO CHANGE
    LEVELS"
1630 PRINT
1640 PRINT TAB(4);"<E> - TO END PRO
    GRAM"
1650 CALL KEY(1,K,S)
1660 IF S=0 THEN 1650
1670 IF (K=18)+(K=2)THEN 930
1680 IF (K<>S)*(K<>14)THEN 1650
1690 IF K=14 THEN 300
1700 END
```



"Roader," Apple version.

Program 5: Roader For The Apple

```
100 N$ = " REDAOR":D = 0:A = 0:B = 0
110  HOME
120  FOR I = 1 TO 7:N$(I) =  MID$ (N$,
     I,1): NEXT I
130  FOR I = 1 TO 7:A = A + .4:N =  INT
     ( COS (A) * 8)
140  VTAB 24 - D - I: HTAB 20 + N: PRINT
     N$(I)
150  NEXT I:B = B + .4:A = B: IF D = 1
     4 THEN 170
160 D = D + 1: GOTO 130
170  VTAB 12: PRINT " WHAT SKILL LEVEL
      DO YOU WISH TO PLAY?"
180  PRINT : PRINT "1) EASY";: HTAB 26
     : PRINT "2) INTERMEDIATE"
190  PRINT "3) DIFFICULT";: HTAB 26: PRINT
     "4) EXPERT"
200  PRINT : PRINT "  USE PADDLE 0 TO
     CONTROL YOUR CAR.": PRINT
```



WOULD YOU SHELL OUT $1000 TO MATCH WITS WITH THIS?

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(For more information on Infocom games contact: Infocom, Inc., P.O. Box 855, Garden City, NY 11530.)

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TI Aquarium

Michael A. Covington

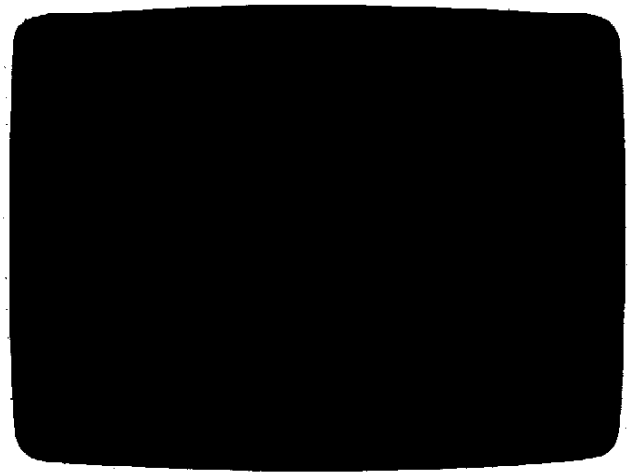
Turn your TI into an aquarium. And the best part is, you never have to change the water. For TI-99/4A with Extended BASIC. The program also demonstrates some basic sprite techniques.

Recent studies have shown that the relaxing experience of watching fish glide around in an aquarium can lower your blood pressure and have other beneficial effects. This program (which we present somewhat with tongue in cheek) enables you to avoid the expense and bother of a real aquarium by using your TI-99/4A to simulate one.

Lines 310 to 330 establish the characteristics of a double-sized, fish-shaped sprite. Lines 400 to 430 read a number from the DATA statement (340) and, treating it both as a sprite number and as a color number, create a fish accordingly. When the sprite is created, it has the same color as the background (color 1, "transparent").

It is made visible by a separate COLOR statement because newly created sprites tend to appear momentarily in the wrong place before jumping to the specified location. If this phenomenon were visible, it would detract from the atmosphere of tranquility.

The subroutine at line 610, which is called several times while the fish are being created and repeatedly after they are on the screen, makes random changes in sprite motion so that the fish move in realistic bobbing movements rather than in straight lines at constant speed.



Relax and watch the fish glide by in "TI Aquarium."

TI Aquarium

```
140 ! REQUIRES EXTENDED BASIC.
150 CALL SCREEN(2)
160 CALL CLEAR
170 FOR I=1 TO 14 :: CALL COLOR(I,1
    5,1):: NEXT I
180 PRINT "TI AQUARIUM": : : :
190 PRINT "This program allows you
    to"
200 PRINT "use your TI-99 to enjoy
    the"
210 PRINT "relaxing sight of fish"
220 PRINT "swimming by, without the
    "
230 PRINT "expense and bother of a"
240 PRINT "real aquarium."
250 PRINT : :"To end the program, p
    ress"
260 PRINT "any key while the fish a
    re"
270 PRINT "being displayed."
280 FOR D=1 TO 1500 :: NEXT D
290 CALL CLEAR
300 RANDOMIZE
310 A$="000000000081C3E7FFFFE7C381000
    0000000000000F0F8FCFEFEFCF8F000
    000000"
320 CALL CHAR(120,A$)
330 CALL MAGNIFY(3)
340 DATA 9,6,4,7,8,10,11,12,14,0
350 CALL SCREEN(2)
360 !
```

```
370 ! Put fish on the screen, with
    sprite numbers and
380 ! colors based on the DATA stat
    ement
390 !
400 READ Q
410 IF Q=0 THEN 540
420 CALL SPRITE(#Q,120,1,90+30*(RND
    -0.5),1,4*RND-3,5*RND+1)
430 CALL COLOR(#Q,Q)
440 GOSUB 610
450 GOSUB 610
460 GOSUB 610
470 FOR D=1 TO 300 :: NEXT D
480 GO TO 400
490 !
500 ! Now that all the fish are on
    the screen, make
510 ! random changes in their motio
    n and check for
520 ! a key being pressed.
530 !
540 GOSUB 610
550 CALL KEY(5,CODE,STATUS)
560 IF STATUS<>0 THEN CALL CLEAR ::
     STOP
570 GO TO 540
580 !
590 ! Subroutine: Change the motion
     of a
600 ! randomly chosen sprite
605 !
610 CALL MOTION(#INT(11*RND)+3,4*RN
    D-2,5*RND+2)
620 RETURN
```

RELATIONAL OPERATORS

Eric Brandon

Relational operators can make your BASIC programs more efficient. Here are some techniques which use relational operators on the Commodore, Atari, TI, Apple, IBM PC and PCjr, Color Computer, and Timex/Sinclair machines.

BASIC has a very useful, but little-known feature. A relational expression such as 2+3>4 is interpreted by BASIC as a value of –1 (or 1, depending on the computer) if the expression is true, and a value of 0 if the expression is false. On all Commodore machines, the TI-99/4A, the Color Computer, the IBM PC and the PCjr, a relational expression which is true gives a value of –1. A relational expression which is true on the Atari, Apple, and Timex/Sinclair computers produces a value of 1. A value of 0 results for a relational expression which is false on each computer.

As an example, enter PRINT 2=2. You should get a result of –1 (or 1) since the expression is true. Now type in: PRINT 2=3. This time, the result is 0 because the expression is false.

Related to this is the fact that the statement

```
IF Q THEN 100
```

will be interpreted identically to the statement

```
IF Q<>0 THEN 100
```

Can you see why? Both expressions evaluate as true, if Q is nonzero.

Cycling A Variable

Suppose you wanted to continually cycle a variable, say J, from 1 to 10. One way to do this would be:

```
10 J=0
20 J=J+1
25 PRINT J
30 IF J<10 THEN 20
40 GOTO 10
```

However, by using a relational expression, we can do this:

```
5 N=-1:REM N=-1 FOR TRUE (MAY BE 1 DEPEND
  ING ON YOUR MACHINE)
10 J=0
20 J=J*(J<10)*N+1
25 PRINT J
40 GOTO 20
```

In this routine, N must be defined as +1 or –1, depending on your machine. Of course, there's really no need for a separate statement to define N. You could easily incorporate the value of N into the expression in line 20. If a true statement produces a –1 on your computer, line 20 becomes J=–J*(J<10)+1. In this case, as long as J is less than 10, BASIC returns a value of –1 for (J<10). So, –J

SOUND SHAPER

Steven Kaye

"Sound Shaper" manipulates volume and frequency to give the VIC a smoother, more musical sound. We've also included versions for the 64, Atari, and TI. See the "Automatic Proofreader" article on page 60 before typing in the 64 and Atari versions.

One of the main differences between the sound the Commodore 64 can produce and sound produced by the VIC is the shape of the sound's waveform. The VIC produces only square waves. One microsecond the sound is off, the next it's on. This abrupt onset of sound produces somewhat nonmusical music. The tones sound electronic and unlike any acoustic instrument.

The Commodore 64, on the other hand, can simulate musical instruments by controlling the waveshape of the sound produced. Instead of turning the sound on and off abruptly, it can increase and decrease the amplitude (volume) more gradually under control of the programmer. It is important to bear in mind that the onset-offset or rise-fall time is still on the order of fractions of milliseconds, but it is not instantaneous as is the case with the VIC. It is this programmable rise-fall time that allows the Commodore 64 to sound more like a traditional acoustic instrument. We cannot control the actual waveshape of sounds on the VIC, but we can simulate wave-shaping by modulating the volume.

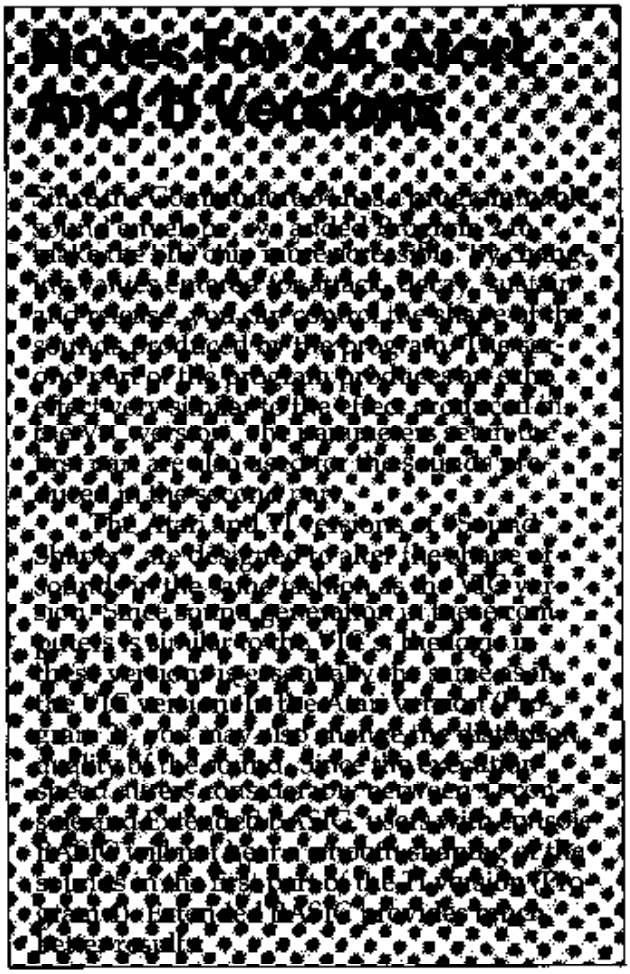
The first part of Program 1 demonstrates a simple application of this technique. It plays the entire frequency range for one of the VIC's four voices. First, the program asks for two inputs, the rise time and the fall time. Values between .5 and 10 seem to work best. Then the frequency value is POKEd into the appropriate register (line 140). Two separate FOR-NEXT loops (lines 150 and 180) control the rise and fall times. As the volume varies between 0 and 15, the input variables control the rate of volume change. Experiment with different rise-fall time values.

Frequency manipulation can also be used to produce unique effects. The second part of Program 1 shows how to produce an echo effect by rapidly alternating a frequency with its complementary frequency. Again we move through the frequency scale. In line 270 we use the amplitude modulation technique described above. Lines 280 and 300 POKE the frequency and then the frequency subtracted from 383 into the appropriate voice register.

On the first time through the loop, voice 2 (36875) is POKEd with 128 and then rapidly alternated with 255 (255 = 383 –128) while the sound fades as variable DB decreases. The timing loops in 290 and 310 as well as the step value in line 270 can be manipulated to increase or decrease the reverberation effect. Voice 2 was chosen for the example, but any of the four voices will produce interesting sounds.

Program 1: VIC Sound Shaper

```
40 PRINT"{CLR}{9 DOWN}"TAB(2)"{RVS}SHAPIN
   G{OFF} {RVS}VIC{OFF} {RVS}SOUNDS{OFF}"
                                    :rem 179
45 FOR T=1 TO 1500:NEXT             :rem 244
50 PRINT"{CLR}{7 DOWN}{6 RIGHT}SHAPED (1)
   "                                :rem 37
55 PRINTTAB(9);"{DOWN}OR":PRINTTAB(7)"
   {DOWN}ECHO (2)"                  :rem 166
60 PRINT"{4 DOWN}{9 RIGHT}";:INPUT I$:IFV
   AL(I$)<1OR VAL(I$)>2THEN50       :rem 15
70 ONVAL(I$)GOTO100,240             :rem 49
100 REM*** THIS PART PRODUCES "SHAPED" MU
    SICAL NOTES***                  :rem 213
110 PRINT "{3 DOWN}{2 RIGHT}RISE AND FALL
     TIME"                          :rem 36
115 PRINT"VALUES MUST EXCEED 0"     :rem 95
116 INPUT R,D:IF (R=0)OR(D=0) THEN 116
                                    :rem 45
120 V=36878:S=36875                 :rem 13
130 FOR F=128 TO 255 STEP3          :rem 71
```




```
140 POKE S,F                              :rem 137
150 FOR DB=0 TO 15 STEP 5/R               :rem 107
160 POKE V,DB                             :rem 206
170 NEXT                                  :rem 215
180 FOR DB=15 TO 0 STEP -5/D              :rem 141
190 POKE V,DB                             :rem 209
200 NEXT                                  :rem 209
210 FORT=1 TO 50:NEXT                     :rem 189
220 NEXT                                  :rem 211
230 POKE V,0:END                          :rem 135
240 REM*** THIS PART CREATES AN ECHO EFFE
    CT***                                 :rem 71
250 V=36878:S=36875                       :rem 17
260 FOR P=120 TO 255 STEP 3               :rem 65
270 FOR DB=15 TO 1 STEP -.5               :rem 73
280 POKE V,DB:POKE S,P                    :rem 9
290 FOR T=1 TO 10:NEXT                    :rem 193
300 POKE S,383-P                          :rem 92
310 FOR J=1 TO 10:NEXT                    :rem 176
320 NEXT:NEXT                             :rem 77
330 POKE V,0                              :rem 119
```

Program 2: 64 Sound Shaper

```
15 PRINT"{CLR}SET PARAMETERS FOR SOUND AN
   D ECHO"                                :rem 12
20 CHIP = 54272                           :rem 199
22 FOR T=CHIP TO CHIP + 24 : POKET,0:NEXT
                                          :rem 234
30 INPUT "ATTACK RATE (0-15)";AT$:AT=VAL(
   AT$):IF AT<0 OR AT>15 THEN 30          :rem 82
40 INPUT "DECAY RATE (0-15)";DE$:DE=VAL(D
   E$):IF DE<0 OR DE>15THEN 40            :rem 198
50 INPUT "SUSTAIN VOLUME (0-15)";SU$:SU=V
   AL(SU$):IF SUS<0OR SU>15THEN50         :rem 35
60 INPUT "RELEASE RATE(0-15)";RE$:RE=VAL(
   RE$):IF RE<0ORRE>15THEN60              :rem 171
80 POKECHIP+24,15:POKECHIP+5,16*AT+DE
                                          :rem 209
90 POKECHIP+6,16*SU+RE                    :rem 68
100 FOR T= 20{2 SPACES}TO 80 STEP 5:POKEC
    HIP+4,17                              :rem 103
110 POKECHIP,50:POKECHIP+1,T              :rem 223
115 FORJ= 1 TO 500+1.7↑AT+1.7↑DE:NEXTJ
                                          :rem 141
120 POKECHIP+4,16:FORH=1TO2↑RE:NEXT:NEXT
                                          :rem 107
200 FOR T= 20 TO 80 STEP 5                :rem 232
210 FOR DB = 15 TO 1STEP -.5              :rem 67
215 PRINT"{HOME}{5 DOWN}*ECHO*{6 LEFT}
    {7 SPACES}"                           :rem 242
220 POKECHIP+4,17:POKECHIP+24,DB:POKECHIP
    +1,T:FORP=1TO10:NEXT                  :rem 111
230 POKECHIP+1,100-T:FORJ=1TO10:NEXT:NEXT
    :NEXT                                 :rem 202
240 POKECHIP+4,16                         :rem 219
```

Program 3: Atari Sound Shaper

```
NN 3 ? "{CLEAR}":POSITION 12,12:? "SOU
   NDSHAPER"
FD 4 POKE 752,1
QK 5 DIM I$(5),VO$(5),DS$(5)
JC 6 FOR T=1 TO 300:NEXT T
MD 10 PRINT "Shape (1) or Echo (2)";
FP 20 INPUT I$
EC 21 IF VAL(I$)<1 OR VAL(I$)>2 THEN 1
   0
EF 40 REM *** THIS PROGRAM PRODUCES SH
   APED MUSICAL NOTES ***
NL 50 PRINT "Voice (0-3)";:INPUT VO$
AF 55 IF VAL(VO$)>3 OR VAL(VO$)<0 THEN
    50
EL 57 VO=VAL(VO$)
DJ 60 PRINT "Distortion(0-14)";:INPUT
   DS$
BK 65 IF VAL(DS$)<0 OR VAL(DS$)>14 THE
   N 60
BA 67 DS=VAL(DS$)
BH 68 ON VAL(I$) GOTO 70,195
SD 70 ? "Rise Fall Time";:INPUT R,D
XC 75 IF R<1 OR D<1 THEN 70
LJ 95 ? "{CLEAR}";:POSITION 12,12:? "*
   Shaped Notes*"
JE 100 FOR F=121 TO 60 STEP -4.1
EF 120 FOR DB=0 TO 15 STEP (1/R)*15
KJ 130 SOUND VO,F,DS,DB
FK 140 NEXT DB
GH 150 FOR DB=15 TO 0 STEP -(1/D)*15
KM 160 SOUND VO,F,DS,DB
GB 165 NEXT DB
BG 170 FOR T=1 TO 50:NEXT T
BD 180 NEXT F
MC 190 POKE 752,0:END
AM 195 ? "{CLEAR}";:POSITION 12,12:? "
   ***ECHO EFFECT***"
JP 200 FOR P=121 TO 60 STEP -4.1
HD 210 FOR DB=15 TO 1 STEP -0.5
LD 220 SOUND VO,P,DS,DB
AP 230 FOR T=1 TO 10:NEXT T
HK 240 SOUND VO,181-P,DS,DB
PK 250 FOR J=1 TO 10:NEXT J
CG 260 NEXT DB:NEXT P
ND 270 POKE 752,0:END
```

Program 4: TI Sound Shaper

```
100 CALL CLEAR
110 CALL SCREEN(15)
120 PRINT TAB(7);"SHAPING TI SOUNDS
    "
130 FOR T=1 TO 6
140 PRINT
150 NEXT T
160 PRINT "CHOOSE:"
170 PRINT
180 PRINT
190 PRINT TAB(4);"1) SHAPED MUSICAL
    NOTES"
200 PRINT
210 PRINT TAB(4);"2) ECHO"
220 PRINT
230 PRINT TAB(4);"3) QUIT"
240 PRINT
250 INPUT A$
260 IF (VAL(A$)<1)+(VAL(A$)>3)THEN
    250
270 ON VAL(A$)GOTO 290,520,690
280 REM  THIS PART PRODUCES "SHAPED
    " MUSICAL NOTES
290 CALL CLEAR
300 CALL SCREEN(13)
310 PRINT TAB(3);"* SHAPED MUSICAL
    NOTES *"
320 FOR T=1 TO 10
330 PRINT
340 NEXT T
350 PRINT "ENTER RISE AND FALL TIME
    S -"
360 PRINT "USE VALUES GREATER THAN
    ZERO";
370 PRINT
380 INPUT R,D
390 IF (R=0)+(D=0)THEN 390
400 FOR F=110 TO 880 STEP 30
410 FOR DB=30 TO 0 STEP -5/R
420 CALL SOUND(-10,F,DB)
430 NEXT DB
440 FOR DB=0 TO 30 STEP 5/D
450 CALL SOUND(-10,F,DB)
460 NEXT DB
470 FOR T=1 TO 50
480 NEXT T
490 NEXT F
500 GOTO 100
510 REM  THIS PART CREATES AN ECHO
    EFFECT
520 CALL CLEAR
530 CALL SCREEN(14)
540 PRINT TAB(8);"* ECHO EFFECT *"
550 FOR T=1 TO 12
560 PRINT
570 NEXT T
580 FOR F=110 TO 880 STEP 30
590 FOR DB=1 TO 30
600 CALL SOUND(-10,F,DB)
610 FOR T=1 TO 10
620 NEXT T
630 CALL SOUND(-10,990-F,DB)
640 FOR J=1 TO 10
650 NEXT J
660 NEXT DB
670 NEXT F
680 GOTO 100
690 END
```

COMPUTE!'s Programmer's Reference Guide to the TI-99/4A

Table of Contents

PROGRAMMING THE TI

C. Regena

File Processing

I've received quite a few letters wondering about files on the TI-99/4A. Files on a computer can be compared to those ordinary big, gray file drawers. Each *file* is a drawer, and you can label your drawers. Each *record* is one of the file folders inside a drawer. On the computer your file cabinet can be either a cassette or a diskette.

You can read about file processing in the *User's Reference Guide* that comes with the computer (pages II-118 to II-136 for the TI-99/4A and pages 144 to 162 for the TI-99/4), so I won't repeat that information here. For some example programs, you can refer to "Color Computer General-Purpose Data Base" in COMPUTE! (May 1983).

If you prefer not to do your own programming, there are several business programs available for the TI, as well as some command modules which utilize file processing. Home Budget Management keeps personal finance records. Personal Record Keeping is a versatile module that helps you set up your own files and records for a small business.

A Spelling Drill

Let's get to an example. This "Spelling Quiz" program presents a drill for spelling words. In many schools, students are sent home with a list of words each Monday with instructions to practice, then a test is given on Friday. TI to the rescue! Enter the spelling words and save them on cassette. Let the computer conduct the drill.

Line 100 DIMensions or reserves space for 30 spelling words on the list. If you have more words, you can change this statement and lines 460–470 to handle more words. Lines 110–150 define graphics characters, and line 1630 draws a smiling face for a correct answer. Please feel free to add your own graphics. Lines 160–310 print the main menu screen of options. When you RUN the program, you have your choice of entering a new word list, editing the existing list, loading a list of previously saved words, saving the present list, reviewing the complete word list, actually performing the quiz, or ending the program.

The first time you RUN the program, you would press 1 to enter a word list, edit the list if necessary, then save the list on cassette for future use. Lines 320–370 contain the procedure that tells you when you try to access an empty list.

Enter The Number Of Words

When you enter a new word list, you are first asked how many words it will contain. This number, N, is unchanged throughout the program and is necessary for saving N items and for performing the quiz for N words. Lines 490–530 ask for the new words, and you type the words in one at a time, pressing ENTER after each word. When you have entered the right number of words, the program returns to the main menu screen.

The edit option is contained in lines 550–960. The complete word list is printed, then you can enter the word you want changed. Lines 640–660 compare the word you entered to the word list so the word can be replaced. If you prefer to delete the word, you can just press the ENTER key. Lines 730–770 adjust N and the positions of the other words if you delete a word.

Lines 1070–1150 save the list of words. The first time you use the program you would enter the words, then save the list for future use.

The OPEN statement is the crux of a file processing program. Line 1090 is OPEN #1:"CS1",INTERNAL,OUTPUT,FIXED which readies device number 1 (you can choose any number or even a variable name that corresponds to a number) labeled Cassette 1. The data file we create is for OUTPUT—we will be filing information on the tape. The format for this output is INTERNAL (versus DISPLAY) and FIXED (versus VARIABLE). This means that the computer will save the output in internal machine format rather than printable ASCII format, and that each record is FIXED at a certain length. Since I didn't specify a length, the computer will assume FIXED 64, or a record length of 64 characters.

```
580 FOR I=1 TO N
590 PRINT W$(I),
600 NEXT I
610 PRINT : :"CHANGE WHICH WORD?"
620 CALL SOUND(150,1497,4)
630 INPUT E$
640 FOR I=1 TO N
650 IF E$=W$(I)THEN 710
660 NEXT I
670 PRINT :"THAT WORD IS NOT IN LIS
    T."
680 CALL SOUND(100,330,4)
690 CALL SOUND(100,262,4)
700 GOTO 780
710 PRINT :"ENTER NEW WORD OR":"PRE
    SS <ENTER> TO DELETE": :
720 INPUT W$(I)
730 IF W$(I)<>"" THEN 780
740 FOR J=I TO N-1
750 W$(J)=W$(J+1)
760 NEXT J
770 N=N-1
780 PRINT : :"PRESS:"
790 PRINT "1 EDIT MORE WORDS"
800 PRINT "2 SEE CURRENT WORD LIST"
810 PRINT "3 RETURN TO MENU SCREEN"
820 CALL KEY(0,K,S)
830 IF K=49 THEN 550
840 IF K=51 THEN 160
850 IF K<>50 THEN 820
860 CALL CLEAR
870 IF N=0 THEN 320
880 FOR I=1 TO N
890 PRINT W$(I),
900 NEXT I
910 PRINT : :"PRESS:"
920 PRINT "1 EDIT A WORD"
930 PRINT "2 RETURN TO MENU SCREEN"
940 CALL KEY(0,K,S)
950 IF K=49 THEN 610
960 IF K=50 THEN 160 ELSE 940
970 PRINT "** LOADING PREVIOUS LIST
    **"
980 PRINT : :"INSERT DATA CASSETTE.
    ": : :
990 OPEN #2:"CS1",INTERNAL,INPUT ,F
    IXED
1000 INPUT #2:N
1010 FOR I=1 TO N
1020 INPUT #2:W$(I)
1030 NEXT I
1040 CLOSE #2
1050 RETURN
1060 CALL CLEAR
1070 PRINT "** SAVING LIST **"
1080 IF N=0 THEN 320
1090 OPEN #1:"CS1",INTERNAL,OUTPUT,
     FIXED
1100 PRINT #1:N
1110 FOR I=1 TO N
1120 PRINT #1:W$(I)
1130 NEXT I
1140 CLOSE #1
1150 RETURN
1160 PRINT "** WORD LIST **": :
1170 IF N=0 THEN 320
1180 FOR I=1 TO N
1190 PRINT W$(I),
1200 NEXT I
1210 PRINT : :"PRESS <ENTER> TO CON
     TINUE.";
1220 CALL KEY(0,K,S)
1230 IF K<>13 THEN 1220
1240 RETURN
1250 CALL CLEAR
1260 IF N=0 THEN 320
1270 FOR I=1 TO N
1280 T$(I)=W$(I)
1290 FL(I)=0
1300 NEXT I
1310 PRINT "YOU WILL SEE A WORD."
1320 PRINT :"PRESS <ENTER>."
1330 PRINT :"WHEN THE WORD CLEARS,"
1340 PRINT :"SPELL THE WORD THEN"
1350 PRINT :"PRESS <ENTER>."
1360 PRINT : : :"PRESS ANY KEY TO S
     TART."
1370 CALL KEY(0,K,S)
1380 IF S<1 THEN 1370
1390 SC=0
1400 FOR I=1 TO N
1410 CALL CLEAR
1420 F=0
1430 RANDOMIZE
1440 R=INT(N*RND+1)
1450 IF T$(R)="" THEN 1440
1460 PRINT T$(R): : :
1470 CALL KEY(0,K,S)
1480 IF K<>13 THEN 1470
1490 CALL CLEAR
1500 INPUT X$
1510 IF X$=T$(R)THEN 1630
1520 CALL SOUND(100,330,2)
1530 CALL SOUND(100,262,2)
1540 FL(R)=1
1550 F=F+1
1560 IF F=2 THEN 1590
1570 PRINT : :"TRY AGAIN."
1580 GOTO 1490
1590 PRINT : :"THE CORRECT SPELLING
      IS:";T$(R)
1600 PRINT : :"PRESS <ENTER> TO CON
     TINUE."
1610 CALL KEY(0,K,S)
1620 IF K=13 THEN 1410 ELSE 1610
1630 PRINT TAB(10);"ab";TAB(10);"cd
     ": :
1640 CALL SOUND(100,262,2)
1650 CALL SOUND(100,330,2)
1660 CALL SOUND(100,392,2)
1670 CALL SOUND(150,524,2)
1680 IF F>0 THEN 1410
1690 T$(R)=""
1700 IF FL(R)>0 THEN 1720
1710 SC=SC+1
1720 NEXT I
1730 CALL CLEAR
1740 PRINT "OUT OF";N;"WORDS,"
1750 PRINT :"YOU SPELLED";SC;"CORRE
     CTLY"
1760 PRINT :"ON THE FIRST TRY."
1770 PRINT : : :"TRY AGAIN? (Y/N)"
1780 CALL KEY(0,K,S)
1790 IF K=89 THEN 1250
1800 IF K<>78 THEN 1780
1810 RETURN
1820 PRINT "PRESS:"
1830 PRINT :"1 SAVE WORD LIST"
1840 PRINT :"2 END PROGRAM"
1850 CALL KEY(0,K,S)
1860 IF K=49 THEN 1060
1870 IF K<>50 THEN 1850
1880 CALL CLEAR
1890 END
```