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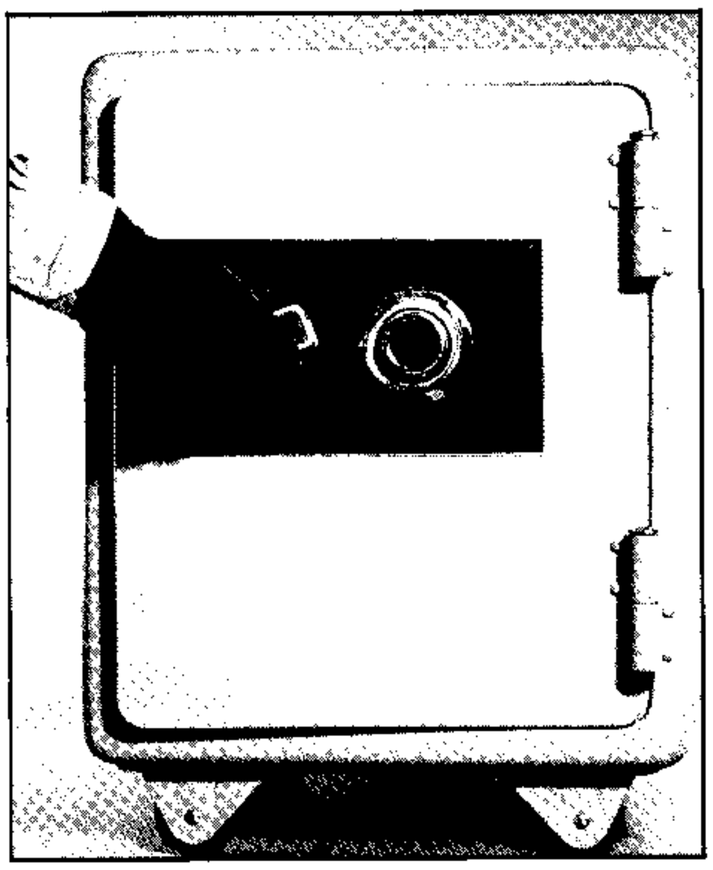

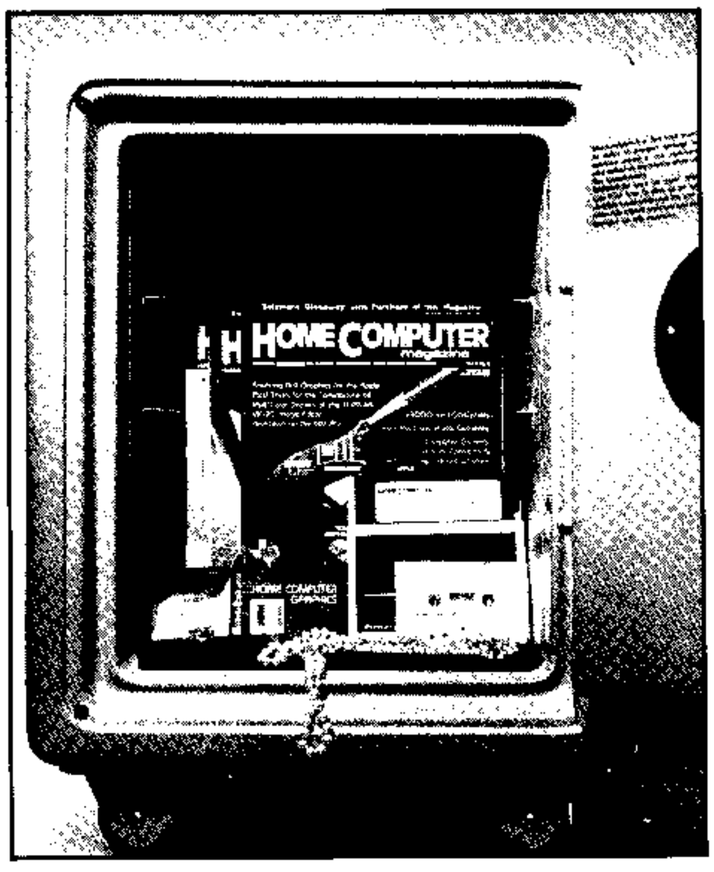

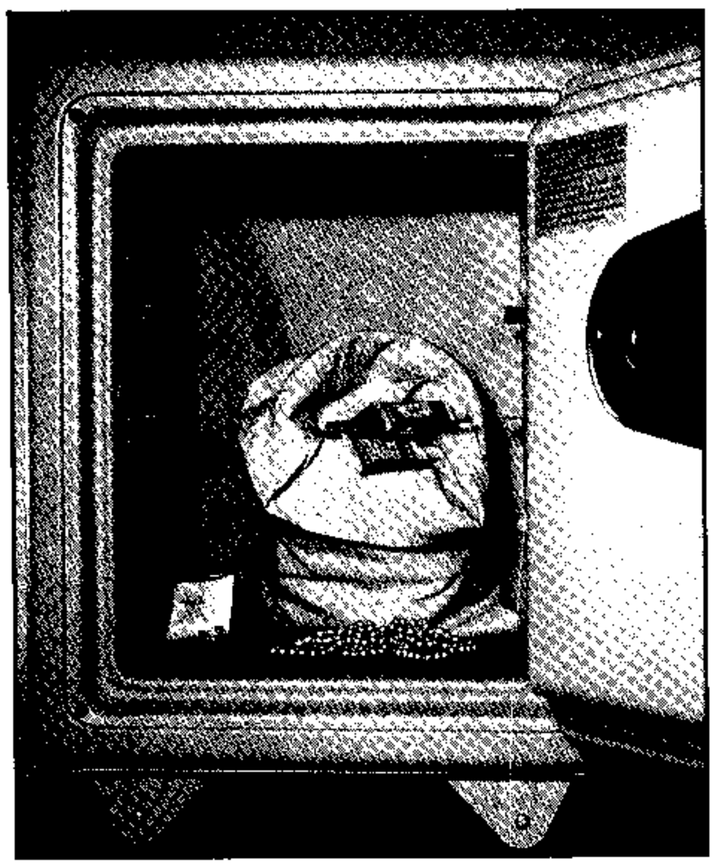

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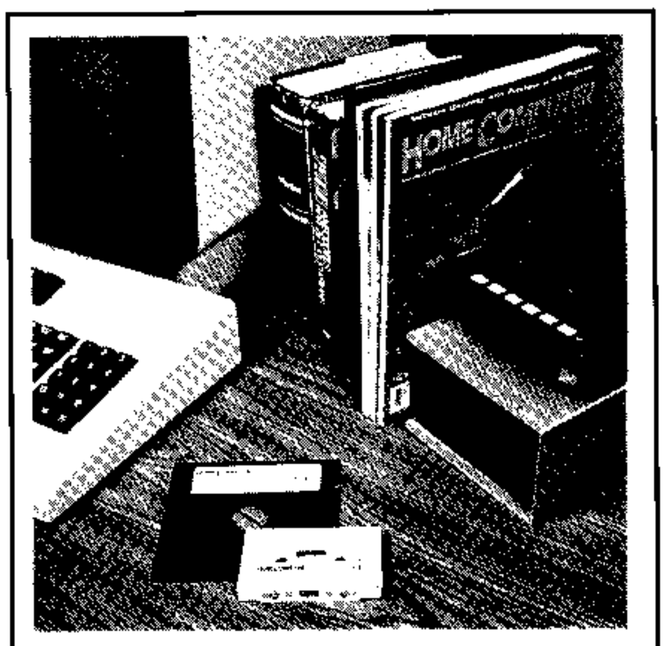

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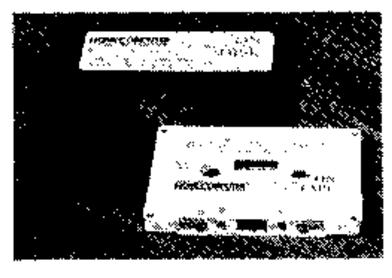

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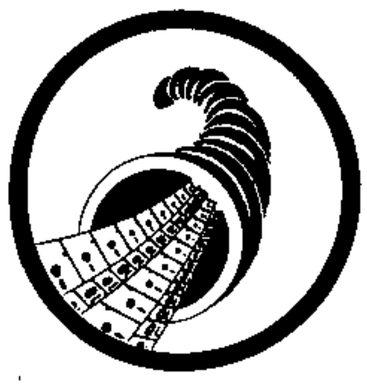

Every issue is a software "horn of plenty" with dozens of type-in-and-RUN programs printed in an easy-to-read listings format. Our programs are also available on inexpensive disks or cassettes for those who prefer the convenience of ready-to-RUN software. Step-by-step tutorials round out each issue, providing the solid facts you need without fluff or filler. Thus, each issue functions as an excellent reference work, as well as a valuable software source.

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Freed from the pressures of servicing *advertisers*, we concentrate on serving our *readers*. Each issue provides uninterrupted editorial flow and graphic layouts for better comprehension—plus unbiased product reviews which focus on true strengths and weaknesses, wherever the chips may fall . . . And we don't have to worry about losing advertisers because of publishing software in the magazine that is "too good." Consequently, we can provide the best free software available anywhere.

Focused on the 4 Hot Home Brands

We are 4 system-specific magazines under one wrapper—not a sprawling, "general interest" publication which attempts to cover too wide a field, only to spread itself too thin. The other side of the coin to this focused approach is the knowledge you gain from being exposed to the many tips, ideas, and techniques we provide for 3 of the 4 systems you may not even have. You'll learn more about your Apple, Commodore, IBM, or Texas Instruments home computer from this one magazine than from a host of more limited sources.

A Balanced Mix For a Perfect Recipe

In each issue we strive for a perfect balance of productivity, entertainment, education, utilities, and computer literacy—serving the needs of novice and pro alike. Every issue is a full-course meal, with a smorgasboard of tasty dishes for all palates. Whereas other computer magazines may dish out lumps of "editorial indigestion," we serve up a satisfying blend—one digestible byte at a time.

—Welcome to Our World of Home Computing

HOME COMPUTER magazine

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Outside HCM

As the cybernetic hand turns the crank, numbers spill and crunch into manageable bytes. Everything—be it conceptual, visual, or audible—is reduced to numbers in today's electronic grinder, the computer. Thus, as the mighty hand of software processes these numbers into useable tools (such as those found in the pages of this magazine) we wind our way from the Mechanical to the Information Age.

Inside HCM

CCcrrrrunnnnnnnnchhhh! It's the sound and fury of numbers crunching—although you don't really get to hear them as they grind away inside your computer. Numbers are to computers what Rice Crispies are to a pack of hungry kids: *deelicious!* In fact, a computer prefers pure numbers to any other fare, happily chewing its numerics morning, noon, and night.

To see this, you need only pick up our featured software package in this issue: *It Figures!* Give this handy program a bunch of values and a formula to go by, and it will crunch out an answer quicker than you can take a byte of your cereal. Then let the youngsters do some number-crunching of their own with *Laserithmetic*, an educational game pitting fast math against a pack of pesky aliens.

A computer can also turn numbers into letters—shuffling and dealing alpha characters like a stack of marked cards. In *Switch 'n' Spell*, another software program in this issue, your challenge is to take a "hand" of letters dealt by the computer and rearrange them into a bonafide word.

Some of our programs start anew, and others enhance some previously developed. Last issue, we premiered a new program, called *The Organizer*, that has been helping you (we hope) keep your thoughts in order. This time, with *Organizer Reports*, you can put those organized thoughts on paper—and do it with a variety of formatting options.

Once you're organized, be sure and check out our four "mini-columns"—one for each brand of computer we cover—for some quick-and-easy practical software procedures.

Providing software is "numero uno" at *Home Computer Magazine*; but we know our readers also count on our reliable reviews for the "true story." In this issue, we take a broad but unsuperficial look at *The Music of Sound* on the Commodore 64. This article explores the new software for turning the C-64 into a home organ/synthesizer by using its amazing sound chip. This should be of interest even to those who own other machines, because of the general trend these musical programs portend for the future of home computing. (Be sure to catch the first installment of our *Commodore Hornblower* column, which begins a series of modules to build a BASIC synthesizer.)

Among our other reviews, we delve into the world of CP/M, examining CP/M packages for the Apple *IIe*, and TI-99/4A—as well as take a brief look at CP/M on the PC and PCjr and the new version 3.0 running on the forthcoming Commodore 128. Apple users who want to get some real work out of their Apple *IIe* or *IIc* will benefit from our review of *AppleWorks*, an integrated word processor, database, and spreadsheet package. PCjr owners wishing to further enhance their machines can look at the *Legacy II PCjr Expansion*, which adds a disk drive and more memory to "Little Blue."

All this and more adds up to quite a number. You can always count on us at *Home Computer Magazine* to turn number-crunching to your advantage.

Until next time, have fun reading, learning, and RUNing

HCM

On Screen

By Gary M. Kaplan
Publisher & Editor-in-Chief

". . . each of you is invited to mail in a written response to this column, communicating your ideas. . ."

One of the benefits of publishing a magazine without outside advertising is the total editorial and artistic freedom such a format permits. You have already had the opportunity to see several issues in this format and to discover some of what's possible. So now it's time for all of us to sit down, take stock, and fine-tune this approach. With this goal in mind, each of you is invited to mail in a written response to this column, communicating your ideas on how this magazine can better serve your needs.

We have decided against using preprinted forms or questionnaires for this response, and instead are requesting a more "free-flowing" type of feedback. Preprinted forms may be easier to quantify and analyze, but we wish to gain a better "feel" for your reactions than a purely statistical approach can provide. To make this formidable job easier—saving us from having to wade through what could be tens of thousands of multi-page letters in all shapes, sizes, and forms—we hope you will stay within the spirit of the following guidelines:

1.) All comments should be typed or computer-printed using a dark ribbon on one sheet of 8-1/2- by 11-inch paper. Print on one side only and leave us ample room to make notes in the margins. PLEASE DO NOT ENCLOSE ANYTHING ELSE IN YOUR ENVELOPE EXCEPT THE ONE SHEET OF PAPER.

2.) On the top of the sheet of paper, clearly indicate your brand of computer(s), how long you have been a reader of our magazine, and whether you are a subscriber, a single-copy purchaser, or a pass-along reader. Indicate whether you type in programs, buy the media, or neither. Please also include your age (approximations are okay if you're sensitive about it) and see that your name, address, and telephone number are present.

3.) Please respond within two to three weeks of receiving this issue. All mail is subject to the same provisions as "Letters to the Editor" (as set forth on the Masthead page).

4.) Try not to be too wordy. Short phrases, an outline form, or brief notes are all appropriate. We're not looking for perfect essays or grammatically correct sentences. Remember, though, to be as specific as possible. Don't forget to fully explain your opinions.

5.) Please leave out any problems that are of a "customer service" nature—i.e., timeliness of receiving merchandise, issues, etc. The purpose of your response here is to comment on the *content* of the magazine.

6.) Things we'd especially like to know include impressions of each of our regular features or sections—whether they're of use, what you'd like to see eliminated, expanded, and/or replaced with what, and what types of programs you'd like to see in the future. Would you like more programs, less programs, more or less space in the magazine taken up with program listings? You can comment on the length of our features. Also comment on how we review products. Are we doing enough different product reviews . . . are we doing too much . . . are they too short, too long? How do you feel about our review criteria? Should we cover other programming languages in our articles? Are some of our articles too difficult? Too easy? Why? What are they?

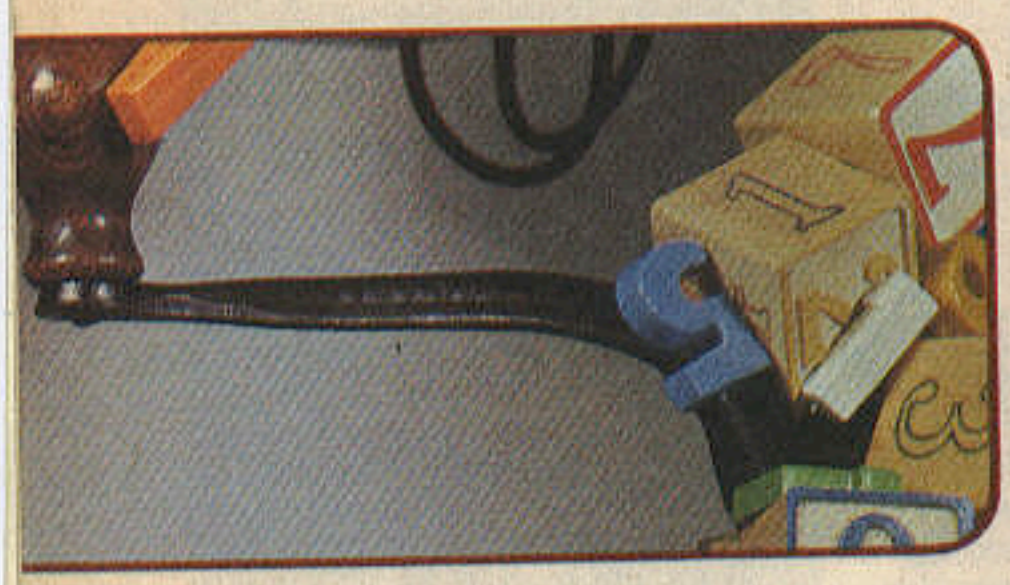
We know we're asking you to think a lot here, but it's *your* magazine, and we want to produce what you want—so let us know. To make things a little more interesting, we are going to select the best constructive response, and award that person a prize—a free trip. No, it's not to Hawaii, Europe, or the Caribbean . . . but to none other than Eugene, Oregon—to show the winner first-hand how we put together the magazine, and to discuss his or her suggestions. So stick your single sheet in an envelope plainly marked ON SCREEN FEEDBACK and address it to Home Computer Magazine, P.O. Box 70288, Eugene, OR 97401.

The feedback we receive will be acknowledged in this column as soon as possible, so you'll be able to find out exactly what other readers think—and as a result, what we are going to be implementing.

Starting with our next issue, we will be undergoing a major expansion in distribution. You'll be able to find us at many more mass-market magazine outlets and bookstores throughout the U.S. and Canada. This is an important action—ensuring that the widest possible audience of computer users are aware of our commitment to excellence, thus fueling our future growth. And as we grow in circulation, we will also strive to grow in quality. Your help and guidance will make this all possible. So become an active participant in this process—send in your constructive ideas; "show 'n' tell" us to your friends, fellow computer users, and favorite magazine/software outlets; and, above all—

Come Grow With Us.

HOME COMPUTER™ magazine



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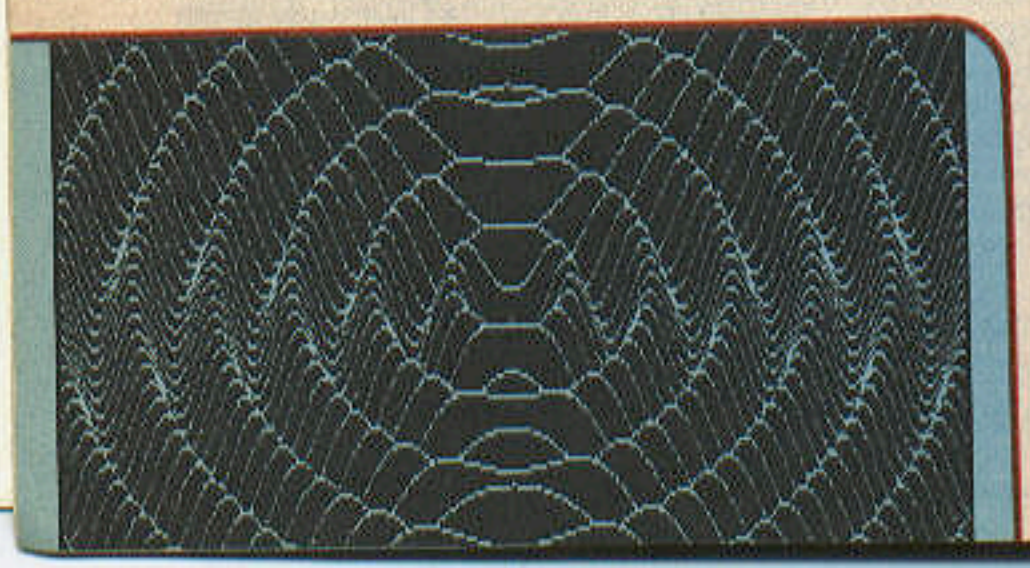

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HISTORICAL NOTE
99'er Magazine (founded in December, 1980) was the forerunner of Home Computer Magazine.

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Letters to the Editor

Program Version Confusion
Dear Sir:

I have two questions for you, but first I would like to say I enjoy your magazine very much and I am very glad to see that you are continuing to give good coverage to several home computers—especially the TI-99/4A. Thanks again for the great programs for free—I am not a subscriber, but I intend to become one the first of the year. Now for my questions:

1. In the August 1984 issue you ran the program Snap-Calc for the TI-99/4A (version 4.3.1). In issue Vol. 4, No. 5 you ran some "DeBugs on Display" for Snap-Calc for several computers. The Snap-Calc was version 4.3.3. What happened to 4.3.2? Also, several of the other debugs were not 4.3.2—Apple was 4.3.4, IBM 4.3.5, and Commodore 4.3.5. I know I did not miss any issues. Is this a misprint?

2. If I purchase ON TAPE for August 1984, will it be revised or will I have to edit it myself from the "DeBugs on Display" column?

G. Preuss
Bridgeport, CT 06606

The answer to your second question is shorter, so we'll talk about that first. At any given point in time that you order ON DISK or ON TAPE media, you will receive the latest version of all programs on that media. If more debugs are discovered and published after your purchase, those debugs will have to be merged into the program yourself.

Now, the answer to your first question: There was no misprint in the version numbers for the various machines. It is entirely possible for software to be revised several times between the publication of any two issues of Home Computer Magazine. In other words, between the time that Snap-Calc was originally published in the Vol.4, No.3 issue until the debugs appeared in Vol. 4, No. 5, the TI-99/4A version of Snap-Calc underwent 2 revisions, while the Apple program underwent 3 revisions, and the IBM and Commodore programs underwent 4 revisions. The debugs for Snap-Calc as listed in Vol. 4, No. 5 include all changes necessary to bring up-to-date the .1 version of each of the listings.

Starting with this issue of the "DeBugs on Display" column, we will include a line in each debug update listing that will tell you the previously published version number. For instance, if there are debugs for a version of Snap-Calc in this issue, they will only include the changes that have occurred since the last time debugs for Snap-Calc were published.

Even though you have a fully functional version of a program, be sure to watch "DeBugs on Display" for changes to that program. Often, readers and HCM staff come up with significant enhancements that get published in that column . . .

Once She Compared . . .
Dear Sir:

I just had a friend loan me 3 copies of your magazine. Since I am a relative newcomer to the ranks of "computer owner," I really needed a magazine with good, usable information. I had bought off the newsstand several other magazines to get a feel for each one and to see how well-suited each was to my level of experience as a neophite Apple owner/user.

Your magazine beat all the magazines catering to Apple owners. It is by far the best magazine I have ever seen for the home computer user anywhere.

Paula Farrell
Williamsville, NY 14221

Thanks, Paula. Why don't you tell your friends about us too . . . The larger the circulation, the stronger we become, and the better we are able to serve our readers.

. . . There Was No Comparison
Dear Sir:

This is my first time writing to this or any magazine. I wouldn't write unless I felt strongly about something. I first heard about your magazine when I bought my TI-99/4A. I recently bought a C-64, but I won't change my subscription to a Commodore-only magazine. You seem worried about losing some readers to one-computer magazines, but I think you have little to worry about. During the time that it took to convert your magazine, I did not receive any magazines for quite awhile. I called your telephone number, and the operator told me why it was taking so long.

Impatient as I was, coupled with the fact that I had bought a new computer, I decided to try a few other publications. I was placated. When I finally received my issue of *Home Computer Magazine*, though, I breathed a sigh of relief. It was like coming home. Your magazine is head and shoulders above the rest.

Since I realized how much I enjoy your magazine, especially since the ads have been removed, I have started recommending *HCM* to all of my friends.

Not only am I recommending *HCM*, I carry a subscription page with me, and give it to anyone who seems interested.

Please keep up the good work and feel secure in the knowledge that if you don't improve your magazine for five years, no one will threaten you.

David Sheldon
Jacksonville, FL 32205

That's quite a story of loyalty, David, and we appreciate it. We appreciate it so much so that we will not just sit on our laurels over the next five years and wait for other magazines to catch up. We will continue to improve Home Computer Magazine—to not only stay on top, but to increase the distance between us and our competitors.

TI Fitness Programs Stocked
Dear Sir:

As a footnote to your product source information in the recent article on fitness software in *Home Computer Digest*, three excellent fitness and nutrition programs are available for the TI-99/4A from Tex-Comp:

The TI Physical Fitness module leads the user through a complete exercise program with a graphical demonstration of each exercise; the TI Weight Control & Nutrition module actually works out a daily diet to reach a desired weight and comes with a recipe book; and Exer-Log is an all new database-type program which keeps track of your exercise activities and calculates calories burned.

Jerry Price
Tex-Comp/P.O.Box 33084
Granada Hills, CA 91344

Thank you, Jerry, for your update on the software availability.

Simon's BASIC Cartridge
Dear Sir:

I am requesting information about an article on page 45 of Vol. 4, No. 4 called "Simon Sez." I am very interested in receiving information about the Simon's BASIC cartridge.

Nancy L. Taylor
Alvin, TX 77512

Continued on next page

Letters to the Editor CONTINUED

A Simon's BASIC cartridge and manual is available through your Commodore dealer, Nancy, for a suggested retail price of $34.95. This cartridge plugs into your Commodore 64 and adds 114 additional commands and functions to Commodore BASIC, making the C-64 much easier to program.

PCjr Second Drive Problem
Dear Sir:

I would like to address a problem I encountered when attempting to add a second drive to my PCjr.

After adding the modifications to the Junior's disk controller card, I got repeated error H's when the system ran its self-tests. At this point, I set up a digital multimeter to monitor the drive select signal for drive 0. I noticed that the select line was being pulled to approximately .9v, which is not a valid logic false level. After checking the data book for the specs on the 74LS10, I decided that the chip might not be able to sink enough current to activate the drive. At this point, I changed the 74LS10 to a 7410 device. From that time on, the system has worked fine.

I would like to add that I contacted Mark Beifuss after reading in *HCM* that he too was encountering the Error H problem. He too made the change to the 7410 and phoned me to say that it also fixed his problems.

I had almost written off purchasing the Junior because of the need and expense of purchasing the special equipment required to add the second drive. After reading your article, I decided to purchase the Junior and I am totally pleased with the machine. Keep up the good work.

Randall Baxter
Garland, TX 75040

Interesting point, Randall. The systems that we have in operation at Home Computer Magazine do use the "LS" chip made by Texas Instruments. Perhaps the specifications between manufacturers of the same chip are somewhat different. The LS (low-power Schotky) series of integrated circuits was selected because of its noise immunity and low power consumption. In this particular application, the 7410 does work better as a "line driver" and may solve problems for people having trouble with the modifications. For anyone that is having a problem with their conversion, we suggest replacing the 74LS10 with the 7410 integrated circuit as Randall suggests.

In addition, the kit that Home Computer Magazine offers will substitute a 7410 in place of the 74LS10 in the future. (The kit includes the special cable required and the two integrated circuits for $49.95. Refer to this kit as the PCjr Disk Drive Kit.) If you have already purchased the kit from Home Computer Magazine and are having the problem described above, let us know via a letter and we will mail you a 7410 integrated circuit at no cost.

POKEing Around Mac
Dear Sir:

I am the owner of an Apple IIe and an Apple Macintosh. To protect LISTing on the IIe all I need to do is type in POKE 1011,0:POKE 214,255. It prevents anyone from pressing [CRTL] [Reset] or [CRTL C] and LISTing the program. Neither of the POKEs work on the Mac. What is needed to do the same thing with the Mac? Do you know of any other POKEs that would be helpful?

I live in Arlington, Washington and have yet to see a *Home Computer Magazine* on a newsstand. I don't know why, because it is the best computer magazine I have ever read.

Dan Stuart
Arlington, WA 98223

Although we use the Macintosh on a daily basis in our Editorial Department, Dan, we have yet to "get inside the box." Perhaps another reader that is a "Mac hacker" will write to us with an answer to your question.

Starting with our next issue, you will be able to find Home Computer Magazine in many more mass-market type outlets. This major expansion in our distribution has been delayed until now because of many changes we've undergone to "arrive" at our new format and frequency.

Braille Processing Needed
Dear Sir:

I need assistance in locating any information that is available on a braille reader and a braille typewriter that could be interfaced into the Commodore 64 home computer. The interfacing of the two would not be a problem, but finding a 6-point strike head printer seems to be impossible.

Brad M. Johnson
Marengo, IL 60152

We don't have the answer to this one for you, Brad, but it sure sounds like a good question to submit to our readers. How about it out there? Anyone know of a braille typewriter and reader that can be interfaced to a home computer?

TI Short-Wave Links
Dear Sir:

I would like to combine my hobbies but I don't know how. I would like to connect my TI-99/4A to a short-wave receiver which is tuned to receive teletype signals from news service transmitters. I would like the computer to interpret and present the teletype signals as text on my monitor.

If an article about this subject has been written, I would appreciate it if you would send me the date of the magazine. Otherwise, this might be a suitable subject for an article.

I.J. Kenner
Severn, MD 21144

Yes, we thought that was a good idea for an article too. Please refer to the Vol. 5, No. 1 issue of Home Computer Magazine, page 43, where you will find an article entitled, "Computer Links to Amateur Radio" which covers several combination hardware/software solutions to the reception and conversion of short wave signals to on-screen text for home computer owners. You will find information applicable to IBM, Commodore, Apple, and TI computers in this article. One additional note, which is repeated in the article itself: Most large news organizations that transmit via radio teletype encode their information so that it is only decipherable by subscribers to their news service.

Axiom Delivers a Lemon
Dear Sir:

I bought a GP550TI printer from Axiom Corporation because of the article in your magazine.

The print is bad, to say the least. And, as you can see from the enclosed memo from Axiom, "What you see is what you get."

I wish your article would have been more detailed about the print before I put down my hard-earned money.

Let others know just how bad the printer is—if you can stand the heat.

G. Jester
Warner Robins, GA 31093

We are sorry, Mr. Jester, that you have been having problems with your Axiom printer, but we wish to point out that the printer you purchased is a different model from the one that we reviewed. We reviewed the GP100 TI II, not the GP550TI. We talked to the factory about your printer problems. They recommended that a lighter weight paper, such as 12- to 15-pound bond, be used rather than the 20-pound bond that your letter was printed on. They also suggested the use of a high-quality ribbon to improve the print quality. We hope this helps to get you better results.

King's Quest Completed on Jr.

Dear Sir:

I read your article in the December issue of *Home Computer Magazine* about King's Quest. I am writing to inform you that we at Shillito Rikes Computer Depot in Cincinnati's Tri-County Mall have solved the popular adventure game. The group included Tom Walton, Tim McNamee, Doug Pemberton, Eric Begehr, and myself, Dennis Krabbe. We gathered the three primary treasures: the treasure chest, the magic mirror, and the magic shield, then headed for the King. But to our surprise, the adventure had one more task to be accomplished before Sir Grahame could inherit the throne.

We started our quest on December 1, 1984 and ended up solving the adventure on January 8, 1985. We all shared our discoveries with each other, which made it possible to solve this complex adventure so quickly.

Dennis G. Krabbe
Cincinnati, OH 45246

What can we say, Dennis, except, "Hail the conquering heroes and long may they live!" Congratulations on your completion of the Quest.

TI/IBM Shared Printer

Dear Sir:

Although I have been a follower of *99'er Magazine* and *Home Computer Magazine* for a number of years, this is the first time I have felt the urge to write you. I was introduced to your magazine a few years ago by my brother, who said it was an excellent source of information in regard to my recently purchased TI-99/4A. I have since added several attachments, including the 99/4 Impact Printer. Unfortunately, my wife's and my work required that we have an IBM PC compatible. The 99/4 Impact Printer would not work with our Compaq and neither the store I bought it from nor TI-CARES could help. I was, therefore, resigned to purchasing a second printer at $300 plus.

While glancing through your Vol. 4, No. 5 issue (I miss the dates!) I chanced upon "C-64 to TI Printer—The Missing Link" in your "Letters to the Editor" section. Remove the serial card and you have a Centronics parallel Epson MX-80. Holy compatibility! A forced march to the land of Big Blue and $49.95 netted us a parallel printer cable looking strong enough to stop a Tiger tank. IT WORKS! Now if I could find a sneaky little switch that would allow me to disable the serial card externally, I would have a printer for all reasons. Know any?

Your magazine has paid for itself many times over in the past, but never quite like this. On the down side, I do miss the ads, which were as much a source of information as the rest of your excellent publication. Please reconsider this position. In any event, your magazine is still one of the best around for the home computer user.

Christopher R. Law
Wilmington, DE 19810

Christopher, we don't know of any simple way to disable the serial interface. But there may be an alternative. If your TI home computer system has the peripheral expansion box and the TI RS-232 interface, you already have a partial solution. By obtaining the special cable that connects the parallel interface port between the RS-232 board of the TI peripheral expansion box and your printer's parallel Centronics port, the same interface can serve both computers. This port is then accessed via the device name of "PIO" in your TI software instead of using RS-232 . . . Then when you want to switch from one machine to the other, you need only unplug the IBM cable from the printer and plug in the TI cable.

C-64 Bulletin Board

Dear Sir:

Should you be compiling a list of Commodore bulletin boards, you might want to include mine. My system has been in operation for a bit shy of a year. It operates 24 hours a day and is rarely taken down as I have a backup computer with which to do my maintenance.

Write to the following address for more information:

Twin City Express
Box M
Mendota, MN 55150

The (612) 778-0506 Commodore Info & Message Bases number operates using a standard Commodore 64, a Westridge modem, three 1541 disk drives and a Comrex mini-monitor. The user log is recorded on a Mannesman Tally MT-80 printer.

James Meehan
St. Paul, MN 55106

Thanks for the information, James. Commodore owners with modems take note: If you wish to use the bulletin board you should drop a line to the address above to receive an access code from James, so that you can log-on to the system.

Apple Double Hi-Res Plotting

Dear Sir:

I own an Apple IIe and an 80-column card (Rev B). I am trying to use the double high resolution for better plotting. The molex-type pin is in place, but I don't know where the Annunciator 3 soft switch is.

Once the double high resolution is activated, do I need to do anything special to plot on the screen? Would HPLOT 340,30 work?

Brian Kramer
Boise, ID 83704

The double hi-res mode on the Apple IIe and IIc requires quite a bit of software to access, Brian, and is much too complicated to explain here. It requires special assembly-language drivers to interface with Applesoft BASIC. Unless you are an experienced assembly language programmer, we don't recommend trying to access this capability on your own. A number of software packages are available (notably the Doublestuff package from Doublestuff Software, Inc. 2053 West 11th Street, Brooklyn, NY 11223) that make accessing double hires a breeze. For $39.95, the Doublestuff package is a good buy. For a complete review of this package, refer to Volume 4, Number 3 of Home Computer Magazine.

Parallel Port Shortcut for Jr?

Dear Sir:

I am trying to determine the most economical way to equip my PCjr with a parallel printer port that would

Continued on next page

accommodate a printer such as the Epson FX-80. My reason for writing is that I knew your magazine had construction articles from time to time and I thought I might check to see if you had done one on this subject.

Louis F. Ostendorff
Bluefield, WVA 24701

No, Louis, we have not run an article on how to add a parallel printer port to the PCjr and we would be interested in knowing if anyone out there has done such a project. If so, they might care to submit their design and an article for publication in Home Computer Magazine. We would certainly consider publishing it.

Fast 99/4A Auto Spell-Check

Dear Sir:

I am writing to compliment you on your fine review of my product, 99/4A Auto Spell-Check. [See Vol. 4, No. 5—Ed.] Your review was concise, objective, and most importantly, accurate. Interestingly, you reported what, in my opinion, is the only significant flaw in version 1.0—SPEED!!! Now available is the faster 99/4A Auto Spell-Check version 1.1. Version 1.0 checked a 100-sector document in about 21 minutes, while version 1.1 checks the same document in about 6.5 minutes.

I wanted to let you, and particularly your readers who own version 1.0, know about this significant improvement. Owners of version 1.0 should send their original diskette and $3 to Dragonslayer ASC, 2606 Ponderosa Drive, Omaha, NE 68123 for an update. Others may purchase 99/4A Auto Spell-Check version 1.1 from their local dealer or favorite mail-order outlet.

Again, thanks for your continued support of 99/4A owners.

Thomas W. Kirk
Dragonslayer ASC
Omaha, NE 68123

Thanks, Tom, for sharing this information with us on the upgrade of your Auto Spell-Check product.

Low-Cost Word Processor

Dear Sir:

I have been subscribing to your publication ever since I purchased my TI-99/4A home computer and have been very satisfied. I have several questions which I thought you might be able to help me answer. I have tried several sources and am now so totally confused that I need a "disinterested" party to help.

My wife will be starting some graduate school programs in the next few months and will need to do some manuscript word processing. There is not the need for an especially sophisticated system, yet there is no sense getting "junk." I do not have disk or memory expansion (and would like to avoid spending the $500+ needed to get them at this time). I do have Extended BASIC, however.

I would very much appreciate your suggestions on the best way to go, given my needs and restrictions. I realize that a $50 program will not do what one ten times as expensive/fancy will, but at least it will get us started.

Hoyt E. Allen, M.D.
Kaufman, TX 75142

We suggest, Dr. Allen, that you stay tuned to Home Computer Magazine. In the next issue we will be doing a review of a product called Missing Link, a package that includes simple word processing software and the necessary hardware to allow connection between a printer and the joystick port on the TI machine.

Apple "Hello" Broken?

Dear Sir:

Your *Home Computer Magazine* for top home computers is the best that I have seen so far. I feel your magazine will be hard to beat.

In 1984 my wife and I had a big year. We were blessed with our first child, we purchased some land to build us a home on in a few years, and we bought an Apple IIc. As you can see, there had to be a shift in our spending priorities. The belt has been tightened, but your magazine makes owning and operating a home computer affordable. The program listings and the reviews are very appreciated.

On page 6 of your August 1984 issue (Vol. 4, No. 3), I found a "hello" program for the Apple. When I tried using it, I got the message BREAK IN 320. I am wondering, was there an error in line 320, or was it written for Apple IIe's only?

Ken Brantley
Shreveport, LA 71107

Thanks for the compliments, Ken, and congratulations on the additions to your family. The problem you experienced in trying to run the HELLO program is probably due to the fact that you are running under ProDOS, and the program you typed in is only DOS 3.3-compatible. If you order our ON DISK for 4.3 (which is a DOS 3.3-based disk), and key in the HELLO program that you found on page 6, it will work as stated in that letter.

C-64 Software Rx Search

Dear Sir:

We are trying to locate a Physician Accounts Receivable program for a Commodore 64. Please help us locate such a program and perhaps other programs set up for physicians.

James R. Gwilliam
Huerfano Memorial Hospital
Walsenburg, CO 81089

We are not aware of the availability of the particular program you describe, James, but this does not mean that it does not exist in the large world of Commodore software. In fact, it probably does. A call to Commodore, however, did not turn up any leads. We suggest that you contact the Commodore users group that is closest to you. In this case, we believe it to be the Western Slope Commodore User Group, 535 Main Street, Grand Junction, CO 81501, (303) 242-0083. If any readers know of any medical-accounting software for the C-64, please let us know.

SUBSCRIBER LABEL CHANGES

Starting with this issue, the first line of the subscriber mailing label has been modified to clearly indicate which issue will be the last in your current subscription. The sample mailing label below illustrates the new format:

```
95000ALEXAND V06N08 H12987090
DONALD ALEXANDER III
4321 BROWNING STREET
CONTINENTAL CA 95000
```

Notice that the first line is composed of three sections: (1) The first section is a computer search code for our use, (2) the last section is the actual subscriber number, and (3) the middle section tells you with which issue your subscription expires. In this case, V06N08 means that the Vol. 6, No. 8 issue will be your last.

HCM ONE-LINERS

Here they are . . . the best of the one-line programs that we have received since printing the first "*HCM* One-Liners" column in *Home Computer Magazine* Vol. 4, No. 5. Although many interesting programs were submitted, we have selected what we felt were the best four (one for each brand of computer covered in our magazine) that arrived prior to this issue's press date. If you have not yet submitted your masterpiece, it is not too late! As long as we keep getting great one-liners written in any computer language, we'll keep filling this page for you. Our prize winners this issue will each receive a check for $50 for sharing their ideas with our readers.

Crossing Axis

[Applesoft BASIC on the Apple *IIe*, *IIc*]

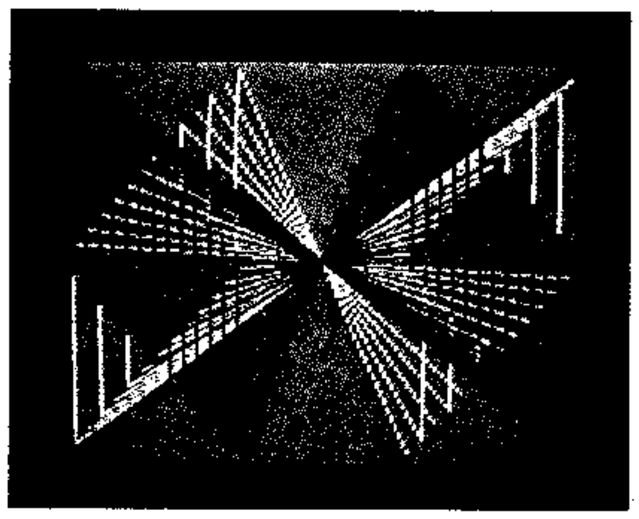
Dear Sir:

"This is a one-liner graphics program called Crossing Axis."

[NOTE: This program must be entered without spaces.]

Andrea Sigurdson
Sidney, BC, Canada

```
1HGFRO2:FOORT-HO=95,355TSTO4:H7C:OLPOR=
H:A=270=05A,95+51+51+59ASATO-E-E-O-O-TA
,95:AOA=0TO,RTOA=0TA-AOA5=AT19:PA7,7V=2
A7O-2TO3A6):NE:XT0E-O27:PA7,75S=PH:E9,K
NHPEXL6                    0N      XT  TH  GT
01
```



Moving Color Fun

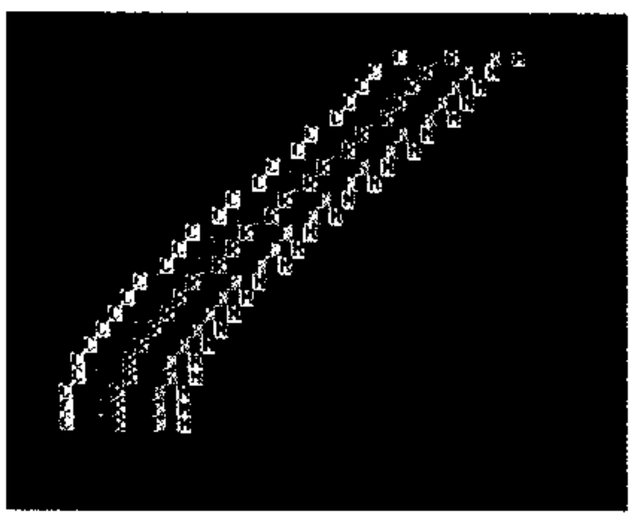
[Commodore BASIC on the C-64]

Dear Sir:

"My submission makes the words COLOR FUN move down the screen in a special pattern. In order to fit my submission into one line, I had to abbreviate the form of BASIC keywords. To make the program run correctly, do not omit any spaces unless it says /SKIP TWO SPACES/. To slow down the program while it is running, press (CTRL)."

John Skiba
Lemont, IL 60439

```
1 5F9 STSHI=0.T1O:5?*3.5H+5;
1 T) ;LSNCTNOFOFEIRSYHFTL"S(IRLYRSHE
5 RVRT  CONTRLCTRLCTRLCTRLCTRLCCNTEWEL
HD  EN  DE :?  CT  CT  FT  LA  ):  RE
RG                  SL  "  :9  "  LH
F                   VR          SH
                    WI          IE
```



Linear Graphics

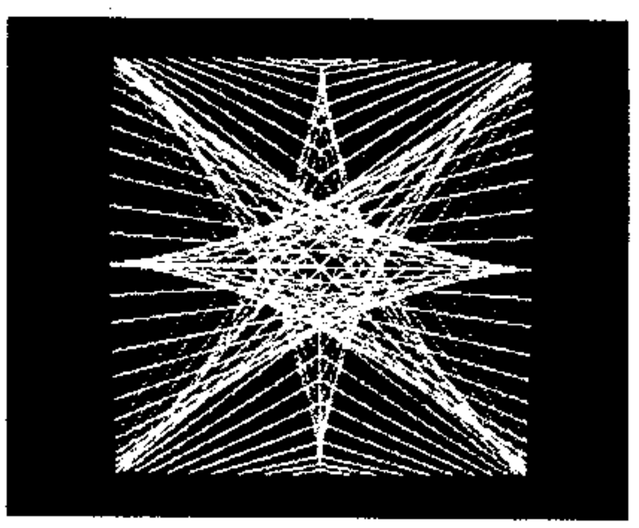
[BASICA on the IBM PC, Cartridge BASIC on the IBM PCjr]

Dear Sir:

"This one-line program produces some interesting graphic designs. It was written on a Sanyo MBC-555 and was changed slightly to run on the IBM PC."

Greg Lane
Willard, MO 65781

```
1 SC=R1LE)ETS/P*)+)NO:F/P,25O1I9Ø0E,X2,ØP:IXF:3-N=OL2(TZØ(:  Y.N,NCNN  O8O=NSXXF3ØTSTTF1P(IZ:8ITNCN)XD:F5OTO(*::O3S(SX9FN
RØTPS()9OE)RXT 7EIX*)RX  N#P)2+D  S(*1ØD  LE)9)Ø=N:GTO  N:F/P11ØØE  O  1/)Ø,X2  N+)IT51  -N Ø  (  2TZEITOEE  N(SXX  (TST  I(IZ  (SX9FN
```



Some Sums

[TI Extended BASIC on the TI-99/4A]

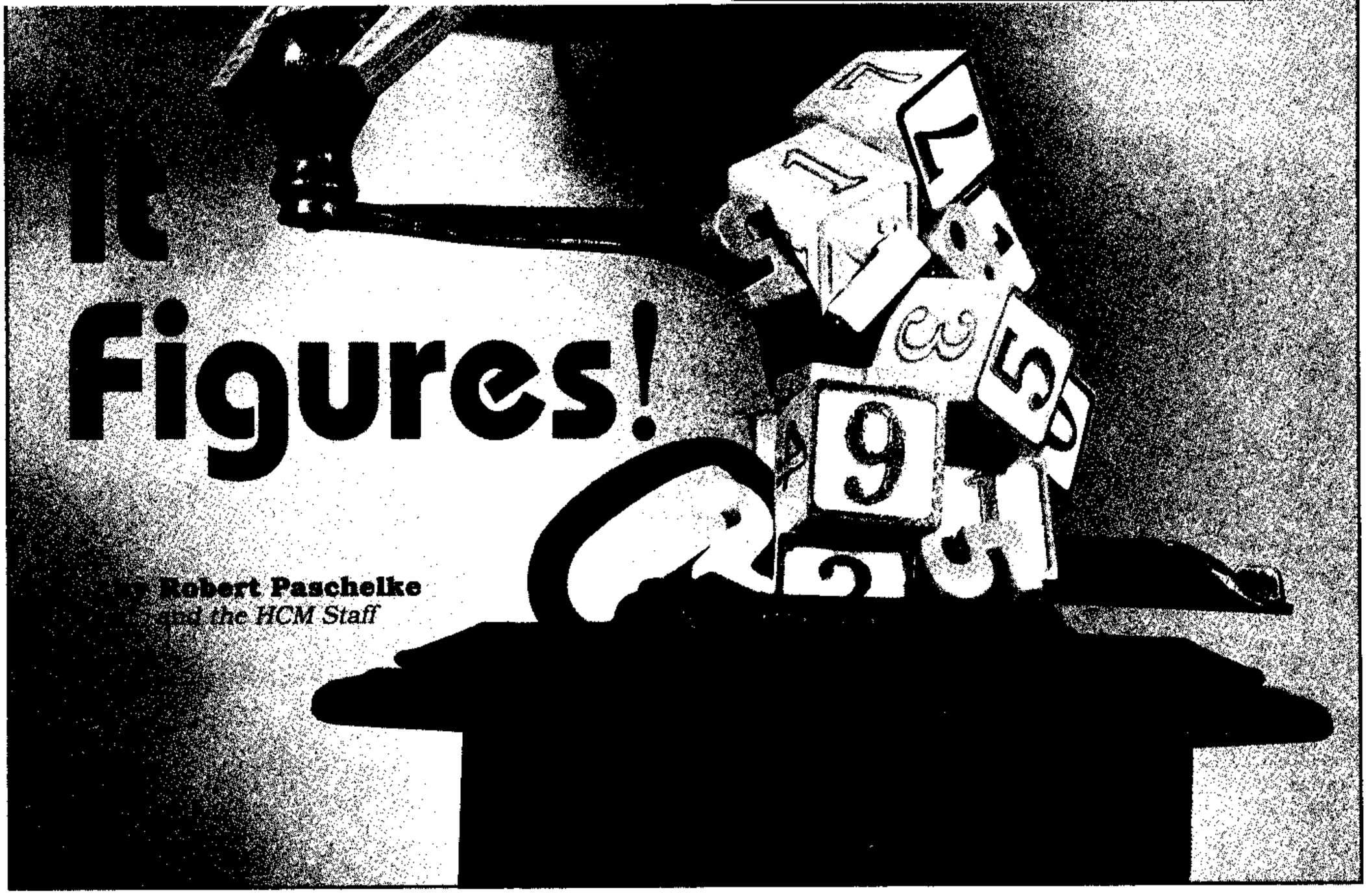
Dear Sir:

"This program displays an addition problem, then waits for an answer and tells you if the answer is right or wrong. Any key may be pressed to go on to the next problem. Type in the program until you hear the beep, then press (ENTER), then press (FCTN) 8 and finish typing in the program."

Steve Lisonbee
Orem, UT 84057

```
1 RN:AD:N+D1O)M:IZ EB=  :: A=(N&E=AT1"+TR1"(1D)0+
*1 )AS(EB1)7DI:PL LS  IN TA(&)CC"PD+$ W  N&A STT(E
RR1 2N  I  N:S  "SR EU  I GI FN PU T  "  R OT HN
EG "N:D $  :  L  R  I  I  I  I  I  I  I  I  I  I
```

All One-Liner submissions are subject to the same publishing criteria as Letters to the Editor (explained in the magazine's Masthead on page 4). If you have written a great One-Liner in any language on any computer covered by *HCM*, send it addressed to: Home Computer Magazine, Attn: Letters to the Editor, 1500 Valley River Drive, Suite 250, Eugene OR 97401. You too may win a cash prize and be immortalized in print!



Whatever your problem, you can reach a solution . . .
. . . but you must have the right formula!

Are you a physics student working with motion equations? Or a worker planning a savings strategy? Or perhaps a home owner figuring the cost of a new carpet? Many of us often encounter situations in which we want quantitative results only a mathematical formula will provide. If only we could just run to the computer, type in the proper formula, enter some values, and get a quick solution . . .

It Figures! is a handy mathematical tool designed to do just this job. It allows you to use up to 8 variables to create even a complicated formula, and then calculate its answer. Think of a variable as being a bucket: we identify each bucket with a name or symbol, then we fill them with different numeric values. (We're not going to consider string variables in this program.) When we express some mathematical relationship between the different buckets (variables), we have put together a formula that can be evaluated for all the possible variations in the contents of each bucket.

In this program, each variable can be assigned both a value and a formula. If there is no value (or a value of zero) assigned to a variable, its equation, when calculated, will yield a value for it—depending on the values in the other variables. If the other values in a formula are changed, and the formula is recalculated, the value of the current variable will also change. For example, we will assign these 3 variables the following values:

```
A=12
B=20
C=25
```

A has the formula B+C= and the value 12 assigned to it. If we calculate A, it will use the current values for the variables within the formula B+C= and place the result back in A. After the calculation, A will have a value of 45. A variable can also appear within its own formula. For example, the formula for A could have been A+B+C=, which—when calculated—would have placed 57 into A. Notice that when A was used inside its own formula, that the current value for A (12) was used to calculate a new value. The program does not update a value for a variable encountered within its own formula until the entire calculation is complete. Only the current value (the one last calculated) is used.

Numeric Functions

Every numeric function available in BASIC is incorporated into this program. A list of available functions is as follows:

Command	Function
ABS	ABSolute value
ATN	ArcTaNgent
COS	COSine
EXP	EXPonent
INT	INTeger
LOG	LOGarithm
RND	RaNDom number
SGN	SiGN (+ or -) returns 1, -1, or 0
SIN	SINe
SQR	SQuare Root
TAN	TANgent

For a detailed explanation of each function, consult your BASIC reference manual. The syntax for each function is: FN(P)

FN is the function name, and P is the parameter. For example, you would designate the sine of A as SIN(A).

Using the Program

It Figures! screen is divided top to bottom into 3 main "windows": a variable list, a formula window, and a "help" window. The upper window is also divided into a value field and a variable label field. Eight variables are displayed in this upper window. Each variable row

includes (left to right) the variable letter, an equal sign, the value of the variable, a colon, and the variable label field. The value and label fields can be edited with the edit keys (insert, delete, erase, etc.) which are listed in your system's Control Capsule. To toggle between these two fields, press either [ENTER] or [RETURN], depending on your system.

To make it all easier to understand, we will take you through each step of the program, using an example formula that calculates the "future value" of a savings deposit. The formula is:

B ((C + 1) ^D) = A

where:

A is the future value of the deposit.
B is the present value.
C is the interest rate.
D is the number of years compounded.

To assign a value to any variable, simply move to its value field and type in the value—then toggle to the label field and type in a label. For example, move to A, leave the value as 0 (it's our unknown), and then toggle over and enter FUTURE VALUE as a label. Next, toggle back to the value field, move down to B, enter 1000 as a value and PRESENT VALUE as a label. Continuing on, enter C equal to .0525 and label it INTEREST PER YR; then enter D equal to 12 and label it YEARS.

You can also assign a formula to any variable. To do this, move the cursor to the row containing the variable and press the Edit key for your system. In this case, move to A and press the Edit key. The cursor will appear in the formula window and the current value field for A will be displayed below the cursor (as A = 0). The current value to be calculated will always be displayed here, along with its assigned formula.

If there were already a formula assigned to this variable, the formula would be displayed in the formula window, and the cursor would be on the first character of the formula. Because there is no formula yet, the cursor is on the first character position of the formula to be entered.

From this point, the formula can be created or edited using the editing keys. To complete entry in the formula window, press the appropriate key to return to the variable field you left when the formula field was called. The last formula you worked on will continue to be displayed in the formula window until another formula is worked on or created. Now, try entering the above Future Value formula.

Calculating

You can calculate any formula for a variable by moving the cursor to a row that contains the variable you want to calculate. To solve that variable's formula, press the Calculate key for your system. As yet, we have only entered a formula for A, to calculate the future value of our $1000 deposit. Try moving to A in the value field and press the Calculate key for your system. After a few moments, you will see a calculated value appear both in the value field in the upper window, and after the current variable displayed in the formula window. You can now assign formulas to any other variables, such as this formula for D (years or times compounded):

(LOG(A/B))/(LOG(C + 1)) =

Or, you could define a new unknown variable—like E

"If only we could just run to the computer, type in the proper formula, enter some values, and get a quick solution . . . "

for INTEREST EARNED—and assign it a formula, such as:

(B*((C + 1) ^D))-B =

or

A - B =

You might notice that if you enter both of these formulas and try some examples, they may not come up with precisely the same answer. This is due to the limited accuracy of your computer. [For more on this subject see "Microcomputer Accuracy" in *Home Computer Magazine*, Vol. 4, No. 1—Ed.]

As an aid to increased understanding of how this versatile tool may be called upon to perform its useful, numerical magic, we have provided more examples in Figure 1. You may use these just for practice—or, for a practical purpose. (Although the sample formulas we give here are fairly simple, the program can handle any complicated formula as large as 78 to 84 characters, depending upon your system.)

Figure 1
Sample Formulas

1. To calculate the height a rocket will reach in a certain time if the initial velocity is known:

(B*C) - ((D/2)*(C ^2)) = A

where

A is the height reached (feet).
B is the initial velocity (feet/second).
C is the time in seconds.
D is the gravitational acceleration (32/ft./sec./sec).

2. To calculate the cost of material (carpet, siding, etc.) covering a certain area:

B*C = A

where

A is the total cost.
B is the cost of material ($ per sq. ft.).
C is the surface area (sq. ft.).

If B is in square yards, the formula is:

B*(C/9) = A

3. To convert ounces to grams:

B/C = A

where

A is the number of grams.
B is the number of ounces.
C is the conversion factor (.035 in this case).

This formula can convert virtually any U.S. weight or measure to metric with the appropriate conversion factor obtainable from most common dictionaries.

Further Options

By pressing the Print key for your system, you can get a hard copy of the current contents of your variables, their present values, their labels, and the formula.

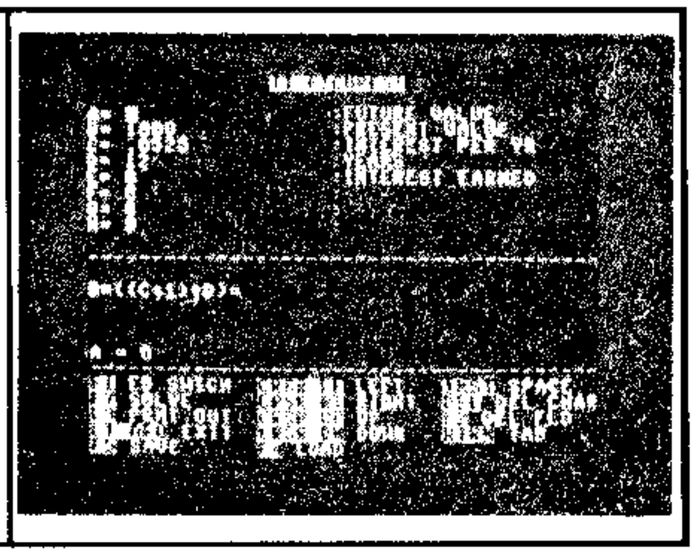
You can save and recall your variables and formulas with a disk or cassette tape (on systems with a cassette interface). Every time you save a file, you are saving *everything* in memory, including all present values. You may update a file by saving to the same file name; or you may save to a new name, creating a new file to hold your latest changes.

A Note On Formulating

This program works through any formula from left to right—hence, the equal sign sits all the way to the right (you don't need to add the unknown variable after the equal sign). You must take this into account when entering a formula, because the order of operations is very important in getting the proper result. Technically speaking, you must "force the precedence of operators" with the placement of parentheses. For example, in the formula B*((C+1)^D)= had we not placed a parenthesis on both sides of (C+1)^D, the program would have multiplied B times (C+1) and then would have used the resulting value under the exponent D. Placing the outside parentheses around the entire statement (C+1)^D ensures that B will be multiplied by the value derived from that statement.

If an equation does not end with an equal sign, the full input field of 80 characters will be read and then calculated. Otherwise, the program will read to the equal sign and calculate immediately.

For *your* key-in listings see HCM PROGRAM LISTINGS Contents.



This representative screen photo taken from the C-64 version of the program shows the formula for figuring the value of a savings deposit and the relevant values.

C64

CONTROL CAPSULE
It Figures!

KEY	FUNCTION
F1	Move to formula-edit field (create or edit formula).
F2	Blank a line.
F3	Print formulas (hard copy).
F4	Load formulas (disk or tape).
F5	Save formulas (disk or tape).
F7	Calculate a variable (update results in variable table).
[RETURN]	Tab between variable and label fields.
Ins	Insert character (all fields).
Del	Delete character (all fields).
←	Escape (from formula-edit field to variable-edit table; from variable-edit table to a prompt asking users whether they are sure they want to exit the program).
Crsr right	Move right one character.
Crsr left	Move left one character.
Crsr up	Move cursor up one line.
Crsr down	Move cursor down one line.

CONTROL CAPSULE
It Figures!

KEY	FUNCTION
Ctrl E	Move to formula-edit field (create or edit formula).
Ctrl B	Blank a field.
Ctrl P	Print formulas (hard copy).
Ctrl L	Load formulas (disk or tape).
Ctrl O	Save formulas (disk or tape).
Ctrl R	Calculate a variable (update results in variable table).
[Return] or Ctrl I	Tab between fields
Ctrl A	Insert character (all fields).
Ctrl Z	Delete character (all fields).
Esc	Escape (from formula-edit field to variable-edit table; from variable-edit table to a prompt asking users whether they are sure they want to exit the program).
↑	Cursor up.
↓	Cursor down.
→	Cursor right one character.
←	Cursor left one character.

SPECIAL FOR II+ USERS:	
Ctrl K	Cursor up
Ctrl J	Cursor down
Ctrl U	Cursor right
Ctrl H	Cursor left

jr

CONTROL CAPSULE
It Figures!

KEY	FUNCTION
Fn 1	Delete character (all fields).
Fn 2	Insert character (all fields).
Fn 3	Blank a field (all fields).
Fn 4	Print formulas (hard copy).
Fn 5	Load formulas (disk or tape).
Fn 6	Save formulas (disk or tape).
Fn 7	Calculate a variable (update results in variable table).
Fn 8	Move to formula-edit field (create or edit formula).
Fn 9	Escape (from formula-edit field to variable-edit table; from variable-edit table to a prompt asking users whether they are sure they want to exit the program).
[ENTER]	Tab between variable and label fields.
←	Move cursor right one character.
→	Move cursor left one character.
↑	Move cursor up one line.
↓	Move cursor down one line.

CONTROL CAPSULE
It Figures!

KEY	FUNCTION
FCTN 1	Delete character (all fields).
FCTN 2	Insert character (all fields).
FCTN 3	Blank a field (all fields).
FCTN 5	Load formulas (disk or tape).
FCTN 6	Save formulas (disk or tape).
FCTN 7	Calculate a variable (update results in variable table).
FCTN 8	Move to formula-edit field (create or edit formula).
FCTN 9	Escape (from formula-edit field to variable-edit table; from variable-edit table to a prompt asking users whether they are sure they want to exit the program).
[ENTER]	Tab between variable and label fields.
FCTN D	Move cursor right one character.
FCTN S	Move cursor left one character.
FCTN E	Move cursor up one line.
FCTN X	Move cursor down one line.
FCTN P	Print formulas (hard copy).

A small deviation from standard BASIC occurs on the TI-99/4A version of *It Figures!* On the TI machine there is no parameter in BASIC for the RND function. To simplify the code in the program, however, you will need to supply a parameter for RND. The parameter you pass will determine the size of the random number. For example, RND(5) would give you a random number between 0 and 5.

HCM

It Figures! (Apple *II* Family)
Explanation of the Program

Line Nos.	
100-190	Program header.
200	Set up error handling.
210-240	Main program-control sequence.
250-630	Initialize program.
640-970	Display main screen for It Figures!
980-1000	Display answer on the screen.
1010-1090	Main control for entry of fields.
1100-1930	Variable value entry routine.
1940-2010	Evaluate formula from number entry fields.
2020-2070	Print hard copy of formulas and variables.
2080-2210	Disk-access control routines.
2220-2980	Variable description entry.
2990-3110	Solve formula from variable label.
3120-3760	Formula entry.
3770-3850	Evaluate formula from formula field.
3860- 3890	Print hard copy.
3900-4210	Parser and solver.
4220-4320	State search definition.
4330-4550	Syntax error prompt.
4560-5880	Evaluate formula subroutines.
5890-6010	Print-out-hardcopy control routine.
6020-6070	Get a character from the keyboard.
6080-6260	Error routine.
6270-6770	Disk-access subroutines.

It Figures! (C-64)
Explanation of the Program

Line Nos.	
100-200	Program header.
210-240	Main program-control sequence.
250-500	Initialize program.
510-780	Display main screen for It Figures!
790-880	Cursor subroutines.
890-920	Display answer on the screen.
930-1010	Main control for entry of fields.
1020-1890	Variable value entry routine.
1900-1970	Evaluate formula from number entry fields.
1980-2030	Print hard copy of formulas and variables.
2040-3010	Variable description entry.
3020-3720	Formula entry.
3730-3820	Evaluate formula.
3830-3860	Print hard copy.
3870-3900	Save from formula entry.
3910-4280	Parser and solver.
4290-4430	State search definition.
4440-4640	Syntax error prompt.
4650-6050	Evaluate formula subroutines.
6060-6240	Print-out-hard-copy control routine.
6250-6660	Disk-access subroutines.
6670-6810	Get a character from the keyboard.

It Figures! (IBM PC & IBM PCjr)
Explanation of the Program

Line Nos.	
100-220	Program header.
230-380	Initialize program and branch to main control loop.
390-400	End-program routine.
410-450	Main program-control loop.
460-550	Entry-control subroutines.
560-610	Edit-screen routines.
620-1240	Evaluate-formula routine.
1250-1330	Disk-access routines.
1340-1410	Syntax error messages.
1420-1840	Formula-entry routine.
1850-1860	Function key intitialization DATA.
1870-2060	Display subroutines.
2070-2340	Keyboard-input subroutines.
2350-2390	Disk-error routines.
2400	Printout routine.

It Figures! (TI-99/4A)
Explanation of the Program

Line Nos.	
100-210	Program header.
220-320	Initialize program, and branch to main control loop; end-program routine.
330-350	Display main screen.
360-490	Entry-control subroutines.
500-560	Edit-screen routines.
570-1200	Evaluate-formula routine.
1210-1270	Disk-access routines.
1280-1340	Syntax error messages.
1350-1700	Formula entry routine.
1710-1860	Keybaord input, and screen display subroutines.
1870-1880	Print-out routine.
1890-1930	Disk-error routines.

XB *It Figures!* requires TI Extended BASIC.

EVACU-POD

by William K. Balthrop
HCM Staff

***On another planet,
in another time,
you delicately guide your ship
on a hazardous rescue mission.
Will you make it on time?
Will you make it at all?***

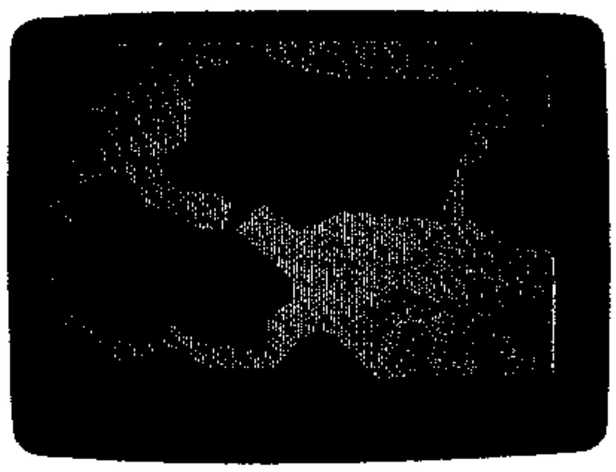
This game is based on an old all-time favorite—*Interplanetary Rescue*—originally published in our forerunner, *99'er Magazine*. Even our old fans of the original will greatly enjoy this much-improved, option-filled version.

The call is out! Send Evacu-Pod!
The time: in the near to distant future.
The place: a neighboring planet.

Mining operations have proven profitable—but risky. Interplanetary construction crews have built full-scale communities on 4 planets, each with its own hospital serviced by crack rescue units. This is where you come in. You've trained back home to fly Evacu-Pod missions, but nothing on the relatively gentle Earth has prepared you for the varying rugged terrain that surrounds each medical center. Evacu-Pod pilots have rated the terrains for their hazards. You may volunteer to fly at any level: beginner, advanced, expert, or professional.

After indicating your skill as a pilot, you can choose the planet to which you would like to be assigned: Earth's moon, Mars, or Venus. A fourth option allows you to designate the size of another planet where you would like to work with gravity ranging from 1 to 9. For comparison purposes, Earth's moon is a 2 and Venus is a 6.

Once you've selected a planet, you will be able to select a time period for your mission. Your choices range from the year 1995 to 2485. As the space program develops over the centuries, more efficient rockets and rocket fuels are invented; thus, the later the year, the easier the assignment will be. This efficiency is incorporated into your rescue vehicle. In 1995, the rockets are fairly inefficient, and so require more fuel to lift the same amount of weight as a rocket built in 2485.



Screen is taken from the IBM version of Evacu-Pod

Winning The Game

To win in *Evacu-Pod*, you must pilot your rescue craft from your home base, over the mountains and valleys of the planet's surface, to the mining camp where you must rescue an injured miner. There you must land at the mining camp, take off again, and safely make it back to your home base. You must do this without crashing, running out of fuel, or running out of time. If you take too long, the injured miner will die while waiting, and you will have failed your mission. The time remaining is not displayed on the screen. This adds a little suspense to the program—you never know when it may be too late . . .

Radar Map

Most of the screen is taken up by the radar map. This is like a topographical map of the local area. Your home base is in the upper-left corner, with the mining camp in the lower-right corner. The radar map is made up of different colors, each color representing a different altitude in 2000-meter increments.

The Radar Altimeter

To the right of the screen is the radar altimeter, which records your altitude in relation to the elevations on the main radar map. The maximum altitude on this altimeter is 10,000 meters. The altimeter serves two purposes: If you are 200 meters or more directly above the planet's surface, the colors of the radar map are displayed vertically, showing their relative altitudes, with a picture of your ship next to the display showing its vertical position. If you are next to one colored portion of the altimeter, you will need to climb before entering the like-colored portion of the radar map. (You will need to be above that color.)

If your ship is within 200 meters of the surface (say, you are at 6150 meters altitude in relation to your base and the terrain you're flying over is at 6000 meters), a different scale will appear on the radar altimeter. The new scale ranges from 0 to 200 meters in relation to the surface directly beneath you. This scale is especially helpful in landing your rescue pod.

Instrumentation

In addition to the radar map and radar altimeter, 6 additional readouts will help you pilot your ship:

BASE — **BASE** altitude is your altitude in relation to both your home base and the mining camp. Even if you are flying over a 6000-meter mountain top at just 25 meters above the top of the mountain, your **BASE** altitude would be 6025 meters.

SURF — The **SURF**ace altitude indicates how close you are to the actual surface of the planet. Using our earlier example, if you were flying over a 6000-meter mountain top at a **BASE** altitude of 6025 meters, your **SURF**ace altitude would be 25 meters. Under this condition, the radar altimeter would be displaying a range of 0 to 200 meters because your surface altitude is below 200 meters.

FUEL — This readout indicates the number of kilograms of fuel that you have remaining. This fuel is added into the weight of your ship. As your fuel is depleted, it will take less power to lift your ship. Once you run out of fuel, your ship will cease to output any thrust and will drop like a rock to the surface.

POWER — The amount of fuel being used by the rockets is displayed here. Three units of power are equal to one kilogram of fuel used every second. The amount of lift generated by the power setting will be determined by the efficiency of your rockets. As mentioned earlier, you can adjust this by selecting a year for the mission. With an efficiency of 1, 1 unit of power would generate 1000 newtons of thrust. The efficiency factor is .66 in 1995 and 2.66 in 2485. This means that only 666 newtons of thrust are generated for a unit of power in 1995, while 2660 newtons of thrust are generated with each unit of power in 2485.

H.VEL — Horizontal **VEL**ocity is the speed at which you are traveling across a planet's surface. This speed has no bearing on whether you are going up or down, it's just your speed across the surface. Velocity is measured in meters per second. One meter per second is roughly 2 miles per hour.

V.VEL — Vertical **VEL**ocity is the speed at which you are either climbing or descending in altitude. If your vertical velocity is a positive number, you are rising—moving farther *from* the surface. If your vertical velocity is a negative number, you are falling back *toward* the surface. A vertical velocity of 0 would indicate that you are hovering at one altitude. Velocity is measured in meters per second. See **H.VEL**.

". . . nothing on the relatively gentle Earth has prepared you for such a rugged terrain."

Controls

The Evacu-Pod is like a rocket-powered helicopter—it always flies nose up and has five rocket engines to enable you to maneuver. Four small rockets, one on each side of the pod, give you control over your horizontal direction of travel and velocity. One large rocket beneath the pod supplies all of the lift.

For the keys to use to control your Evacu-Pod, see the Control Capsule.

Landing

Landing the ship is very tricky and difficult. You must touch down at a velocity of −4 meters per second (mps) or less to have a perfect landing. You can land at any location on the map, but if you are not directly over the base and you land at a rate faster than −4 mps, you will crash. The results of landing on a base or mine are a little more bearable:

V. VEL AT TOUCHDOWN	RESULT
0 to −4 mps	Perfect landing.
−4.01 to −10 mps	Landing gear damaged.
−10.01 to −15 mps	Fuel leak—lose half of fuel.
−15.01 to −25 mps	Ship is inoperative. You can't take off again.
−25.01 and up	Crash. You and your crew die in the explosion.

Now get out there, mind your controls, and rescue those miners. Happy Landing!

For your key-in listings, see HCM PROGRAM LISTINGS Contents.

CONTROL CAPSULE
Evacu-Pod

KEY	FUNCTION
U	Increase power light.
I	Increase power medium.
O	Increase power heavy.
J	Decrease power light.
K	Decrease power medium.
L	Decrease power heavy.
E	Thrust ship to the North.
S	Thrust ship to the West.
D	Thrust ship to the East.
X	Thrust ship to the South.
T	Initiates takeoff thrust.
1	Pause game. Continue by pressing any key.

The Apple *II* version of *Evacu-Pod* uses unique character-oriented, machine-language graphics routines, which are located in **DATA** statements at the end of the program. The two variables, **PRNT** and **REST**, contain the addresses used in **CALL**s. The **PRNT** routine redirects the output of a **PRINT** statement from the normal text screen to the high-resolution (hi-res) graphics screen. In addition, the routines change the characters **PRINT**ed into the graphics which appear on the screen in *Evacu-Pod*. The characters are contained in the **DATA** statements from lines 1540-2370.

After the **PRINT** to the hi-res screen, the system must have its output routine restored, and this is the purpose of the **REST** routine.

This program is designed to run under both ProDOS and DOS 3.3. The **PRNT** routine has to keep the Disk Operating System (DOS) aware of where the screen output is being directed. However, the 2 operating systems have different addresses where this information must be placed, so a special flag is set at zero-page location 6 telling which operating system is in charge.

By **PEEK**ing 2 locations (49505 and 495111) in line 250, the operating system in charge can be discovered. These locations are part of the ProDOS System Global Page. Even in future updates of ProDOS, these locations will contain the same values, so you can feel confident that the program will remain compatible with future versions.

At the same time, we have found that these same locations do *not* contain these values when DOS 3.3 is the DOS, so this program will function properly whether keyed in or converted to either system.

C64

One of the Commodore 64's strengths is its 10-character keyboard buffer. In a game like *Evacu-Pod*, however, the program needs to isolate each keypress, and not keep a queue. Instead of using the **GET** statement, this program bypasses the buffer and directly **PEEK**s the keyboard (location 197) for the key presently being pressed.

If no key is pressed, a **PEEK** of location 197 yields a 64. The following 2-line program allows you to see exactly what values are present when you press a key.

```
10 K=PEEK(197):IF K=64 THEN 10
20 PRINT K:GOTO 10
```

When you press a key while running this program, the value **PEEK**ed from location 197 is printed to the screen. A look at lines 930-1080 will reveal how *Evacu-Pod* uses this same input method.

PC jr

Quite a bit of mathematical manipulation is involved in *Evacu-Pod*, and the IBM machines make displaying the results to the control panel very easy—the key is the **PRINT USING** statement. The control panel is displayed in lines 1100-1160. For example, here's line 1100:

```
1100 LOCATE 23,1:PRINT USING "& #####.##";"BASE:
";ABS.ALT;:LOCATE 1,1
```

Here the ABSolute ALTitude from the BASE is being displayed. Because this number depends upon the Evacu-Pod's acceleration, it could have many decimal places. The # symbols in the **PRINT USING** statement each stand for one digit. They tell the BASIC interpreter to round off the number to the number of digits indicated and display only that number. The **&** symbol tells the system to display the entire string indicated—in this case, the word BASE.

TI

Evacu-Pod makes excellent use of the TI Extended BASIC **DISPLAY AT** statement. To depict the surface of the planet, an entire screen of colorful graphics is required. Because 21 rows are needed to display the screen, you might expect to see lines and lines of **PRINT** statements for each of the 4 possible screens available. Instead, the entire screen is displayed with just one line of code for all 4 screens.

This one line is set up with a series of 4 **RESTORE** statements in lines 1370-1400. The location **RESTORE**d to is determined by the skill level chosen by the player. The option is placed on the O(0) array, and that value is used in the **ON GOTO** statement in line 1360. One of 4 sets of **DATA** is **READ** in line 1410 to actually display the screen:

```
1410 CALL CLEAR :: CALL COLOR(9,10,12):: FOR A=1 TO 21 :: READ
A$ :: DISPLAY AT(A,1):A$ :: NEXT A
```

If you look at the **DATA** in lines 1430-2300, you will see a number of lower-case letters and punctuation marks. These characters were redefined earlier as either solid blocks or spaces, then **CALL COLOR** was used to set up foreground and background colors. **HCM**

Evacu-Pod (Apple *II* Family) Explanation of the Program.

Line Nos.	
100-200	Program header.
210-410	Initialize program.
420-450	Main menu.
460-590	Main program loop.
600-740	Display subroutines.
750-920	Keyboard input routines.
930-1150	Routines to calculate ship's state.
1160-1210	Update control-panel routine.
1220-1510	Check landing condition.
1520-2370	Terrain display and data.
2380-2470	Screen messages.
2480-2680	Get player options choices.
2690-2830	Message and machine language data.

Evacu-Pod (C-64) Explanation of the Program.

Line Nos.	
100-190	Program header.
200-380	Program initialization.
390-550	Get level input and draw screen.
560-660	Main program loop.
670-790	Display control panel.
800-1370	Display altimeter and update variables.
1380-1800	Landing routines.
1810-2000	Output subroutines.
2010-2920	Radar map print routines.
2930-3250	Sprite DATA.
3260-3420	Sound and message DATA.

Evacu-Pod (IBM PC & IBM PCjr) Explanation of the Program.

Line Nos.	
100-230	Program header.
240-310	Program initialization.
320-540	Get level input and draw screen.
550-740	Main program loop.
750-890	Update variables.
900-1090	Display altimeter.
1100-1190	Display control panel.
1200-1690	Radar map DATA.
1700-1800	Option input routine.
1810-2020	Print messages, end game routines.

Evacu-Pod (TI-99/4A) Explanation of the Program.

Line Nos.	
100-190	Program header.
200-290	Initialize program.
300-370	Main control loop.
380-500	Display routines.
510-670	Get input for ship controls.
680-730	Calculate velocity and altitude.
740-790	Check for a collision.
800-890	Check ship position, update radar.
900-950	Display control-panel values.
960-1010	Landing and crash away from base.
1020-1070	Option to play again. Display score.
1080-1260	Landing and crash at base.
1270-1420	Get options for a new game.
1430-2310	Terrain data and display.
2320	Key input, and paruse routine.
2330-2450	Data for option messages.

XB *Evacu-Pod* requires TI Extended BASIC.

WITCH'N'SPELLS

by Randy Thompson
and the HCM Staff

Simply knowing how to spell words isn't enough to conquer this challenging word game— you've got to know how to spell them forwards and backwards!

Here's a real challenge! Spelling can be hard enough, but you can count on your computer to make it even more challenging—or perhaps *intriguing* is a better word. We are accustomed to having the computer put everything in order; but it is also quite good at putting things in *disorder*—such as the letters of a word. Then, by putting things right again, you also end up learning how to spell that scrambled word, from the "inside out."

Switch 'n' Spell is just such a spelling aid, with an unexpected twist. In an entertaining way it combines logic and the language arts to create a unique educational game for use with your computer. Good spelling is the main object in this program, but unlike many simple drill programs, it's fun! As for age level, the words can be simple for the young or difficult for us more experienced spellers.

When the program begins you are given a menu with two options:

(1) Create Word List
(2) Load Word List

Since the game cannot be played unless a word list is in memory, one of these options must be chosen before the program will proceed.

(1) Create Word List

This mode allows you to create and edit a new or previously prepared word list. If a word list is already in memory when you select this mode, you will be asked whether you want to add to the current list or create a new one. If you choose to create a new one, the list currently in memory will be erased.

The editing screen will display 10 words at a time. Once a screen of 10 words is filled, a new screen will appear. To return to the previous screen, simply press the proper key (as shown in the Control Capsule for your machine). Similarly, another keypress will get you to the next screen if the current one has already been filled.

To input words, simply type them in. Each machine has its own editing functions detailed in the proper Control Capsule. You may enter a list of up to 50 words.

(2) Load Word List

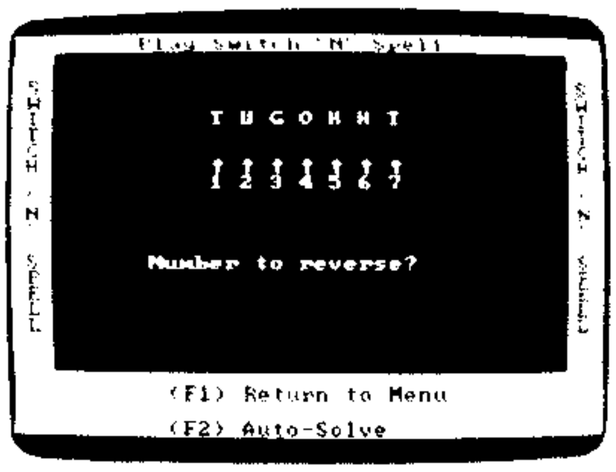
To use this option, you must have created a list previously and saved it on tape or disk. Upon entry of this option, you will be prompted for a file name. Use a file name appropriate to your system.

Once a list is in memory, the main menu will expand with 4 more options, creating a total of 6. The last 4 options are:

(3) Save Word List
(4) Print Word List
(5) Play Switch 'n' Spell
(6) Exit Program

(3) Save Word List

This mode allows you to save the word list that is currently in memory. As in the Load Word List option, you will be asked for a file name, and again, respond with a file name appropriate to your system.



Screen taken from the IBM version of Switch 'n' Spell

(4) Print Word List

Use this option when you want either a hard copy of the word list or to simply view it on the screen. You can select the printer or the screen to receive the output.

If you choose to print the list on the screen, words 1 through 10 will be displayed first. This mode is very similar to the Create Word List option. A specified key will allow you to see the previous 10 words, and another will show the upcoming screen of 10 words.

(5) Play Switch 'n' Spell

Immediately after you enter this mode, the computer will display a word on the screen and then erase it. This is the word you are to spell.

Now, here's where the *switch* comes in. In the upper section of the screen the same word that you were just shown will be printed—the same word, except that all of its letters have been mixed up. Your object is to switch letters, starting from the left, until the word is spelled correctly. To switch the letters, you are asked to input a number. If you input a 3, the first three letters of the scrambled word are reversed. A 5 would reverse the first five letters. Here's an example: The word SAG might be scrambled as AGS. To switch this correctly, first input a 2. The first two letters, A and S, are now reversed to turn AGS into GAS. Now, when you enter a 3, the

whole word GAS is reversed, and you get the desired result, SAG, in just 2 switches.

When the scrambled word is switched correctly into the right spelling, the computer will give a whistle and tell you how many switches you made. A new word will again be displayed, and if you're ready, you may try your hand at another scrambled mess.

If you can't remember the original word, the proper control key will allow you to view it again for a brief period of time. For those of you who give up on switching the scrambled word back into order, pushing another key will make the computer solve it for you.

The computer chooses words sequentially from the word list. This is helpful when you want the words to increase or decrease in difficulty. When the whole list has been used, the cycle starts over.

(6) Exit Program

If you have created or changed a quiz without saving it before choosing option 6, you will first be asked whether you really wish to exit the program. If you answer anything but yes, you will be returned to the menu. If you do answer yes, the program will end. Typing RUN will start it up again, but any word list that might have been in memory will be lost.

For your key-in listings, see HCM PROGRAM LISTINGS Contents.

"We are accustomed to having the computer put everything in order; but it is also quite good at putting things in disorder—such as the letters of a word."

The WM$( ) array is manipulated in lines 4230-4240, and printed to its proper locations on the screen in the subroutine in lines 4390-4400.

C64

CONTROL CAPSULE
Switch 'n' Spell

KEY	FUNCTION
Esc	Return to main menu.
Play Mode:	
Control E	View unscrambled word.
Control R	Autosolve.
Edit Mode:	
Control Q	Insert space.
Control Z	Delete a character.
Control B	Blank a word.
Control I	Insert a word space.
Control D	Delete a word.
↑	Previous word.*
↓	Next word.*
←	Cursor left.*
→	Cursor right.*
*SPECIAL FOR II+	USERS:
Control K	Previous word.
Control J	Next word.
Control H	Cursor left.
Control U	Cursor right.

The Apple version of *Switch 'n' Spell* animates the reversal of letters by string manipulation in conjunction with three string arrays: WL$( ), WM$( ) and ET$( ). WL$ ( ) contains the word list, each element containing one word.

When a word is randomized, it is placed into the ET$( ) array, one character at a time, with one character in each element. The 5 elements of the WM$( ) contain the different parts of the word as it is being reversed. These different sections are all "padded" with spaces so that they are all the same length—and can therefore be PRINTed to the screen starting in the same column (HTAB). Only the row number (VTAB) must be altered to move the different elements around.

CONTROL CAPSULE
Switch 'n' Spell

KEY	FUNCTION
F7	Exit to main menu
Play Mode:	
F1	View word unscrambled.
F3	Autosolve.
Edit Mode:	
F1	Return to previous 10-word screen.
F3	Go on to next 10-word screen.
SHIFT INST	Insert letter
DEL	Delete (backspace).
Crsr Down or Return	Next word.
Crsr Up	Previous word.
Crsr Left	Cursor left.
Crsr Right	Cursor right.

One of the more striking aspects of *Switch 'n' Spell* is the animated way in which letters are rearranged on the screen when a reversal occurs. The Commodore 64 makes this easy because the screen can be directly accessed, via PEEKs and POKEs, from BASIC.

The code for this reversal of letters is in lines 4290-4490. It is accomplished with two FOR-NEXT loops. The outer loop divides the section of the word where the switch is to occur in half. It moves the characters to be switched from the front and back of the section to above and below the word, replacing their original locations with spaces. The inner loop uses the C-64 ASCII characters that cause an insert (ASCII 148) and delete (ASCII 20) to move the letters to above and below their new locations. Then the subroutine at 4000-4060 places the new word in its proper location.

IBM

The IBM PC and PCjr machines have quick-acting graphic commands that are used in *Switch 'n' Spell* to create the borders around the various screens used in the game. No matter which part of the game is being used, the same routine is called to create the inverse-color effect that acts as a border: lines 1490-1520.

Before this routine is called, the title of the screen (e.g., Create Word List, Play Switch 'n' Spell, etc.) is displayed normally at the top of the screen. Line 1490 then uses the GET statement to copy the area of the screen to be inverted into an array. The PUT command then places an inverse image in the identical location using the PRESET option.

CONTROL CAPSULE
Switch 'n' Spell

KEY	FUNCTION
Fn 1	Return to main menu.
Play Mode:	
Fn 2	Autosolve.
Fn 3	View unscrambled word.
Edit Mode:	
Fn 2	View next 10 words.
Fn 3	View previous 10 words.
Backspace	Backspace
Del	Delete character at cursor.
Ins	Insert character.
↑	Edit previous word.
↓	Edit next word.
←	Cursor left.
→	Cursor right.

Similarly, lines 1500 through 1520 create vertical boxes on both sides using the LINE command. The name *Switch 'n' Spell*, contained in the LOGO$ variable, is printed vertically within the boxes. Then the GET and PUT commands are used to create the inverse-color effect.

CONTROL CAPSULE
Switch 'n' Spell

KEY	FUNCTION
Play Mode:	
A	View unscrambled word.
B	Autosolve.
C	Return to main menu.
Edit mode:	
A	Add word.
B	Change a word.
C	View next 10 words.
D	View previous 10 words.
E	Return to main menu.
FCTN 1	Delete a character.
FCTN 2	Insert mode.
FCTN 3	Blank a word.
FCTN S	Cursor left.
FCTN D	Cursor right.

The TI-99/4A version of *Switch 'n' Spell* is written in TI BASIC, which lacks any simple instructions for moving the cursor on the screen. Any character placed at a specific screen location must be placed there using the HCHAR statement. By using the ASC function in conjunction with the SEG$ function to extract ASCII values of charcters in a given string, any set of letters can be selectively placed in any position on the screen.

We used this technique extensively in animating the "switch" in this program. Where I is the number of characters to be reversed, this FOR statement begins a loop to extract the ASCII values needed in the HCHAR statement to place the characters on the screen in their reverse order:

```
FOR Z=I TO 1 STEP -1
```

Followed immediately by this SEG$ statement, the characters' ASCII values are placed one by one into the CH variable and are subsequently displayed on the screen with HCHAR:

```
CH=ASC(SEG$(SW$,Z,1))
```

HCM

Switch 'n' Spell (Apple *II* Family) Explanation of the Program

Line Nos.	
100-190	Program header.
200-210	Set ProDOS flag and error entry.
220-330	Main program control.
340-600	Intitialize variables.
610-740	Main menu.
750-1080	Create word list.
1090-1680	Peripheral-access routines.
1690-2860	Keyboard-word-entry routines.
2870-3140	Name-list entry.
3150-3300	Play-game control loop.
3310-4050	Input for game and prompts.
4060-4190	Autosolve.
4200-4640	Word-manipulation routines.
4650-5280	Peripheral-access subroutines.

Switch 'n' Spell (C-64) Explanation of the Program

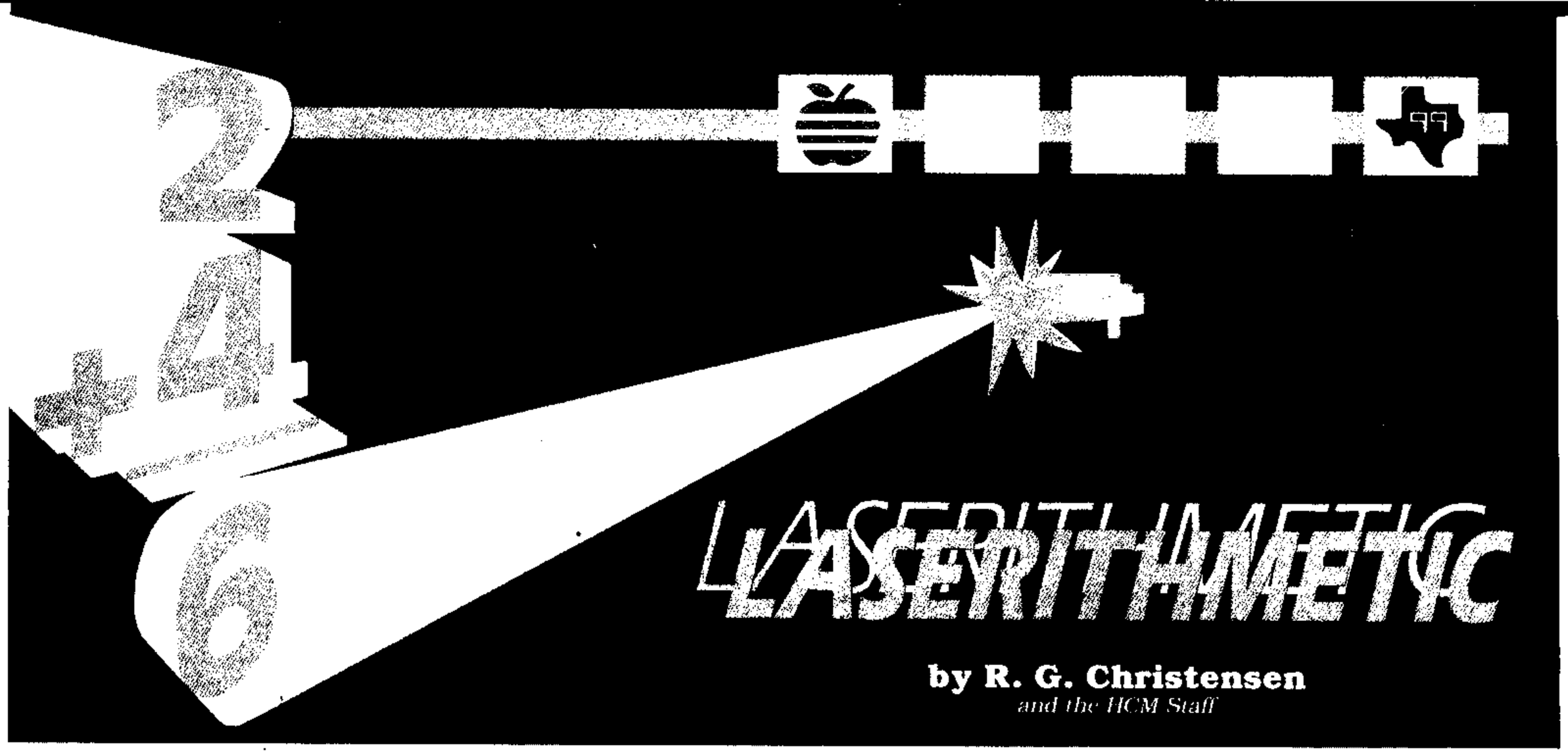
Line Nos.	
100-190	Program header.
200-540	Initialize variables and main menu.
550-950	Create word list.
960-1410	Disk and tape access.
1420-1910	Print word list.
1920-2590	Play Switch 'n' Spell
2600-3230	Screen-display subroutines.
3240-3600	Input routines.
3610-3720	List the words.
3730-3900	Ask if device is tape or disk.
3910-3990	Print word.
4000-4200	Erase and print to game screen.
4210-4830	Rearrange-word routines.
4840-4970	Autosolve.
4980-5010	Data for screen title, color, note.

Switch 'n' Spell (IBM PC & IBM PCjr) Explanation of the Program

Line Nos.	
100-230	Program header.
240-370	Initialization and main screen.
380-900	Edit, input, and display routines.
910-980	Create word list.
990-1030	End-game routine.
1020-1210	Disk-access routines.
1220-1230	Convert lower case to caps.
1240-1530	Play-game control loop.
1540-1810	Display, music, and input routines.
1820-1900	Printer routine.
1910-2070	Autosolve.
2080-2100	Music and keyboard subroutines.
2110-2180	Print-to-screen routine.
2190-2240	List-cleanup routine
2250-2260	Singular or plural of "reversal."

Switch 'n' Spell (TI-99/4A) Explanation of the Program

Line Nos.	
100-210	Program header.
220-450	Initialization and main screens.
460-560	Create word list.
570-1190	Edit word list.
1200-1410	Storage access routines.
1420-1670	Print-word-list routines.
1680-2160	Play game.
2170-2970	Autosolve
2980	Return to main menu.
2990-3110	End-game routine.
3120-3150	Data for menu screens.



LASERITHMETIC

by R. G. Christensen
and the HCM Staff

By answering math problems right, you'll prove that you have the right stuff to defend your interstellar spacecraft—the Columbia.

Mankind has taken another giant leap into the future and launched its first interstellar spacecraft—manned by none other than YOU. Your ship carries the name of another pioneering spacecraft, the *Columbia* (the first space shuttle). You have no idea what sort of dangers lie beyond the protective boundaries of the solar system. Little do you know that the most deadly force in the universe is waiting quietly as your ship approaches.

Suddenly, you are under attack: not by a swarm of invaders from every direction, but from a single deadly invader—an alien almost unaffected by your laser blasts. Your best hope is to hold it off until help can arrive.

Education in Space

Such is the scenario of *Laserithmetic*, an educational game which strengthens children's skills in addition, subtraction, multiplication, and division. Several skill levels allow the program to teach these math fundamentals to younger children, and to help enforce good practice skills in older children.

When you start this program, you will be presented with the title screen and a musical theme. Press **[ENTER]** or **[RETURN]** to skip the music and continue.

Next you will be asked to enter one of 4 problem types:

```
1) ADDITION
2) SUBTRACTION
3) MULTIPLICATION
4) DIVISION
```

To select the type of problems you want, simply press the number beside the option. You do not need to press [RETURN] or [ENTER].

Then you will be asked to select one of 4 difficulty levels.

```
1) EASY
2) HARD
3) HARDER
4) REAL HARD
```

After selecting a level, the computer will display a short message describing what is about to follow:

```
CAPTAIN,
YOU'RE THE COMMANDER OF THE SPACE SHIP COLUMBIA.
DESTROY THE ATTACKING ALIENS BY LOADING YOUR LASER
CANNON WITH CORRECT ANSWERS TO THE PROBLEMS.

CAUTION! DON'T LET AN ALIEN GET TOO CLOSE!
```

The Attack

After selecting these options, you will be ready to start Round 1 of the program. There are 4 rounds in all, each presenting 48 math problems. If you complete all 4 rounds without letting the alien reach your ship, you win.

You can hold the alien at bay by giving the correct answers to the math problems, which are displayed in the middle of your ship. When you enter an answer, it will appear to the right of the problem. If you answer correctly within the allotted time, a laser blast will be fired at the alien, keeping it from moving toward you. If you enter a wrong answer or run out of time, the alien will advance closer toward your ship. With each successive level, the time given to answer a problem is reduced. In addition, the problems get progressively more difficult with each higher level and within each round (on the average). If you don't successfully answer enough questions to keep the alien at a distance, your ship will be destroyed and you will be given your final score and the option to play again or quit.

Notice that the values in the program are not selected totally at random. One of the values used is random, and the other is not. This nonrandom value is determined by 2 **FOR-NEXT** loops. The outer loop counts from 1 to 12, and will be one of the values used. The inner loop will repeat that value 4 times. This sequence of 48 problems makes up one round. This value may appear on the left or the right side of a problem. The larger of the two numbers will always appear on the left side so that the subtraction problems will always have a positive answer.

Division problems are special—it was necessary to eliminate fractional answers. To do this, the computer multiplies the two numbers selected to arrive at the dividend. One of the two selected numbers becomes the divisor; the other the "unknown quotient.

For your key-in listings, see HCM PROGRAM LISTINGS Contents.

In *Laserithmetic*, a problem's difficulty is determined directly by the skill level. In line 440 of the Apple version, the skill level is multiplied by 4 and then multiplied by a random number (between 0 and 1) to determine one of the numbers in the problem. The higher numbers will tend to make the problems more difficult.

Because the game uses the hi-res screen for its display, a special shape table is created in line 820 for all of the digits. They are arranged such that the number of the shape corresponds to the digit shape codes. Thus, if shape 1 is DRAWn, the digit 1 appears. Shape 2 is the digit 2, and so on. The shape table DATA is contained in lines 950-1020. To use this shape table in your programs, simply copy lines 820 and lines 950-1020 into your program. Note that the shape table is placed in memory locations 24576 through 24787. A very large program might interfere with this section and the shape table would have to be relocated.

The Commodore 64 version of *Laserithmetic* uses a sprite for the alien and character graphics to draw the ship. The sprite DATA is located in lines 1480-1610, and the ship is PRINTed to the screen in lines 1130-1190. The location of the alien sprite is updated in the routine in lines 1410-1470. The MA variable contains the horizontal pixel position of the sprite and is originally set to 254. Each time the sprite moves, MA is decremented by 8. Thus, when the sprite move routine is called, the sprite moves 8 pixels to the left.

Meanwhile, the horizontal character column of the sprite is kept in the SP variable and it is decremented by one each time the sprite moves. The spaceship's laser gun is located in column 12, so if SP is less than 12 the alien has reached the vessel, and the player's ship is destroyed.

The IBM computers have many powerful graphic commands for the BASIC program to use. The DRAW command lets you quickly and easily create a graphic shape. The GET and PUT commands, however, actually allow you to place a known shape on the screen more quickly.

Laserithmetic uses these commands together to create and move the alien. The DRAW command draws the alien on the instruction screen. Once there, the GET command places the alien's graphic information in an array. From then on, any time the alien is to be placed on the screen, the PUT command allows for lightning-fast access to the alien's shape by PUTing the same information on the screen via the same array. Using these commands together allows you to attain animation effects that many machines can only access in machine language.

The TI-99/4A version of *Laserithmetic* contains a special input routine which checks every character you type against the characters it expects to see for a right answer. For example, if the right answer to a problem is 144, you would register a wrong answer as soon as you typed 13, because the second character typed was a 3, and the program was looking for a 4.

Laserithmetic (Apple *II* Family) Explanation of the Program

Line Nos.	
100-200	Program header.
210-270	Title screen and music routine.
280-360	Get options and display instructions.
370-390	Start a new round.
400-510	Determine problems and answers.
520-560	Display the problem.
570-720	Get input, evaluate, and take action.
730-810	End of game—option to play again.
820-910	Define and display graphics.
920-1020	Music and graphics data.

Laserithmetic (C-64) Explanation of the Program

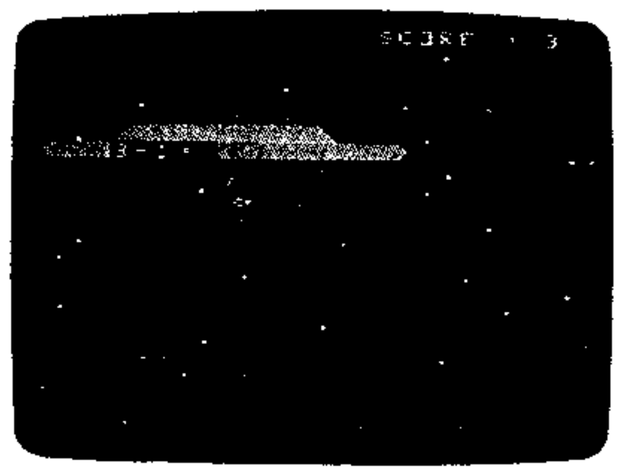
Line Nos.	
100-200	Program header.
210-300	Title screen and initialization.
310-550	Get options and display instructions.
560-690	Determine and diplay problem.
700-950	Get input, evaluate, and take action.
960-1100	End of game—option to play again.
1110-1190	Game screen and ship.
1200-1280	Subroutines for sound and action.
1290-1390	Music routine.
1400-1470	Move alien.
1480-1610	Sprite data.

Laserithmetic (IBM PC & PCjr) Explanation of the Program

Line Nos.	
100-230	Program header.
240-320	Title, menu, and instructions.
330-400	Begin main game loop; determine and display problem.
410-440	Get input and determine if correct.
450	Do next problem, and display success message if appropriate.
460-500	Right- and wrong-answer subroutines.
510-520	Move alien when time runs out.
530-540	Lose-game routine.
550-590	Display-game-screen subroutine.
600-630	Music and input subroutines.

Laserithmetic (TI-99/4A) Explanation of the Program

Line Nos.	
100-200	Program header.
210-490	Title screen and initialization.
500-770	Get options and display instructions.
780-940	Start a new round.
950-1130	Determine problems and answers.
1140-1190	Display the problem.
1200-1610	Get input, evaluate, and take action.
1620-1910	End of game—option to play again.
1920-2160	Define and display graphics.
2170-2290	Music and graphics display data.



Screen from the TI-99/4A version of Laserithmetic

This task is accomplished by first checking on whether the latest key-input makes the input answer the same number of characters as the actual answer. If so, they are simply compared, and appropriate action is taken. If not, then a FOR-NEXT loop is entered to compare the characters. If any of the characters are not the same, the program immediately reacts with an incorrect-answer response. The alien would advance at this time, and your entry would then be cleared from the screen.

HCM

GENERATION 0 GENERATION 1 GENERATION 2 GENERATION 3 GENERATION 4

THE ORGANIZER REPORTS

In the previous issue of *Home Computer Magazine* (Vol. 5, No. 1) we presented *The Organizer*, an outline-generating program designed to assist you in task solving. We now offer this final addition that allows you to print your organized results.

by William K. Balthrop
and the HCM Staff

Now that you have had a chance to work with *The Organizer*, wouldn't it be great if you could also get a hardcopy of your file? Well, we promised that we'd show you how, and here's the program to do it. *Organizer Reports* completes the final step in the organizational process—it can give you a listing of your entire outline, just the text, or any number of generations that you specify to be printed out.

Organizer Reports has 6 features accessible from the main menu, allowing you to tailor your printout to a variety of specific generations:

```
Select Generation (Y/N)?
    Enter number of generations?
Indent generations (Y/N)?
    Indent width (1 to 5)?
Print Outline (Y/N)?
    Mark headers?
    Bold headers?
Print text (Y/N)?
    Print Text Headers (Y/N)?
    Mark headers?
    Bold headers?
Format text (Y/N)?
Printout width (20 to 132)?
```

Running The Program

When you run the program, you will be asked to enter the name of an *Organizer* file. After entering the file name, you will be taken to the option-selection screen. There you will be able to input several options to control the output of your report. The first choice for selection is the Maximum Generation option.

SELECT MAXIMUM GENERATION (Y/N)?

When you enter Y for Yes, you will be prompted to enter the number of generations (depth) that you want the program to print out.

ENTER NUMBER OF GENERATIONS?

When you enter a number specifying how many generations you want printed, the program prints all of the generations through the childern of the generation specified. If, on the other hand, you entered N for No to the first prompt, the program would not ask for the number of generations and would print the entire outline. (See Figure 1.)

INDENT GENERATIONS (Y/N)?
INDENT WIDTH (1 TO 5)?

The Indent Generations option will allow you to either indent each generation a specified number of spaces, or left-justify all of your outline. If you answer Yes to the Indent Generations prompt, the Indent Width option will be asked next. You can specify from 1 to 5 spaces of indentation for each generation printed. If, for instance, you wanted your printout to indent each generation 3 spaces, you would enter 3 and the program would automatically indent your outline—how's that for ease of use? (See figure 2 .)

There is a limit, however, to the depth of indentations. The program always must have at least 20 character spaces available in which to print. When the program reaches this limit, it will simply stop indenting any farther. All following lines will indent to the same column until a generation that calls for less indentation comes up. For example, if you specify a line width of 80, and an indent width of 5, indentation would stop at column 60, allowing you to indent 12 generations (5 columns per generation).

PRINT OUTLINE (Y/N)?

Entering Y for the Print Outline option will cause all headers in the generations specified to be printed. But first, the next two options will determine how these headers will appear:

MARK HEADERS (Y/N)?
BOLD HEADERS (Y/N)?

"In formulating your outline, you could get a printout during the early stages and see at a glance those areas that need more work."

First, you can direct the program to mark each header by placing a hyphen in front of it, setting it apart from the text. Second, you can have the outline headers printed in bold face. (See Figure 3.) If you don't want the program to print out your entire outline, you can enter **N** to the Print Outline option and move on to the next option, Print Text.

PRINT TEXT (Y/N)?

This option will allow you to print text created with *The Organizer*'s text editor. If you select the text option and did not select the above option to Print Outline, then you will be asked whether you want just the text headers to be printed.

PRINT TEXT HEADERS (Y/N)?
MARK HEADERS (Y/N)?
BOLD HEADERS (Y/N)?

If you enter a **Y** to this question, then only those outline headers which have text will be printed above that text; and, you have the option to set the headers apart from the text with either a hyphen or boldface or both. (See Figure 4.)

FORMAT TEXT (Y/N)?

You can also direct the program to format your text to a specified line width. The number you entered for the Indent Width option will be used as the left margin. Your text will be left-justified, although indented. This print format will not change the file itself—only the way that it is presented to the printer. (See figure 5.)

PRINTOUT WIDTH (20 TO 132)?

This last option lets you set the column width of the actual printout of your outline. The minimum width you can set it to is 20 characters per line, and the maximum width is 132 characters per line. The number that you enter will be used by the program in formatting your text and for determining how far the report can indent, if the Indent Generations option was selected. (See Figure 6.)

A Whole New Look

The first time you see a hardcopy of your entire program, you will realize just how useful *The Organizer* really is. We at *Home Computer Magazine* see *The Organizer* as a simple method for keeping track of almost any type of home, business, or school project, and *Organizer Reports* makes the process of getting started easier and more accessible. In formulating your outline, you could get a printout during the early stages and see at a glance those areas that need more work. The Select Generations option could be used to generate a very general report such as a table of contents. You could then print more detailed reports as the need arose. With this multitude of formatting options, *Organizer Reports* is a very flexible tool which will become an indispensable addition to *The Organizer* program family.

For your key-in listings, see HCM PROGRAM LISTINGS Contents.

Figure 1

Entire remodel outline indented 3 spaces and including text.

```
Contractor supplies
   Labor
   All labor will be completed by the
   contractor by the contracted date;
   but if additional work is necessary,
   adjustments to the contract will be
   made by agreement of both parties.
      New floor
         Replace rotten joists
         Install moisture barrier
         Lay plywood
         Smooth with grout
         Lay tile
         Install cabinets
      Plumbing
         Install sink
         Connect drains
         Connect faucets
      Wallpaper
         No gap in seams
         No overlap
         Fit edges within 1/8"
      Trim work
         Trim floor
         Trim ceiling
         Trim cabinets
      Wiring
         Install light above sink
         Replace all switches
   Bonding
      To legal minimum
      Ascertain what the local state law
      requires and ask contractor to
      show proof of bond.
   Liability for damage
      To existing structure
      To cabinets
      To new materials
      To new fixtures
   Late penalty
      After date _____________________
      Unless revised by owner
Owner supplies
   Labor fee
      Total amount $__________
         40% down
         60% down on completion
Cost of materials
   Only on approved list
   Not to excede estimate
   Revisions
   Proposals for change in original
   list must be submitted in writing
   and approved by owner with
   signature.
Blueprints
Materials list
   Nails
   Grout
   Glue
   Wallpaper
   Lumber
   Floor tile
   Plumbing fixtures
   Wire
   Electrical fixtures
   Misc.
```

Figure 2

A portion of the outline with no indentation and the same portion with indentation.

```
Contractor supplies
Labor
New floor
Replace rotten joists
Install moisture barrier
Lay plywood
Smooth with grout
Lay tile
Install cabinets
Plumbing
Install sink
Connect drains
Connect faucets
Wallpaper
No gap in seams
No overlap
Fit edges within 1/8"
Trim work
Trim floor
Trim ceiling
Trim cabinets
Wiring
Install light above sink
Replace all switches
Bonding
To legal minimum
Liability for damage
To existing structure
To cabinets
To new materials
To new fixtures
Late penalty
After date _____
Unless revised by owner
```

```
Contractor supplies
   Labor
      New floor
         Replace rotten joists
         Install moisture barrier
         Lay plywood
         Smooth with grout
         Lay tile
         Install cabinets
      Plumbing
         Install sink
         Connect drains
         Connect faucets
      Wallpaper
         No gap in seams
         No overlap
         Fit edges within 1/8"
      Trim work
         Trim floor
         Trim ceiling
         Trim cabinets
      Wiring
         Install light above sink
         Replace all switches
Bonding
   To legal minimum
Liability for damage
   To existing structure
   To cabinets
   To new materials
   To new fixtures
Late penalty
   After date _____
   Unless revised by owner
```

Figure 3

These two examples show marked headers, and bold headers with no text.

```
-Contractor supplies
   -Labor
      -New floor
         -Replace rotten joists
         -Install moisture barrier
         -Lay plywood
         -Smooth with grout
         -Lay tile
         -Install cabinets
      -Plumbing
         -Install sink
         -Connect drains
         -Connect faucets
      -Wallpaper
         -No gap in seams
         -No overlap
         -Fit edges within 1/8"
```

```
Contractor supplies
   Labor
      New floor
         Replace rotten joists
         Install moisture barrier
         Lay plywood
         Smooth with grout
         Lay tile
         Install cabinets
      Plumbing
         Install sink
         Connect drains
         Connect faucets
      Wallpaper
         No gap in seams
         No overlap
         Fit edges within 1/8"
```

Figure 4

Text only printed along with the headers specific to it.

```
- Labor
  All labor will be completed by the
  contractor by the contracted date;
  but if additional work is necessary,
  adjustments to the contract will be
  made by agreement of both parties.
    - To legal minimum
      Ascertain what the local state law
      requires and ask contractor to
      show proof of bond.
```

Figure 5

Text only printed along with the specific headers, with a column width of 20 spaces.

```
Labor
All labor will be
completed by the
contractor by the
contracted date;
but if additional
work is necessary,
adjustments to the
contract will be
made by agreement
of both parties.
  To legal minimum
  Ascertain what
  the local state
  law requires and
  ask contractor
  to show proof of
  bond.
```

Figure 6

The entire outline formated with a column width of 40 spaces.

```
Contractor supplies
   Labor
   All labor will be completed by
   the contractor by the contracted
   date; but if additional work is
   necessary, adjustments to the
   contract will be made by
   agreement of both parties.
      New floor
         Replace rotten joists
         Install moisture barrier
         Lay plywood
         Smooth with grout
         Lay tile
         Install cabinets
      Plumbing
         Install sink
         Connect drains
         Connect faucets
      Wallpaper
         No gap in seams
         No overlap
         Fit edges within 1/8"
      Trim work
         Trim floor
         Trim ceiling
         Trim cabinets
      Wiring
         Install light above sink
         Replace all switches
   Bonding
      To legal minimum
      Ascertain what the local state
      law requires and ask
      contractor to show proof of
      bond.
   Liability for damage
      To existing structure
      To cabinets
      To new materials
      To new fixtures
   Late penalty
      After date

      _____
      Unless revised by owner
Owner supplies
   Labor fee
      Total amount $_____
         40% down
         60% down on completion
Cost of materials
   Only on approved list
   Not to excede estimate
   Revisions
   Proposals for change in
   original list must be
   submitted in writing and
   approved by owner with
   signature.
Blueprints
Materials list
   Nails
   Grout
   Glue
   Wallpaper
   Lumber
   Floor tile
   Plumbing fixtures
   Wire
   Electrical fixtures
   Misc.
```

This Apple program can be divided into two major sections—option selection and output. The option-selection section prompts the user for a number of formatting options to be used in the final report. The order in which the options are selected is not always the same. Depending on previously selected options, some options no longer apply, and so will not be asked.

The method used to determine which options are asked is quite simple. The description for each option is contained in the string array PR$( ). There are ten elements, one for each option.

Similarly, there is another array that contains the responses and defaults for each option. This is the RA$( ) array. If you simply press [RETURN] at each prompt, the array will not be updated, so the last value contained there will be used.

By placing both the options and the responses in an array, you can use any prompt at any time simply by changing the value of the variable used to index into the array. The SL variable does this. After each prompt is completed, the value SL is updated to the next prompt that should be provided. Tests are often made to determine what the next prompt should be.

Two input routines are used to get the option information. Each routine is designed to accept only one kind of specific information. The routine that starts at line 1220 will input any integer numeric value from 1 to 4 digits. It is used for options requiring a value such as the width at which you want the report formatted. The second routine starts at line 1360 and will only accept a Y or N response for the Yes/No options.

C64

After using your Commodore *Reports* program, you may notice that the text created with the text editor portion of *The Organizer* has been reformatted. The file you created with *The Organizer* has not changed at all, only the output you see at the printer has been modified. This formatting is done in a string array inside the *Reports* program.

The P$( ) array will contain one page of formatted text and outline. All information that will go to the printer is first stored in this array, like a large buffer.

As the records are read into memory from the data file, they are manipulated according to the options selected on the option screen. The manipulated text is then placed into the P$( ) array. This includes special characters to turn the bold typeface off and on, and the spaces used to indent records.

This array makes text formatting simpler. As a text record is read into memory, the program checks the current line that it is working on in the array. The amount of free space on the line is determined by subtracting the length of the line from the maximum allowable length. It then searches through the text just read into memory and locates the first word on the line. If the word will fit onto the line in the array, it is added to the array line and removed from the line that was input from the file. This process is then repeated until no more words will fit on the line in the array. At this time the program simply moves down to the next line in the array and starts over. When the program has finished filling 60 lines in the array, it will branch to an output routine which will print all 60 lines to the printer and eject to the top of the next page. The array is also cleared at this time so that the next page of text can be built there.

This program takes files created with the IBM PC and PCjr version of *The Organizer*, which was published in Vol. 5, No. 1, and reformats them for output to the printer. The file itself is not changed; the program does all of its formatting internally, and then forgets that information when it is done.

One printer page at a time is formatted (60 printer lines). After formatting the page, it will be printed, and the paper will be advanced to the top of the next page. This formatting is accomplished using a string array with 60 elements, **PAGE$( )**.

As the program reads each record from the file, it builds the **PAGE$( )** array until it is full. It then prints the entire array, clears the array, and returns for more information.

Each record in the file contains text from either the outline or the text editor. If the text is from the text editor, it will all be "scrunched" together to fill out each line to its maximum length.

After reading in the text from a record in the file, the program checks the current line it's working on in the **PAGE$( )** array to see how much free space is left at the end of the line. It does this by subtracting the length of the line from the maximum allowable length determined by the options selected on the option page. If there are, say, 22 spaces left on the line, the program then starts at the 22nd character of the line that was input and scans backward until a space is found. The space indicates a break between words. The remainder of the line to the left of the space is then relocated to the **PAGE$( )** array.

TI Extended BASIC has a few commands built into it which make it a very powerful language.

The **ACCEPT AT** statement allows the program to accept data input from any location on the screen. You can limit the field of input to 1 to 28 characters, and can have the computer give a beep when the statement is executed.

Two features of the **ACCEPT AT** statement used in this program allow you to leave default values in the input field, and validate the type of characters that can be entered.

Default values can be placed into the input field by using the **SIZE** option of the **ACCEPT AT** statement. The size option determines the size of the input window in characters; **SIZE(1)** would allow only one character to be entered. If you specify a negative value as the size parameter, then any characters already on the screen where the input window appears will be kept in the window. This program supplies defaults for all of its inputs in this manner. If you would like to have your program use different defaults, you can change them in the data statements in lines 1150 through 1180.

The second feature used is the ability to limit input to only certain types of characters. In line 1080 the **VALIDATE** option is used to do this. By placing those characters which are legal into a string or directly into the statement, as was done here, you can specify only those characters to be legal. If users try to type anything else, they will be greeted with a loud beep, and the character will be ignored. You can specify groups of characters (as done in line 1090) with parameters like **DIGIT** within the **VALIDATE** option. This parameter will only allow the entry of the numbers 0 through 9.

HCM

The Organizer - Reports (Apple *II* Family) Explanation of the Program

Line Nos.	
100-240	Program header.
250-370	Main control loop.
380-800	Initialize program.
810-860	Routine to print heading.
870-1440	Display options and get input.
1450-1640	Main control loop for printing the report.
1650-1770	Report abortion messages.
1780-2010	Set up the print buffer.
2020-2130	Output print buffer to the printer.
2140-2550	Format one line of the buffer.
2560-2690	Main control for file name entry.
2700-3000	File-handling routines.
3010-3080	Clear screen.
3090-3140	Get character.
3150-3230	Return to the organizer.
3240-3430	Error routine.
3440-3660	Check limits on file name during entry.

The Organizer - Reports (C-64) Explanation of the Program

Line Nos.	
100-250	Program header.
260-420	Main program-control routine.
430-550	Main control for printing report.
560-650	Main control for building a page of text.
660-690	Print a page to the printer.
700-810	Preliminary text formatter.
820-1020	Formatter.
1030-1690	Get options.
1700-1710	Cursor-control routine.
1720-1750	Initialize the screen.
1760-1800	Get file name.
1810-1860	Initialize variables.
1870-2020	File-handling routines.
2030-2140	Error routine.
2150-2160	Return to main menu.

The Organizer - Reports (IMB PC & PCjr) Explanation of the Program

Line Nos.	
100-240	Program header.
250	Initialize the error routine.
260-290	Display title screen.
300-370	Load file links.
380-430	Main control routine.
440-760	Option input screen.
770-910	Main control for printing the report.
920-990	Main control for building the page buffer.
1000-1170	Format text.
1180-1260	File-handling routines.
1270-1340	Initialize variables.
1350-1380	Exit back to main menu.
1390-1470	Error-handling routine.

The Organizer - Reports (TI-99/4A) Explanation of the Program

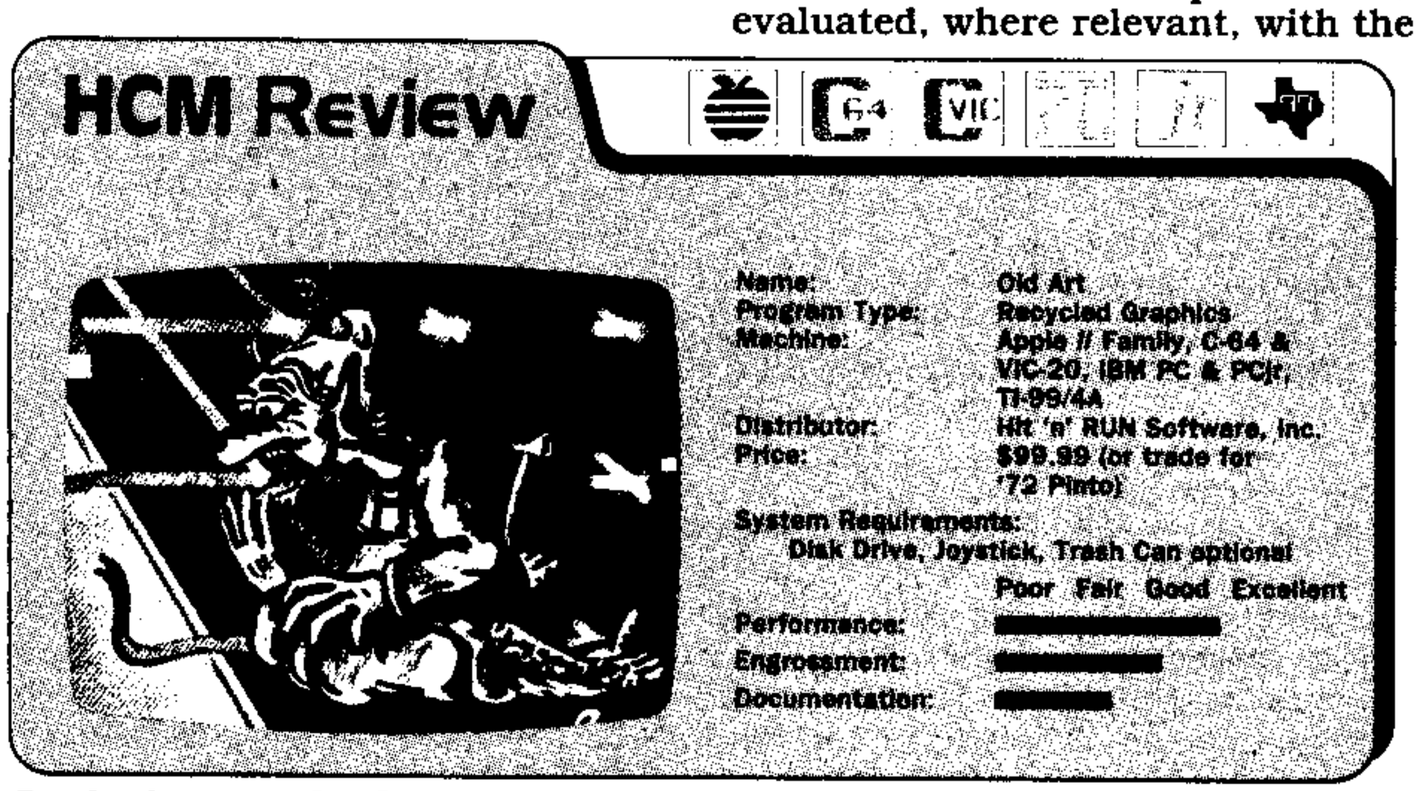
Line Nos.	
100-250	Program header.
260-350	Initialize program.
360-430	Load file links.
440-750	Get options for report.
760-890	Main control routine for the report.
900-930	Main control routine for formatting a page.
940-1050	Format text.
1060-1070	Output a page of text to printer.
1080-1090	Input subroutines for the options.
1100	Clear the page of text for the next page.
1110-1140	File-handling routines.
1150-1180	Data for the option screen.
1190	Exit back to main menu.
1200	Error for lack of memory expansion.
1210-1310	Error-handling routine.

HCM Review Criteria

Each month, *Home Computer Magazine* (*HCM*) reviews products designed for the Apple *II* Family, Commodore 64 and VIC-20, IBM PC and PCjr, and Texas Instruments 99/4A computers. *HCM* reviews take a detailed look at the quality, utility, and value of commercially available packages for these machines. Because our publishing charter forbids accepting outside advertising, we strive to make the scope and content of our review pages shine with a unique blend of humanistic frankness and objectivity.

Not only will you find all relevant information for making a wise purchase decision, but in some special cases we also provide nuggets of compu-prestidigitation.* For example, we frequently include essential documentation not furnished by the manufacturer. Additionally, each issue of *HCM* tries to review at least one outstanding product —a "Diamond in the Rough"—which, because of company size, marketing clout, or for some other reason, has not received the attention it deserves.

At the beginning of each review, a review-at-a-glance box provides the user with an instant assessment of the product. Each item will be evaluated, where relevant, with the criteria below.



*** Performance—**
How well the product performs as intended; how well it takes advantage of a specific machine's capabilities; how well it responds to the user's commands; how effectively the graphics, sound effects, music, or speech are integrated with the software.

*** Engrossment—**
Whether the game or activity has that intangible quality that holds players on the edge of their seats while the hours tick by unnoticed.

OR

*** Ease of Use—**
The degree to which a user can interact with the product without outside help; the ease and effectiveness of error-handling features; whether the actual reading level of the activity is appropriate for the suggested audience.

OR

*** Ease of Set-up—**
How well the product design facilitates easy installation.

*** Documentation—**
The quality of the printed matter that comes with the product; whether the instructions are clear and comprehensive; whether the machine configuration requirements are spelled out. Information such as how to load a program, use the keyboard, and restart an activity contributes to the documentation rating, as do tips on performance peculiarities.

Products may also be evaluated in the following areas:

*** Flexibility—**
Can the product be adapted to the specific needs of the users?

*** Cost/Benefit—**
Is the product worth the user's investment in time and money?

*** Necessity—**
Is the product a solution for which a problem already exists?

*** Originality—**
Is it unique in concept, or simply a "me too" product?

*** Longevity—**
The "Boredom Factor." Does the program sustain interest?

*** Rewards—**
Are the audio-visual rewards motivating and appropriate?

*** Concept Presentation—**
Are the concepts presented clearly, logically, and in depth?

*** Special Effects—**
How does quality of sound and visual effects rate? Do they enhance or detract from the product or learning process?

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3. Be of outstanding merit, quality, and value.
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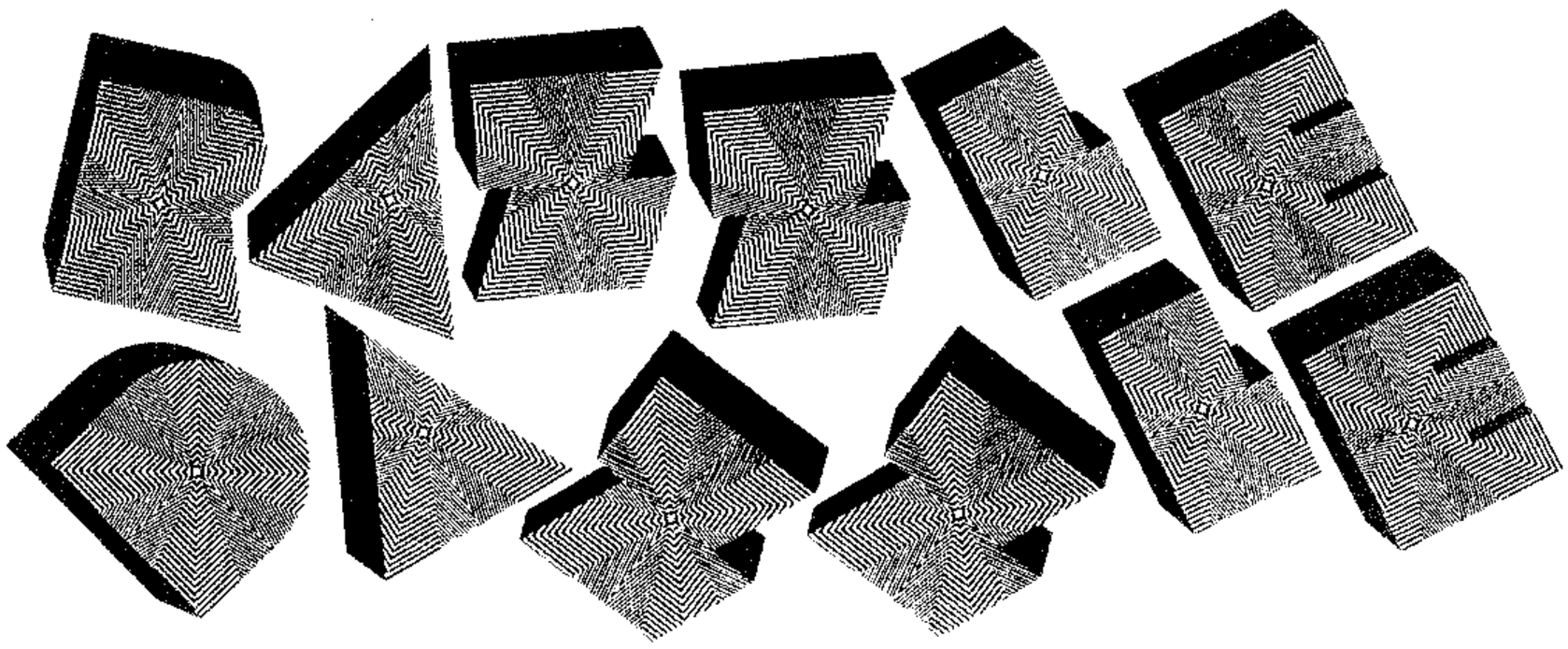
***Compu-prestidigitation** (kŏm´ • pū • prĕs´ • teh • dĭ • jeh • tā´ • shŭn) —*n* 1. The magical quality of unexpected comprehension that results from presenting technical information about computers in a lively, entertaining, visually attractive and easy-to-understand format. 2. The magical tricks that make a computer sing, dance, and do all sorts of wonderfully useful things.



by William K. Balthrop
HCM Staff

A few quick tricks tune your TI-99/4A into dazzling 3-part harmony.

How much money do you suppose your neighbors paid for that big fancy organ in their living room? I'm willing to bet it was more than you paid for your TI-99/4A. How would you like to aggravate them by turning your computer into an organ just like theirs, at a fraction of the cost? Read on and find out.

The TI-99/4A has a very powerful sound synthesizer built into it. It is capable of producing up to three different tones and one noise at the same time. In addition, you can independently control the volume for any of the three tones or the noise.

This program, *Musikey*, converts your keyboard into a musical organ; each key in your keyboard will be programmed to create a tone. By pressing the keys, you can play your favorite tune, or just have a lot of fun.

Split Keyboard

The 99/4A has what is known as a split keyboard. This doesn't mean that it's broken. It allows the computer to seemingly read two keys at the same time. When accessing the split keyboard, the parameters passed in the **CALL KEY** statement are slightly different. When the first parameter in the statement is a 0, both halves of the keyboard are read, and normal ASCII values for the key pressed are returned. If you use a 1 as the first parameter—as in the **CALL KEY(1,K,S)** statement—then only the left side of the keyboard will be read, returning a value from 0 to 19. These are *not* ASCII values. Using a 2 as the first parameter means that the right side of the keyboard will be read, with a value from 0 to 19 again being returned.

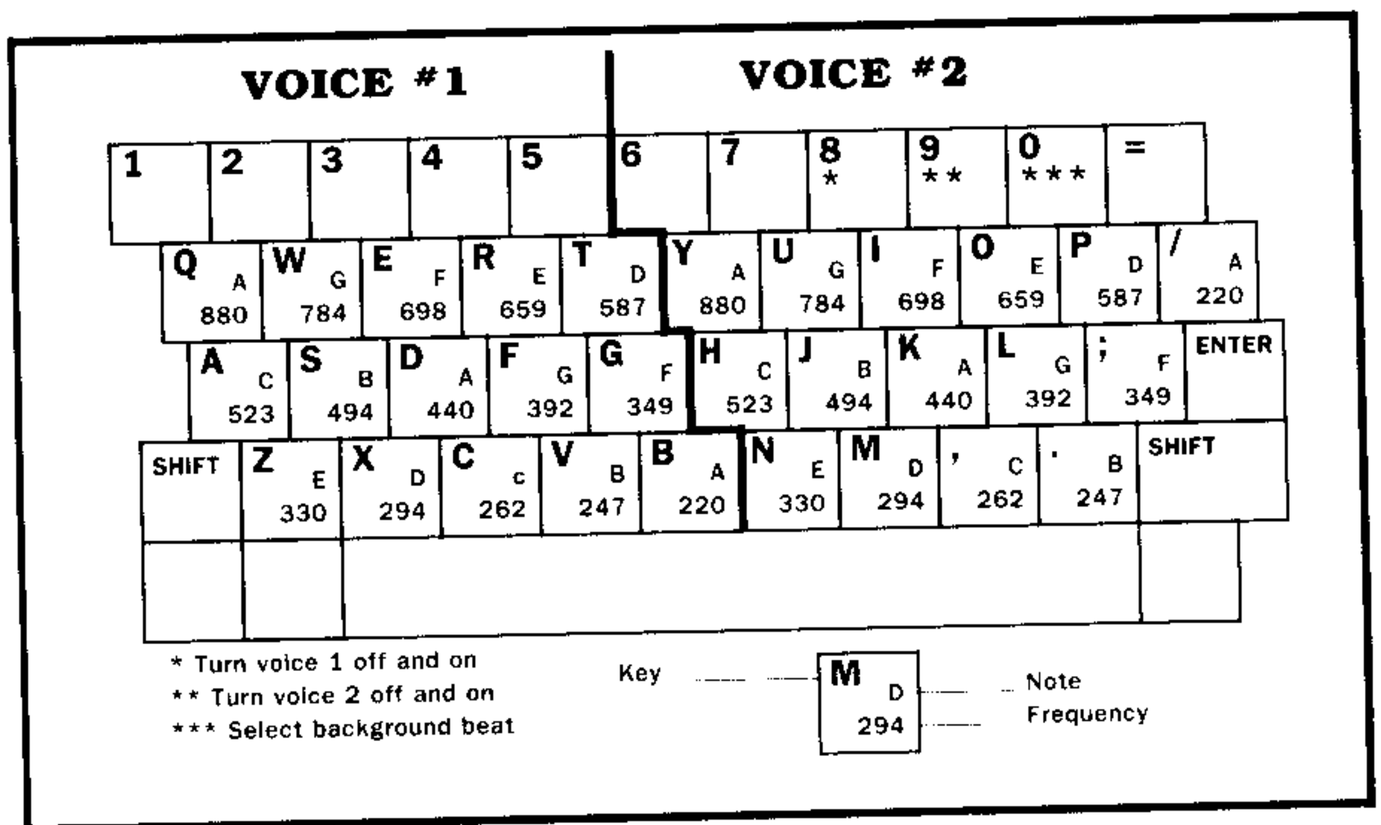
If you use two **CALL KEY** statements in a row, reading first one side and then the other, you can detect which two keys are being pressed on either side of the keyboard at practically the same time. This is done in lines 340 and 350 of the program. The left side of the keyboard controls Voice 1. The right side of the keyboard controls Voice 2. Voice 3 is programmable. I will discuss this in more detail later.

This method allows you to press two keys at the same time, thus mixing two different tones together. You can turn these voices off or on at any time. Pressing **8** will turn Voice 1 off or on. Pressing **9** will turn Voice 2 off and on. Pressing **0** will select one of three preprogrammed background rhythms.

The Beat Goes On

The third voice or tone is preset to generate an accompaniment. You can use one of the three rhythms provided here, or generate your own. The rhythms can be changed by pressing 0. With each keypress, a different rhythm is selected. Currently only three rhythms are set up in the program. If you have a working knowledge of TI BASIC, then you can increase this number or modify the existing three rhythms to suit your needs.

Lines 590 through 610 contain the data for the three rhythms. If you want to change a rhythm, you can do so by altering the data in these lines. Each rhythm is on its own line. The first number in the **DATA** statement represents a frequency, the second number a volume. There are eight combinations of a frequency with a volume on the line. These are the notes which will comprise the



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rhythm. If you change the data in these lines, you will need to keep the same number of items on each line—unless you wish to change other parts of the program. A frequency canbe any number from 110 to 44733, or a negative number from -1 to -8. The positive values are in Hertz or cycles per second. The negative values produce 8 different types of noise. The volume can be any number from 0 to 30. A value of 30 turns off the sound. The notes you set up in these lines will repeat themselves over and over again while you play notes on the rest of the keyboard.

If you want to make the background tune longer, you can do so by making minor changes to the program. In line 220 you will need to change the center subscript of the BN( ) array to the number of notes that you want to use. It is currently set to 8. You will then need to change the 8 in the FOR-NEXT loop in line 250 to the number of notes used. Line 540 checks for the note that is to be played and restarts the sequence when it reaches the end. You will also need to change the value that Z2 is tested against to one more than the number of notes you are using. Finally, you will need to provide enough data in lines 590-610 to supply the array with notes and volume settings.

"The TI-99/4A has a very powerful sound synthesizer . . . capable of producing up to three different tones and one noise at the same time."

If you want to add more choices to the background rhythms, you can make a few more minor changes. To start, you will need to increase the size of the first subscript of the BN( ) array in line 220, which is the rhythm index. It is currently set to 3 because there are 3 rhythms. Increase the size to the number of different rhythms you would like to use. Next, change the 3 in line 240 to the number of choices that you are going to have. Each time you select another rhythm, Line 500 increments Z1. Line 510 then checks to see if the rhythm index is beyond the number of rhythms available. If so, line 520 resets the rhythm index to 1. You need to change the value against which Z1 is checked. The value needs to be one more than the number of rhythms being used. Currently the value is set to 4, because there are 3 rhythms.

You can experiment with other parts of the program. In line 560, the tones are actually played. The volume is set to either 0 or 30, depending on the status of the flags in V1 and V2. If you would like to simply have a lower volume instead of turning off the voice, you can lower the number 30 to a value from 0 to 30.

In line 580 there are a number of preset values for the program when it starts. The first value is the duration. It is currently set to −600. The minus sign tells the computer to discontinue the tones if another CALL SOUND is encountered. Try changing this to 600 and see what happens. What happens when you try some of these values in place of the −600 duration: −50, −200, −300, 50, 250, 400, 1000?

HCM

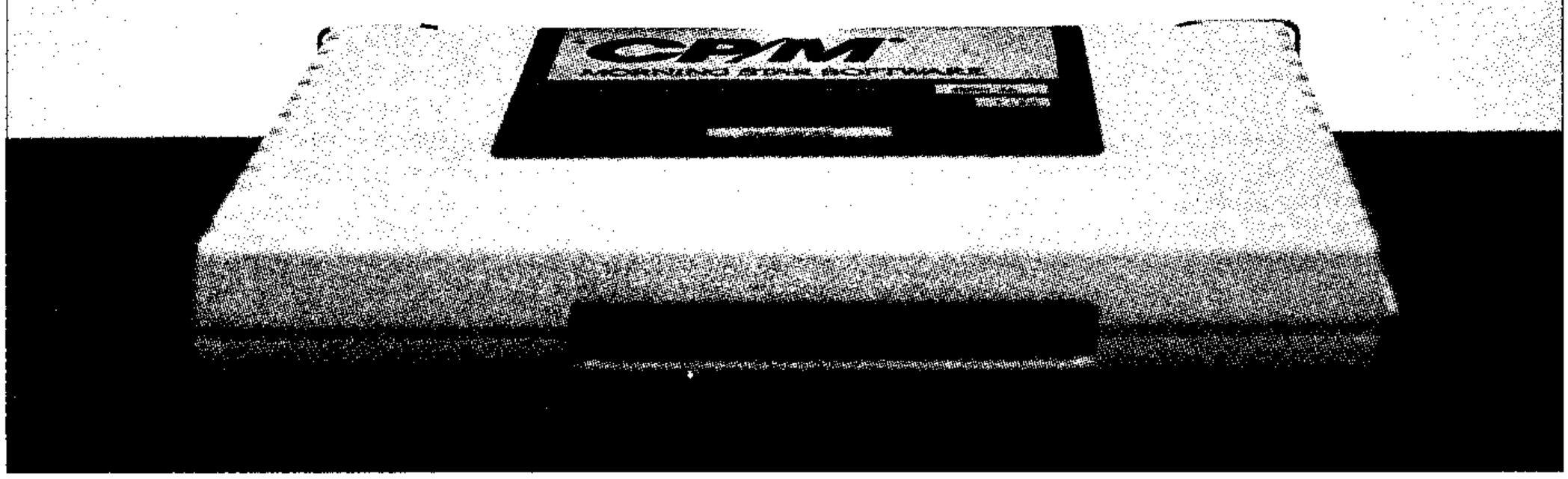
Musikey (TI-99/4A) Explanation of the Program.

Line Nos.	
100-190	Program header.
200-330	Initialize program variables.
340-350	Scan both halves of the keyboard.
360-430	Assign frequency to voice 1 and 2 from N( ) array.
440-490	Turn Voice 1 and 2 off or on.
500-520	Choose which background rhythm is playing.
530-550	Choose which note to play in the background. Indexes into the BN( ) array.
560-570	Play the tone and return for more.
580	Data for the initial condition of the tones when the program starts. The first value is the duration, which will remain the same throughout the program.
590-610	Data for the background tune. One data statement exists for each beat.
620	Data which maps notes to the keyboard.

```
100 REM  *********
110 REM  *  MUSIKEY  *
120 REM  *********
130 REM  COPYRIGHT 1985
140 REM  EMERALD VALLEY PUBLISHING CO.
150 REM  BY WILLIAM K. BALTHROP
160 REM  HOME COMPUTER MAGAZINE
170 REM  VERSION 5.2.1
180 REM  TI BASIC
190 REM  OR EXTENDED BASIC
200 CALL CLEAR
210 PRINT TAB(10);"MUSIKEY"::::::::::
220 DIM N(19),BN(3,8,2)
230 READ D,F1,V1,F2,V2
240 FOR Z1=1 TO 3
250 FOR Z2=1 TO 8
260 READ BN(Z1,Z2,1),BN(Z1,Z2,2)
270 NEXT Z2
280 NEXT Z1
290 Z1=1
300 Z2=1
310 FOR Z=0 TO 19
320 READ N(Z)
330 NEXT Z
340 CALL KEY(1,K1,S)
350 CALL KEY(2,K2,S)
360 IF (K1=-1)*(K2=-1) THEN 530
370 IF K1=-1 THEN 400
380 IF N(K1)<110 THEN 400
390 F1=N(K1)
400 IF K2=-1 THEN 530
410 IF N(K2)<110 THEN 440
420 F2=N(K2)
430 GOTO 530
440 IF N(K2)<3 THEN 530
450 ON N(K2)-2 GOTO 460,480,500
460 V1=ABS(V1-1)
470 GOTO 530
480 V2=ABS(V2-1)
490 GOTO 530
500 Z1=Z1+1
510 IF Z1<4 THEN 530
520 Z1=1
530 Z2=Z2+1
540 IF Z2<9 THEN 560
550 Z2=1
560 CALL SOUND(D,F1,V1*30,F2,V2*30,BN(Z
    1,Z2,1),BN(Z1,Z2,2))
570 GOTO 340
580 DATA -600,220,0,220,0
590 DATA 262,0,330,0,220,0,1250,20,-7,0
    ,-7,15,-7,20,110,30
600 DATA 440,0,494,0,523,0,494,0,523,0,
    587,0,523,0,494,0
610 DATA 220,0,220,15,247,0,220,15,330,
    0,330,15,349,0,330,15
620 DATA 294,523,494,440,784,698,659,2,
    3,4,5,587,392,247,262,330,220,349,8
    80,1
```

A CP/M Dawn

for the TI-99/4A



Thousands of programs await the TI-99/4A—if only it ran Adam Osborne's brand of CP/M. With this new package, it can do just that and more . . .

Are you looking for a way to expand the range of software available for your TI-99/4A? How about the wealth of programs that run on the "transcomputer" CP/M operating system? Ordinarily you would not be able to run these programs on the TI-99/4A because the TI machine uses the TMS 9900 microprocessor, which is not compatible with CP/M. But Morning Star Software's CP/M product contains the hardware and software necessary to run this popular system on the TI machine, finally opening up the wide, business-oriented world of CP/M to TI-99/4A users.

Morning Star's package consists of hardware, software and documentation. The hardware is a sturdy card which plugs into the Peripheral Expansion Box. This card contains a Z80 processor; 64K of random access memory (RAM); and an erasable, programmable, read-only memory (EPROM). The CP/M software comes on one 5-1/4 inch floppy disk. This disk contains most of the standard CP/M programs plus a few extras. The documentation consists of two manuals: Digital Research's general CP/M manual, plus a smaller manual from Morning Star describing CP/M on the TI-99/4A.

For this review I used a 99/4A with a TI color monitor, the peripheral expansion box, one disk drive, the memory expansion, the RS-232 interface card, an Okidata 82A printer, and the Morning Star CP/M package.

Installing CP/M on the 99/4A is a breeze. Complete installation instructions are given in the manual. After installation, you turn on the 99/4A as usual. You will see that a small menu has been added to the TI "color bars" screen, simply telling you to press 1 for the TI disk system or 2 for CP/M. Next you mount the Morning Star CP/M disk in the main (or only) disk drive, and press 2 for CP/M.

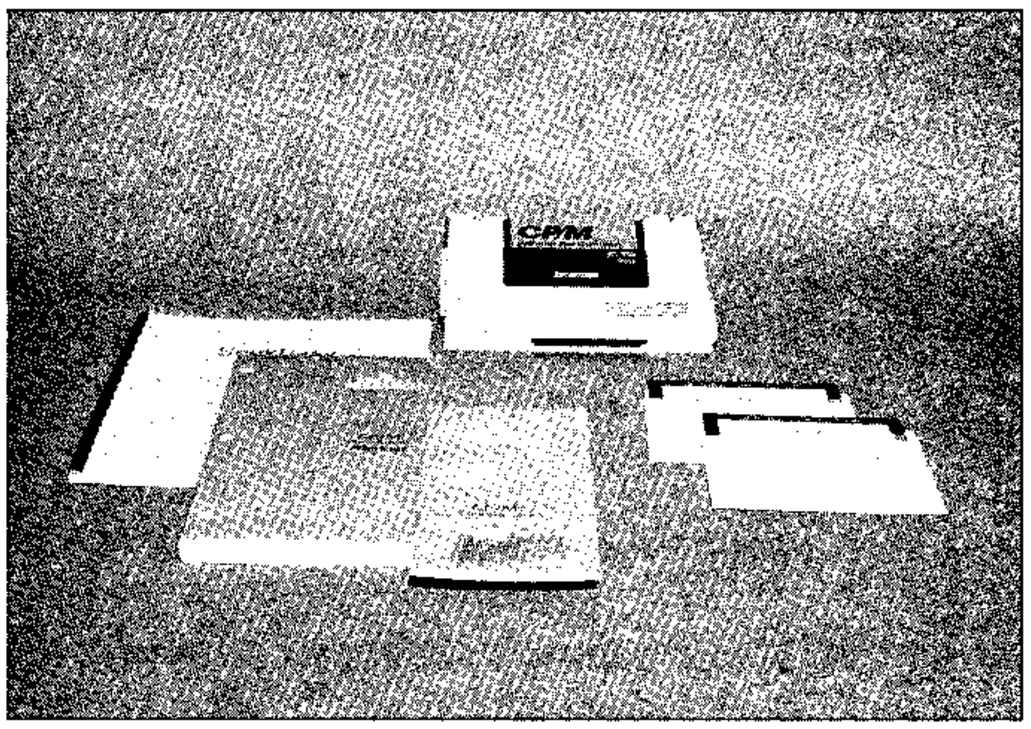
The Screen

Morning Star CP/M uses the screen in Color Graphics mode, which gives you 40 columns by 24 lines on the screen at any one time. This 40-column limitation is built into the TI hardware. Most of the CP/M software I've seen uses 80 columns by 24 lines. To get around this potential conflict, Morning Star thinks of the TI screen as a "window" on a larger "writing pad." This writing pad is 80 columns wide by 72 lines long. You can move the screen window around to view different portions of the writing pad by means of special key combinations. For example, (FCTN) 4 rolls the screen down 24 lines to show the next 24 lines of the writing pad. Nine different combinations exist for moving the window, and I found myself refering to the manual for all except one: (FCTN) (SPACE) gives you the other half of the screen (that is, the 40 columns to the left or right of where you are). This combination was the only one I really needed.

By using color graphics mode, Morning Star squeezes the most out of the existing TI-99/4A hardware (remember, TI BASIC gives you 32 columns, and only 28 using the PRINT statement), but there's a price: the screen is slow to draw and scroll. The company plans to offer the option of using 40-column Text mode in the near future, and this should speed things up for text applications like word processing, where you don't need color. To someone who has used CP/M on an 80-column screen, it is difficult to adjust to seeing only 40 columns at a time. If you are primarily a TI-99/4A user, then you are probably accustomed to 32 or 40 columns, so this limitation won't bother you.

The Tutorials

The Morning Star manual includes several tutorials which cover the basics. They are simple and clear. The



Name:	Morning Star Software CP/M
Program Type:	Operating System
Machine:	TI-99/4A
Distributor:	Morning Star Software 4325 S.W. 109th Ave. Beaverton, OR 97005 1-800-824-2412
Price:	$595

System Requirements: Peripheral expansion box, disk drive. Optional: Expansion memory, 2 additional disk drives and RS-232 interface.

	Poor Fair Good Excellent
Performance:	
Ease of Use:	
Ease of Set-up:	
Documentation:	

"It's obvious that Morning Star Software designed their product with the goal of allowing TI-99/4A users access to most of the CP/M programs available."

most important points—such as backing up your CP/M disk—are covered, and there is even an explanation on how to copy a file from one disk to another on a single-disk system. This useful procedure might take you months to figure out on your own. It's just the kind of thing you always hope to find in a tutorial but often don't.

CP/M Commands

Most of the "traditional" CP/M commands are present in the Morning Star system, and there is nothing weird about their usage. If you're already familiar with CP/M, then you should be able to step right up and start working. For readers who aren't familiar with CP/M, these commands and programs are present:

ASM	—an assembler
DDT	—a debugger
DIR	—display the directory of a disk
DUMP	—display a file in hexadecimal notation
ED	—a line editor
ERA	—erase a file from disk
LOAD	—turn assembler output into an executable program
PIP	—copy disk files
REN	—rename disk files
SAVE	—copy a portion of memory to a disk file
STAT	—display the status of the system, disks, and files
SUBMIT	—have CP/M execute a series of instructions
TYPE	—display a text file
USER	—select a user area
XSUB	—extended SUBMIT with more power

You can do quite a lot with these utilities. For example, you can input an 8080 assembly language program (with ED), assemble it into machine code (with ASM), debug it (with DDT), and store it on disk in executable form (with SAVE).

Experienced CP/Mer's might notice that three utilities are missing, namely MOVCPM, SYSGEN, and FORMAT. The MOVCPM utility, which lets you reconfigure CP/M for different memory sizes, would serve no purpose because the Morning Star system already has 64K of memory. SYSGEN, which copies the CP/M operating system bootstrap to disk, and FORMAT, which formats disks for CP/M, are replaced by the two special utilities described in the next section.

Morning Star Extras

Morning Star provides two nontraditional utilities with its CP/M. The first is called INIT. It formats disks for CP/M and puts a copy of the system bootstrap onto the first three tracks of the disk. INIT is a nice addition to CP/M because it's a one-step process that you will use a lot.

If you're wondering what a bootstrap is, let me explain. The bootstrap is the set of instructions that brings CP/M to life. When you turn on the 99/4A and select CP/M, you must have a disk with the bootstrap mounted in the main disk drive or the system won't know what to do. The bootstrap may also be needed at other times while you're running CP/M. For this reason you'll want to have bootstraps on almost all of the disks that you work with in the main disk drive. Morning Star makes it easy by including the copy procedure of the bootstrap in its INIT and BACKUP programs.

BACKUP is the other extra Morning Star utility. It makes copies of whole disks. It is like INIT in that it formats the new disk and copies the bootstrap. It is especially useful in making backup copies on one-disk systems.

Morning Star CP/M adds another useful feature to the 99/4A: a keyboard buffer. This means that you can type faster than the letters appear on the screen. Once you get used to this you'll have a hard time using TI BASIC, where your keystrokes are lost if you type too fast.

Running Some CP/M Applications

As I said earlier, the real reason to use CP/M is the wealth of applications programs which run under it. So it seemed reasonable to run some of my favorite CP/M programs on the Morning Star system as a test of the system's capabilities.

You'll notice that many ads for CP/M software include a list of available disk formats. Although CP/M is known as a standard, the truth is that there are variations from computer to computer. One of these variations is the disk format. You usually cannot take a disk from one CP/M computer and read it on a different brand of CP/M computer. I was relieved to find that Morning Star CP/M uses the common Osborne-1 single-sided, single-density disk format. In other words, you can put an Osborne-1 disk into your 99/4A disk drive and have Morning Star CP/M read it. This means that you can order software in a readily-available disk format. One of my other CP/M computers writes Osborne-1 disks, so I was able to get

programs across to the TI machine very easily. I created Osborne disks from scratch on the other computer and used them on the 99-4/A. I also took CP/M disks from the 99/4A and used them in the other computer.

Another variation among CP/M programs involves the type of terminal or screen being used. Screen manufacturers use different codes to manipulate the information on the screen—for example to clear the screen. Many CP/M applications include a procedure for setting up the appropriate screen codes for your computer (be careful though, many programs do not).

T/Maker II

The first program I ran on the 99/4A was *T/Maker II* by Peter Roizen. *T/Maker* was one of the first "integrated" programs—combining word processing, calculations, and primitive graphing. Running *T/Maker* itself went normally except for the smaller screen. I did regret that Morning Star replaces the normal (FCTN) S and (FCTN) D for cursor movement with (CTRL) S and (CTRL) D. This was a little hard to grow accustomed to, but once I adjusted to the new keystrokes I was able to whip out sensible text at close to my usual speed.

When it came time to print out my document, I had to do some experimenting. Morning Star will have a SETUP program to let you configure CP/M for various printer requirements such as baud rate, but it was not being supplied yet when *Home Computer Magazine* received the system for review. I was able to print on the Okidata printer without too much trouble by setting up the printer to conform with the RS-232 interface's default serial settings: 300 baud with parity and 7 bits of data. On the Okidata 82A, these settings are made with pencil switches. On the front bank of switches, I set switches 5 and 8 to on and the rest to off. On the rear bank of switches, I set switches 4 and 5 to off and the rest to on. Printing at 300 baud was not speedy, but it was adequate for testing purposes.

"Morning Star CP/M adds another useful feature to the 99/4A: a keyboard buffer."

Fortran-80 And Link-80

The next test involved running *Fortran-80*, a CP/M Fortran compiler, and *Link-80*, its linker, both by Microsoft. This was easier than running *T/Maker*, because these programs do no fancy screen manipulations. I used CP/M's editor ED to write a simple program and a couple of very simple subroutines on the 99/4A. Then I compiled them with *Fortran-80* and linked them with *Link-80*. Both the compiler and linker ran normally, and the resulting program ran just as expected.

There was one nice surprise, though: the disk speed was faster than usual. Morning Star uses a disk-buffering technique which speeds up reading from and writing to a disk.

The Third Test

For my final test, I decided to run one of my own programs, which does maintenance on disk files containing business statistics. This program displays a main menu and several submenus. The user selects items from the menus and ultimately arrives at screens showing information about such things as year-to-date sales and profits. The user can then change the numbers selectively, and the changed information is stored on disk.

To prepare for the test, I copied the program and its associated data files onto a Morning Star (Osborne) disk. I mounted the disk in the 99/4A and invoked the program. It ran flawlessly.

This test pointed up another feature of Morning Star CP/M. My program is on the large side; in fact, it is too large to run on some CP/M computers. Morning Star gives you a 60K TPA (Transient Program Area), which means that you should have no memory-size problem in running off-the-shelf programs.

"There was one nice surprise . . . the disk speed was faster than usual."

Things That Could Be Better

Aside from the small screen size, I found very few things about Morning Star's CP/M that I didn't like. The complexities of moving the window might be simplified by some kind of crib-strip for the TI-99/4A console, although the (FCTN) (SHIFT) combinations would be hard to show that way.

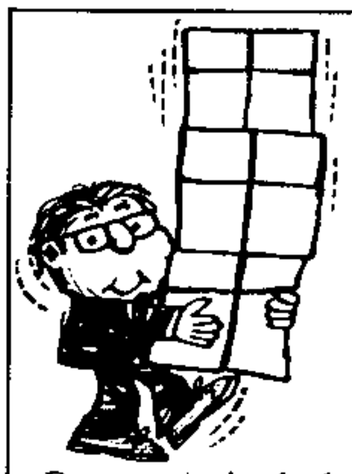
The *Digital Research CP/M Manual* is not as clear as it might be. I've used this standard manual many times before and always found it to be somewhat limited and confusing. Plenty of better books about CP/M are available in bookstores. I have at least two such books, and I think you might want to invest in one, especially if you are new to CP/M.

The Morning Star manual says that you can exit from CP/M and get back to the "color bars" screen by pressing (CTRL) (FCTN) (SPACE BAR). I found that this produced a garbled screen. I was able to reselect CP/M with no problems, but if I tried to select the TI disk system from the garbled screen, I continued to see garbage. The simple remedy is to turn the console off and back on (after removing your disk).

Conclusion

It's obvious that Morning Star Software designed their product with the goal of allowing TI-99/4A users access to most of the CP/M programs available. Its choice of a common disk format and screen codes, and the generous size of the TPA illustrate this intention. Within the limitations of the TI-99/4A hardware, I would say that Morning Star was very successful.

HCM



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INDUSTRY WATCH

SPECIALIZED PRODUCTS CONTINUE TO FLOURISH FOR ORPHANED 99/4A

Even though production of the TI-99/4A computer has long been discontinued, product development for it continues to flourish. A new CP/M-compatible card for the 99/4A's peripheral expansion box (PEB) could itself function as a stand-alone computer, says a representative of Foundation Computing, its creator. The card includes 64K RAM, a proprietary operating system, 2 RS-232 ports, and a built-in Western Digital disk controller that operates with double-density drives. The $350 card's CPU is a Zilog Z80A that operates at 4 megahertz. It can be operated with Foundation's soon-to-be-released 80-column card. Speaking of cards, Myarc Inc. is expected to introduce a flexible expansion memory card, also for the TI-99/4A PEB. It will come with as little as 32K RAM, with additional chips available to upgrade it to 128K. In addition, Myarc is releasing a chip that will provide owners of Myarc's disk controller card with a resident disk directory available for use at any time. It takes up 1K of the card's memory and can be used without losing the contents of the computer's memory.

APPLE PRODUCTS SHOW EFFORT AT COEXISTENCE WITH IBM

In its continuing effort to wedge its way into the business environment, Apple Computer Inc. recently introduced its new product line (the Macintosh Office), reduced prices, and renamed the Lisa as expected. Making their first official appearances at Apple's annual stockholders' meeting were Laserwriter, Apple's $7,000 laser printer, and AppleTalk Personal Network, Apple's local area network that consists of a cable kit, software for the Mac and for MS-DOS, and a card for the IBM PC, PC XT, and PC AT—all at $50 per unit. AppleTalk will support 32 devices. (In addition, a third-party company, Dayna Communications, has announced a $995 MacCharlie, a coprocessor that allows Mac users to run IBM PC software.) Price reductions included the 512K Fat Mac, down to $2,795 from $3,195; the 512K memory expansion kit, cut $300; and the Lisa 2/10, now renamed the Macintosh XL, down to $3,995 from $5,495. What wasn't expected, at least to outsiders, was the departure of Apple Co-Founder Steve Wozniak, who reportedly disagrees bitterly with the company's direction and is leaving to develop home-video equipment (and maybe even other computers . . .). He will stay on Apple's payroll as an engineering consultant. With the departure of Wozniak and at least 2 other engineers, development of Apple's *II*x—its next generation II Family machine—may be suspended.

UNLIKE PREDICTIONS, MSX INTRODUCTION A NONEVENT

The much-touted MSX world finally made a presence at the Winter Consumer Electronics Show, but it was one of yawning excitement rather than something of real impact. The arrival here of MSX computers—which all run Microsoft Extended BASIC and are supported by the biggest names in Japanese electronics—has been long awaited, but the wait may have been too long. Dealers, distributors, and competitors gave the technically-similar machines a less-than-warm welcome, saying that the 8-bit machines are now technically outdated, and that there is no room for another low-end machine standard such as the MSX. However, the new MSX computers include displays of 256 colors instead of 16, disk drives, and computer graphics that can be combined with images stored on a videodisk. MSX's price will place it between low-enders Atari and Commodore and high-enders Apple and IBM, and its biggest selling point may be its unique ability to interface to video systems, laser disks, and other home appliances originating from Japan Inc. Kazuhiko "Kay" Nishi, who devised the MSX standard, promised that the computers would be in the U.S. in time for Christmas 1985, even though the 12 MSX manufacturers at CES stated that they were in Las Vegas only to show, and not sell.

ATARI & COMMODORE DECIDE: OUT WITH THE OLD, IN WITH THE NEW

Swelling inventories due to sluggish Christmas sales has prompted Commodore International Ltd. officials to cut both its production workers and its prices. Commodore has "furloughed" approximately 540 workers at its chip-assembly and computer plants, and cut the price of its Commodore 64 computer and disk drive units about 25 percent. Thousands of the systems are being sold at unheard-of low prices through a national liquidator, which said that Commodore is phasing out the C-64. Competitor Atari Corp. immediately followed by reducing the price of its 800 XL to $99, which, some analysts speculate, would mean that Atari is selling the machine for less than it costs to make it. Both companies are trying to clear their decks of these old machines in favor of obtaining cash for their new models, the Commodore 128 and the Atari ST. Interestingly, both of these rivals have finally seen the need to implement upward software compatibility, but neither firms' machines have built-in disk drives, nor is there mention of intended cassette software support. Although there are only price rumors available, it seems that buyers will be expected to spring for the optional disk drives and monitors at the time of machine purchase, pushing the price of the typically low-end system up into the $500 to $1000 range.

WHAT NEXT FOR THE PCjr?

Now that the Christmas buying rush is long past, the big question on the minds of PCjr dealers is whether/when IBM will renew its promotional pricing for the machine. Reducing its tag to $999 (almost a 60-percent reduction from its price a year ago) while throwing in a color monitor and software, jolted it out of ho-hum sales into a starring role this past Christmas. Many retailers have insisted that the $999 price set a precedent for the machine, and to discontinue the promotions would once again have them singing the "blues." Even though IBM has not yet announced any new marketing schemes for Junior, it is reportedly producing PCjrs at the same rate as it did in its successful fourth quarter.

THINGS TO WATCH FOR THIS YEAR:

Turbo Pascal for the TI-99/4A . . . A Kodak personal computer . . . Hitachi's and IBM's CD ROM compact disk drives, which store up to 300,000 text pages . . . A 40-megabyte optical drive for IBM's portable . . . IBM's Personal Computer JX, similar to the PCjr but with 3-1/2 inch floppy-disk drives. It may in fact turn out to be the long-awaited PC2 . . . Rumored for the more distant future are a 3-1/2 inch, hard-disk-based Atari computer for less than $1,000, and a Mitsubishi-built Atari PC-compatible . . . Things Not To Watch For: a Cabbage Patch computer from Coleco—the company which gave us the Adam, another famous orphan.

GEM: DIAMOND OR RHINESTONE?

It's been compared to Apple's Macintosh. It will run on the IBM PC and has been described as a better alternative than IBM's *Top View* windows program. It is going to be bundled with Atari's new ST computers, and it has received enthusiastic response from industry critics. Hot out of the starting blocks before it has even been released for public consumption is GEM, Digital Research Inc.'s Graphics Environment Manager. It functions as a transparent layer between the operating system and an application, using a mouse to point to icons representing common computing functions much like the Macintosh does. In addition to the bundling endorsement from Atari and Britain's Applied Computer Technology, both Texas Instruments (for its Pro line) and Tandy/Radio Shack are expected to follow suit. So far at least 7 major software publishers are adapting old and developing new programs to run with the window manager. The GEM Desktop application will reportedly be available in late spring as a separate retail product of about $50.

HOME COMPUTER™ product news

Each month we publish items of interest and news of recently or soon-to-be released computer products. Our publication of information from manufacturers of computers, peripherals, software, and accessories is not to be construed as product endorsement. Prices quoted are the manufacturers' suggested retail prices and are subject to change.

Send press releases to:

Product News Editor
Home Computer Magazine
1500 Valley River Drive., Suite 250
Eugene, OR 97401

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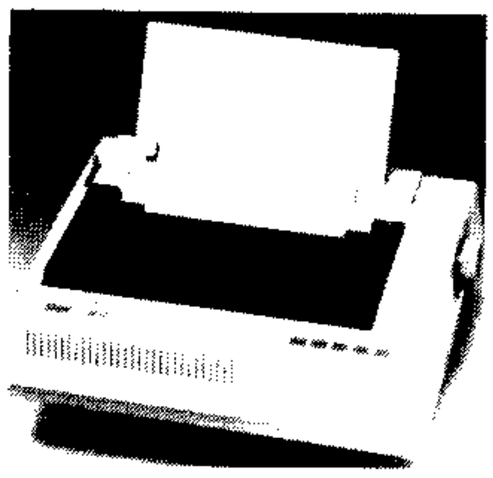
The Printed Word Becomes Starstruck

New Printer Line Offers Flexibilty

Star Micronics Inc. has introduced its new line of printers, the SG, SD, and SR series, each available in 10- or 15-inch versions. The 15-inch machines have a standard 16K buffer. All of the printers offer Near Letter Quality or Draft modes, friction and tractor standards, hex dump, and downloadable characters. In addition, the SR printers have automatic single-sheet feed, pause and feed buttons, and short form tear-off. The SG-10 ($299) and SG-15 ($499) print at 120 cps, the SD-10 ($449) and SD-15 ($599) print at 160 cps, and the SR-10 ($649)



and SR-15 ($799) print at 200 cps. The printer series combines the Star standard and PC printer lines into one line that is switch-selectable for the IBM PC, Apple *II* Family, and Commodore computers.

Star Micronics Inc.
200 Park Ave.
New York, NY 10166

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TI Users Get An Extension

Extended BASIC Available Again

Under a direct license from Texas Instruments Inc., Microsphere has begun shipping their MicroPal Extended BASIC cartridges for the TI-99/4A. Microsphere guarantees that MicroPal is 100-percent compatible with all commercial and user-written programs requiring the original TI Extended BASIC. It carries a suggested retail price of $89.95.

Microsphere, Inc.
14009 E. Jefferson Blvd.
Mishawaka, IN 46545
1-800-348-2778

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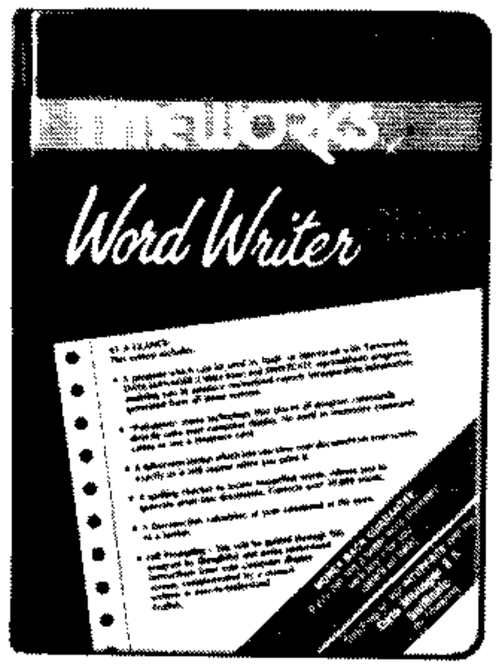
Integration Is The Key Word

Double Package for PC, PCjr

The Word Writer word processing program and Data Manager 2 data base from Timeworks, Inc. are now available for the IBM PC and PCjr. They join Timeworks' SwiftCalc spreadsheet, making up an integrated, three-program set. Word Writer includes a spell checker of more than 40,000 words, as well as a built-in calculator. Along with normal editing features, it provides for document chaining, page separations, horizontal and vertical scrolling, and form-letter printout options. Data Manager 2 is a general information-storage and retrieval system with report-writing, graphics, and label-making capabilities. It contains Timeworks'



X-Search, X-Sort, and X-Chart features. For a limited time, the IBM versions of Word Writer and Data Manager 2 can both be purchased for $129.95 total.

Timeworks
444 Lake Cook Rd.
Deerfield, IL 60015
1-800-323-9755

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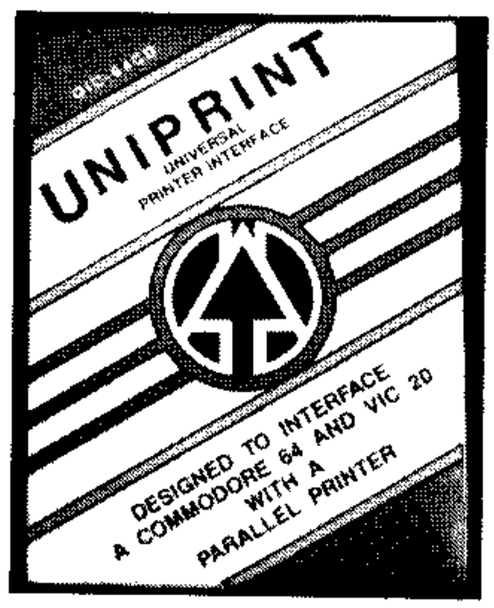
The Commodore Connection

An Easy-to-Use Printer Interface

Uniprint, by Giga International Corp., interfaces the Commodore 64 and VIC-20 with any parallel printer, including daisy wheels. It has no dip switches, and no chip changes are required. Uniprint converts Commodore ASCII into Standard ASCII through its Translate mode, which accesses special printer features like underlining, boldface, and italics when set in Transparent mode. It permits most printers to emulate the Commodore VIC 1525 Printer and allows dot-matrix printers with programmable graphic capabilities to



print all the letters and graphic characters found in Commodore ASCII. The Uniprint interface costs $99.

Giga International Corp.
312A Auburn St.
San Rafael, CA 94901
(415) 258-0901

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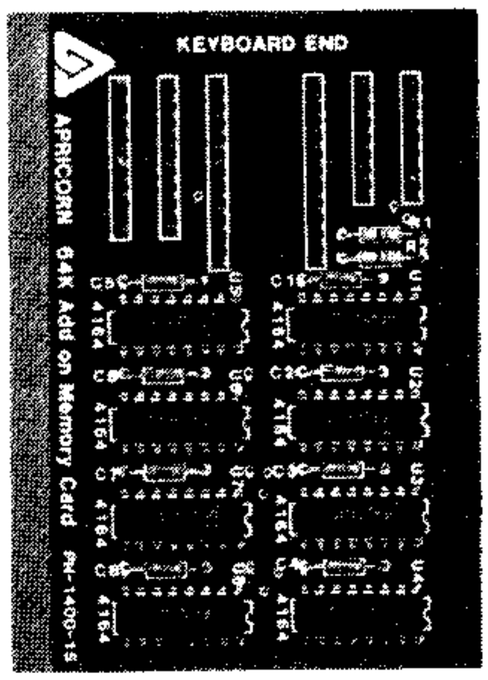
HOME COMPUTER™ product news

Peripheral Power

New Add-Ons for Apple

Two new peripherals for Apple *II* Family computers have been released by Apricorn: Extend-It, and Super Serial Imager. Extend-It is a 64K memory module that doubles system memory to 128K bytes for owners of Apple *IIe* computers equipped with Apple's 80 Column Text Card. Super Serial Imager can transfer high-resolution graphics from screen to printer, and it will also support the new 300/1200 baud intelligent modems.



Apricorn
7050 Convoy Court
San Diego, CA 92111
(619) 569-9483

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Great Graphics With Zoom

Graphics Design Tool for the 99/4A

Graphx is a graphics design program for the TI-99/4A that can be used alone or as a tool with assembly language programs. Users can try freehand drawing, zooming in on or moving sections of pictures, repainting parts of pictures to new colors, a typewriter mode to add text, line and circle creation, and animation, among other things. Graphx requires 32K, a disk drive, and a joystick, and it costs $50.

Graphx
P.O. Box C568
Sydney, NSW 2000 Australia

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Only The Final Result Counts

Word Processing & Spreadsheet Results

Handic Software has released Word Result, an IBM PC or PCjr word-processing program that works with the company's Calc Result spreadsheet program when 256K memory is available. Word Result uses verb and noun combinations for the commands. Full-screen formatting displays what the printed document will look like, including headers, page numbers, margins, indents, and footnotes. Other features include mail merge, discretionary word division, abbreviation registers, and "total printer compatibility." Word Result and Calc Result are $195 each, or $345 for the set when purchased together.

Handic Software Inc.
520 Fellowship Rd. Suite B206
Mount Laurel, NJ 08054
(609) 866-1001

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Update Of A Classic

It's Super Zaxxon!

Human Engineered Software has introduced Super Zaxxon for the Commodore 64, with fast action, more ground targets, and advanced three-dimensional graphics. A tunnel where planes zoom in to attack and flying saucers drop bombs on from above has been added, as have floating fortresses and a fireball-spitting dragon. Super Zaxxon retails for $29.95.

Human Engineered Software
150 North Hill Dr.
Brisbane, CA 94005
(415) 468-4111

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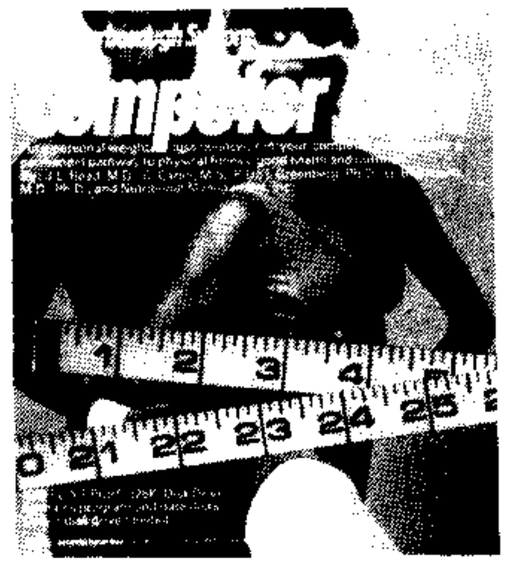
Computer-Assisted Weight Reduction

Ways to Keep Fit & Lose Weight

The Original Boston Computer Diet, a new program by Scarborough Systems, Inc., emphasizes change—in eating habits, exercise routines, lifestyle, and behavior. Designed for people with weight-loss problems of 10 to 40 pounds, the program acts as a personal fitness and weight-loss counselor, using dialogue to analyze your nutritional requirements, monitor your eating and exercise habits, and suggest meal plans. The Original Boston Computer Diet is available for Apple *II* Family and IBM PC/PCjr systems for $79.95, and for the Commodore 64 for $49.95.



Scarborough Systems, Inc.
55 S. Broadway
Tarrytown, NY 10591
1-800-882-8222

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Role-Playing On Apples

Magic Abounds in Fantasy Lands

Two fantasy role-playing games for the Apple *II* Family, IBM PC/PCjr, and Commodore 64 will be released this Spring by Origin Systems, Inc. Ultima IV—Quest of the Avatar fully occupies both sides of two disks and allows the player to converse with characters in the game on hundreds of topics. Opportunities for an "infinite variety of combat situations in a multitude of terrains and scenarios" abound in the land of Brittania, as does "a unified system of magic." In Moebius I—The Orb of Celestial Harmony, players must recover the stolen Orb before it disrupts the universe and destroys the island kingdom of Khantun. Travels take players through the elemental planes of Earth, Water, Air, and Fire and their hostile residents, with a sword and knowledge of martial arts the only defenses. Both games retail for $59.95.

Origin Systems, Inc.
1545 Osgood St. #7
North Andover, MA 01845
(617) 681-0609

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Turn From Luck To Skill

A Guide to Casino Gaming

Caesars World Productions, Inc. and Screenplay, Inc. have released Blackjack, the first game in their series "Caesar's Guide to Gaming." The series is designed to help players improve their skills through the simulation of casino games as played at Caesars Palace in Las Vegas, Nevada; Caesars Tahoe at Stateline, Nevada; and Caesars Atlantic City in New Jersey. Other games to be released later include Roulette, Craps, Poker,

Baccarat, and Slots. They will all be available for the Commodore 64, IBM PC and PCjr, and the Apple *II* Family computers. The retail price of Blackjack is $69.95.

Screenplay, Inc.
1095 Airport Rd.
Minden, NV 89423
(702) 782-9731

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Let The Computer Deal With The IRS

A New Tax Calculation Program

Texas Taxes is a tax calculation program for the TI-99/4A that includes forms 1040 and 2441, schedules A, B, G, and W, and the tax tables (including the state sales tax for your state). The 16K program requires only a cassette player or a disk drive, and it is available for $10.95 plus $2 postage and handling. If you send it back every year with $5, you will receive an updated version that includes all form changes.

Steven Karasek
855 Diversey Dr.
St. Louis, Mo. 63126

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Let The Apple Sound Off

Music & Sound Capabilities Arrive

Polyphonic music, sound effects, and speech response for the Apple *II* + and *IIe* are now possible with the Sound Master plug-in printed circuit board from Covox, Inc. It can produce 3 independently programmable tones and other noises, and a demonstration disk includes a numbers vocabulary for creating talking calculators and games. An on-board power amplifier directly drives either the internal or an external loudspeaker. Also, prerecorded synthetic or digitized speech may be

reproduced. The Sound Master is $39.95, which includes the board, a 32-page manual, and the demo disk.

Covox, Inc.
675-D Conger St.
Eugene, OR 97402
(503) 342-1271

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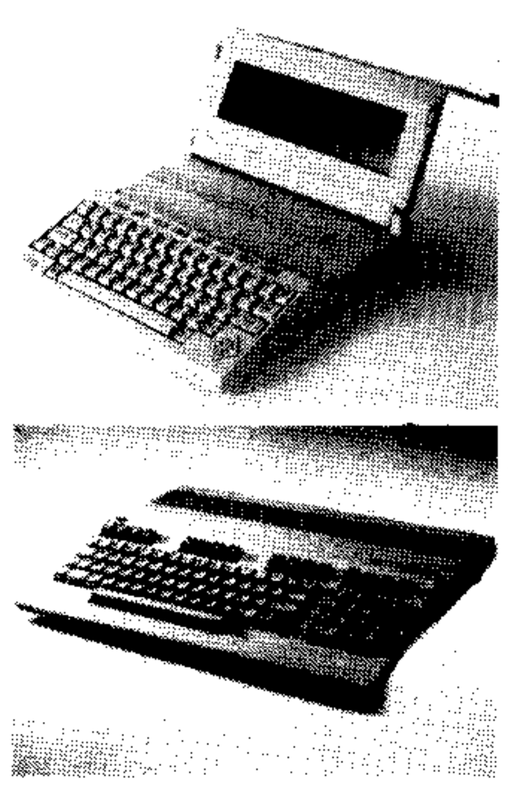
Commodore Rolls Out New Systems

A PC, An LCD, and Peripherals

Commodore International Ltd. has introduced its new Commodore 128 Personal Computer, its Commodore LCD, and a line of peripherals which include a disk drive, monochrome and color monitors, modems, and a mouse. The Commodore 128 features 128K RAM expandable to 512K, 40/80-column full-color display, compatibility with all Commodore 64 peripherals and software, a 92-key keyboard including a numeric keypad, and the ability to run CP/M programs.

The LCD (liquid crystal display) is a three-pound, briefcase-size computer with built-in Comodore 3.6 BASIC, 32K RAM, and an 80-column-by-16-line screen. It can run on batteries or external power supplies, and word processing, file management, spreadsheet, communications, and other software are built-in.

The Commodore 1571 5-1/4 inch floppy disk drive offers 1/2 megabyte, 360K formatted storage, fast data transfers, and two operating modes—Commodore 64, which operates at about 300 cps, and Commodore 128 mode, which operates at about 2000 cps. The Commodore 1660 Modem 300 and 1670 Modem 1200 feature auto-answer/auto-dial, and a built-in speaker. The Commodore Mouse complements the Commodore 128 Personal Computer, and the Commodore 1901 Monochrome Monitor and 1902 RGBI/Composite Monitor both support 80- and 40-column displays.



Commodore International Ltd.
1200 Wilson Dr.
West Chester, PA 19380
(215) 431-9100

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Getting It Disassembled

Serious Programmer's Tools Available

StarSoft has introduced their Disassembler and Disk Editor programs for the TI-99/4A. Both are $19.95. The Disassembler can disassemble in text, data, or mnemonic instruction formats, and output to the screen, printer, or drive. It may also be used to disassemble system ROM routines as well as programs loaded from disk. It requires 32K, a disk drive, and the Editor/Assembler cartridge. The Disk Editor allows the user to edit a disk by individual sectors and bytes rather than by file names. A full-screen editor displays the contents of a sector on the screen and allows editing in both hexadecimal and ASCII character formats. It requires 32K, a disk drive, and either an Extended BASIC, Mini Memory, or Editor/Assembler cartridge.

StarSoft
601 Alleghany St.
Blacksburg, VA 24060
(703) 953-1490

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Stay-At-Home Shopping

Obtain Mall Access Via Computer

The Electronic Mall, a videotex shopping service for modem-equipped personal computer users, will be available later this year to subscribers of CompuServe Information Service. The Mall offers thousands of products and services from such outlets as retail stores, airlines, travel services, insurance and record companies, and publishers, often at a discount to subscribers. Complete descriptions are provided on all products, and a feedback capability allows shop-at-home users to ask the mall manager specific questions. It is "open" 24 hours a day, every day.

CompuServe
P.O. Box 20212
Columbus, OH 43220
(614) 457-8600

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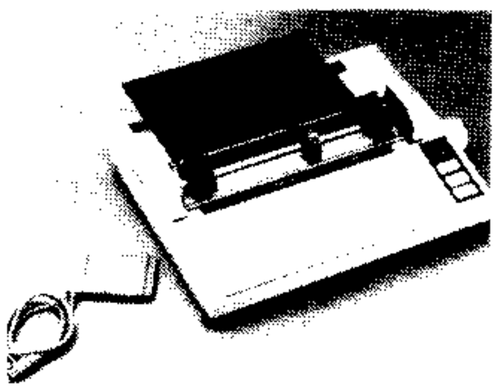
Write A Letter Home

New Printer Connects to Many Systems

HomeWriter 10 is a new 80-column dot-matrix printer by Epson America, Inc. that was created specifically for the home market. Its new plug-in Printer Interface Cartridges (PIC) connect the printer to most brands of personal computers, including the Commodore 64, IBM PCjr, and Apple *IIc*. The HomeWriter 10 operates at 100 cps in Draft mode and at 16 cps in Near Letter Quality mode. Users can choose combinations of print styles such as condensed, emphasized, or doublestrike. The printer will be available in March for $269, and $60 for each PIC. An optional tractor feed ($39.95) and cut sheet feeder ($99.95) will also be available.



Epson America Inc.
2780 Lomita Blvd.
Torrance, CA 90505
(213) 539-9140

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From Pints to Quarts to Gallons to . . .

Unit Conversions Computed

Tanoak Software Inc. has introduced Tanoak Conversions, a software package that performs unit conversions of more than 50 engineering, scientific, and general categories. Up to 36 units are available in each of these categories, which are indexed in alphabetical order. The menu-driven program accepts both decimal and exponential notation for both input and output formats. The program runs on the IBM PC and compatibles with 128K RAM, and is priced at $49.

Tanoak Software Inc.
878 Brookline Dr.
Sunnyvale, CA 94087
(408) 738-8339

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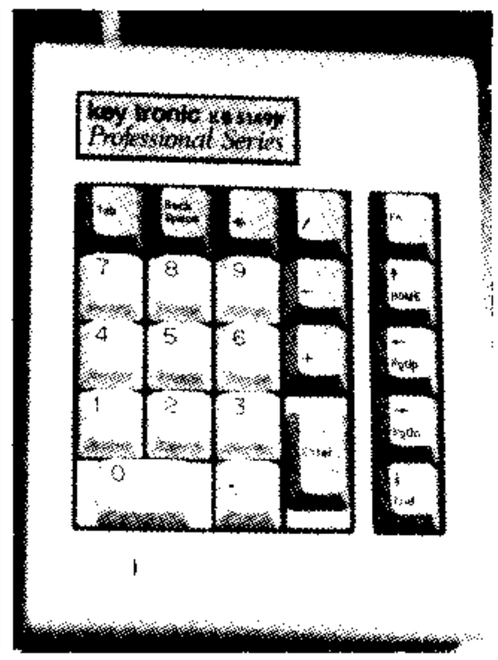
First Letters, Now Numbers

PCjr Gets Numeric Keypad

Key Tronic has released its KB 5149jr, a numeric data entry pad that attaches to the PCjr. It includes keys for numeric data entry, cursor control, mathematical functions, tabs, and backspacing, and it can convert to function mode without returning to the PCjr keyboard. Its suggested retail price is $99.95.



Key Tronic
P.O. Box 14687
Spokane, WA 99214
1-800-262-6006

❖ ❖ ❖ ❖

A Ticklish Matter

2 Printer Utilities for TI

Gembar Graphics has released two printer utilities for the TI-99/4A. The Epson RX-80 Tickler and the Gemini 10X/15X Tickler employ menus to help the user set font styles, print pitches, line and form feeds, margins, tabs, bold, underlines, subscripting, and other options. Available on diskettes only, the packages require Extended BASIC and expanded memory, and cost $11.95 each.

Gembar Graphics
455 Amherst Circle East
Satellite Beach, FL 32937

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Computer Clubs Competition

Apple to Award Prizes Again

The Second Annual National Competition for Apple Student Computer Clubs is now under way. Sponsored by Apple Computer, Inc., students and advisors at elementary and secondary schools across the country will again compete for Apple hardware and software awards. Clubs can submit either a computer programming project that demonstrates their collective technical skills, or a project that uses personal computers to help members of the community. Club advisors can enter either an advisor project that documents an effort to successfully build a student computer club, or a lesson plan project that demonstrates how advisors and teachers can work together to integrate personal computers into the regular educational curriculum. A total of 88 clubs and 48 advisors will be chosen as semifinalists. All U.S. clubs that are members of the Apple Computer Clubs program are eligible. Entries must be postmarked by April 15, 1985. For more information or to enter, write:

Apple Computer Clubs
P.O. Box 948
217 Jackson St.
Lowell, MA 01853

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TECH NOTES

NUMERIC DATA COMPACTION

A major concern among TI-99/4A programmers is the machine's limited memory—only 16K-bytes. Expanding this to 48K is relatively expensive, and software which requires memory expansion sorely reduces the audience that could use it. The following routines may help eliminate some memory space problems.

The TI-99/4A is capable of containing only one type of number, refered to as a floating point. A floating point number can be extremely large or small, and can include scientific notation (such as 4.0036623E+56). However, the cost in memory space to hold such numbers is great. No matter what value you assign to a number, it will always use up 8 bytes of memory. A further restriction is that the numbers must be positive, ranging from 0 to 65536. But, it is not always necessary to use floating point numbers—many applications work only with integer numbers. Integer numbers are numbers which have no fractional part (nothing to the right of the decimal point). The biggest advantage that the method shown below has over storing values conventionally is that it requires only 2 bytes of memory for each value, as opposed to 8 bytes with normal variables. This is a 400% savings in memory.

The most efficient use of these routines occurs when you need to contain a large number of values in memory, and you can't do it with conventional variables. (Although conventional variables should be considered first, because as with everything else in the world, nothing is free—i.e., the routines presented here are slow in comparison to simply using standard numeric variables.)

The secret to these routines is to convert a TI BASIC number into a 2-byte (16-bit) integer representation. Strings are the perfect medium for the 2-byte integer. Strings contain ASCII characters; each character uses 8 bits and can have a value between 0 and 255. By using two characters, we can create a 16-bit quantity:

```
CHARACTER 1          CHARACTER 2
ASCII VALUE=2        ASCII VALUE=5
00000010             00000101
```

The two characters above could be combined with this type of statement:

```
A$=CHR$(2)&CHR$(5)
```

The first character would have a weight of 256 because it contains the high-order byte of the value. The second character would have a weight of 1 because it contains the low-order byte. The value of the above string could be found like this:

```
V=(ASC(SEG$(A$,1,1))*256) + (ASC(SEG$(A$,2,1)))    =517
      (2*256)             +          5             =517
```

Separate the characters from each other using the **SEG$** function. The ASCII value of the first character is then multiplied by 256. The ASCII value of the second character is added to that result. Thus we arrive at a value of 517.

To create an integer string of a number, V, we must perform the opposite process:

```
A$=CHR$(INT(V/256))&CHR$(V-INT(V/256)*256))
```

To simplify the programming process, define these two lines as functions. As a function you can pass a number or a string, and return the converted result. The two functions are:

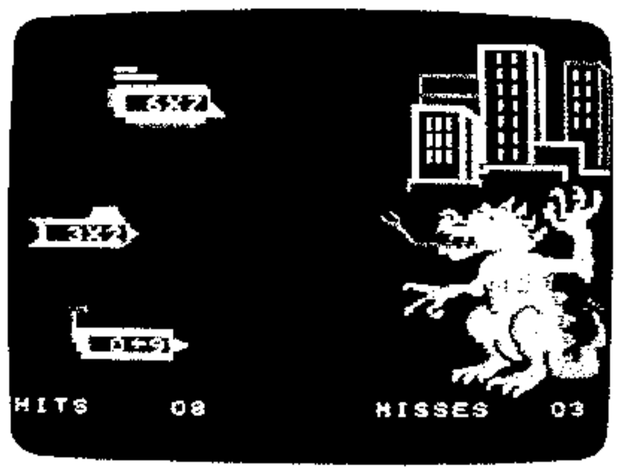
```
DEF NTS$(V)=CHR$(INT(V/256))&CHR$(V-(INT(V/256)*256))

DEF STN(A$)=(ASC(SEG$(A$,1,1))*256)+(ASC(SEG$(A$,2,1)))
```

—William K. Balthrop

What do flying saucers and fire-breathing dragons have to do with multiplication and division?

HCM Review



Name:	Dragon Mix
Program Type:	Educational game
Machine:	TI-99/4A
Manufacturer:	Texas Instruments TI-CARES 1-800-842-2737
Price:	$15.95

	Poor	Fair	Good	Excellent
Performance:				■
Engrossment:			■	
Documentation:				■

DRAGON MIX

A Review by Steve Nelson
HCM Staff

One of the oldest ways of capturing a child's interest in an educational program is to make it look like an arcade game. The idea is to *entertain* in order to *educate*. This approach can get more than old—at times, it leaves me wishing for something more original. I believe that children can and do learn without needing to be "entertained," or fooled into thinking that they are not really learning, but playing. All children have one propensity—the desire to discover new things—i.e., to learn.

Make Learning Fun

Dragon Mix is an educational "game" that uses the old, standard, make-learning-fun approach. The object of this game is to defend the city from three attacking spaceships—each displaying a multiplication or division problem. A "student" may defend the city with the help of an enormous, fire-breathing dragon that bears the correct answer to one of the spaceship problems on its belly button. After solving one of the problems, the student can try to "equalize" the ship (blow it out of the sky) by making the dragon breathe fire on it. For this, the student presses the space bar when the dragon's tongue is aimed at the chosen ship (the dragon's tongue moves rapidly between the three advancing spaceships). If the answer is wrong, or if the dragon breathes fire at an incorrect spaceship, the student loses a point, and the spaceships advance even closer to the city. Once they get beyond a certain point, they will destroy part of the city by vaporizing one of the skyscrapers.

On the higher difficulty levels, the ships advance quite fast, and the child playing the game must quickly determine the correct firing angle and press the space bar when the appropriate ship is in line. Good hand/eye coordination—as much as math skill—is essential when playing this game.

"Good hand/eye coordination—as much as math skill—is essential when playing this game."

Rapid-Fire Calculations

This game also relies on the speed of the player calculating the correct answers, because the ships advance at a very fast pace. At the beginning of each game, the player may choose from 9 levels of play and 3 sets of problem ranges (multiples of 3, 6, or 9). On the upper levels, the game would be quite challenging for grade school students. The capability to set the game to a student's skill level is one of the best features about *Dragon Mix* because it gives the student time to work on his or her skills in a less-pressured environment—and, as the student progresses, the difficulty level can be increased. Too often students are discouraged because they are unable to complete an educational game, or they cannot answer enough questions correctly before gameplay ends—all of which can lead to frustration and lost interest.

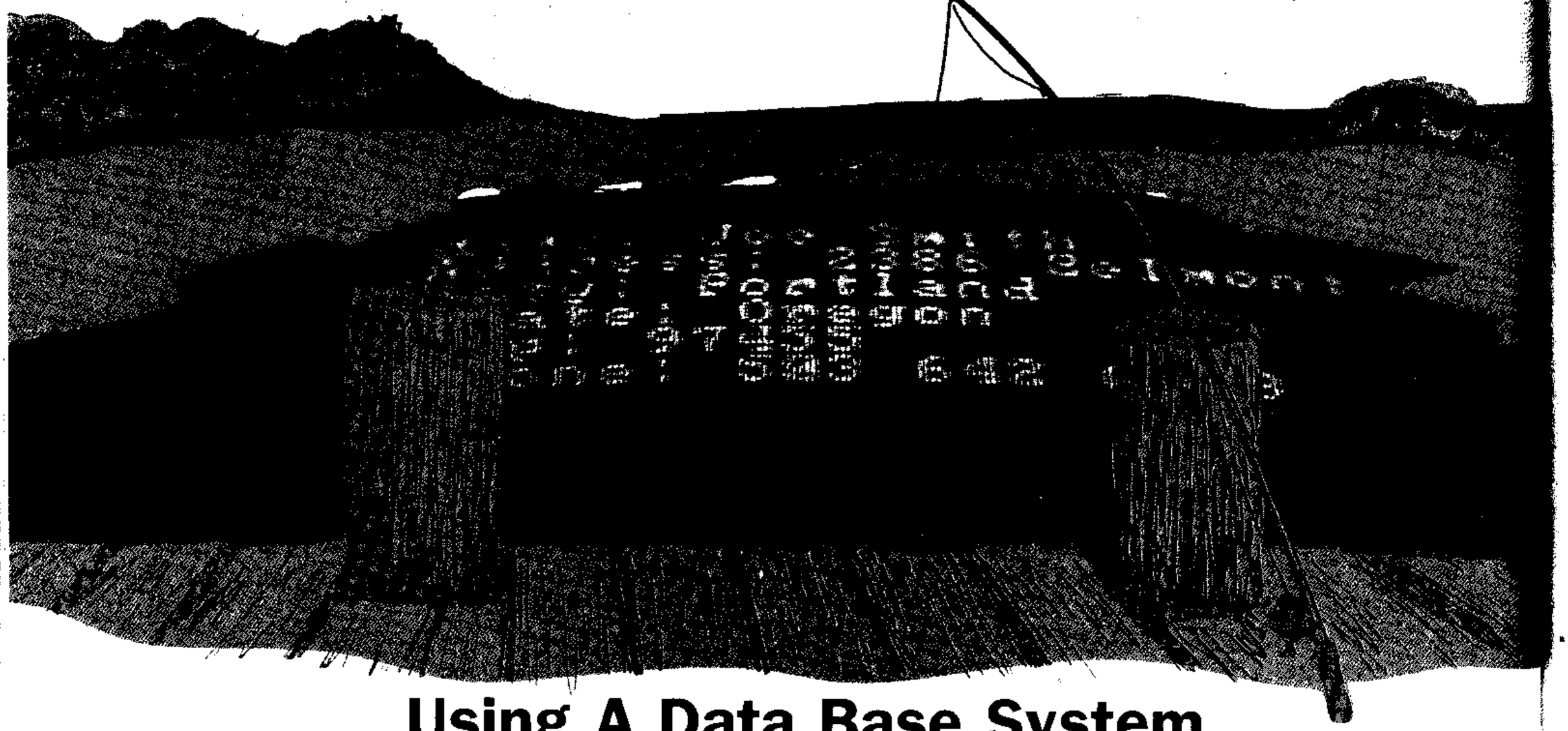
Dragon Mix has good graphics and sound effects, which add to the make-learning-fun aspect of the game. The documentation is helpful, with its easy-to-follow instructions. At the end of each game a screen appears that shows you the number of problems that you answered correctly and the number that you got wrong. The program also keeps track of your highest score while playing.

Regressing

While I checked out this game, I tried to put myself in the place of a 10-year-old boy who is somewhat intimidated and confused about the whole idea of higher math. He understands addition and subtraction (as long as he doesn't use fractions) but multiplication and division just don't seem to be his cup of tea. Playing the game was easy enough (even in my 10-year-old state of mind), and although the ships advance rapidly, I could eliminate some of the pressure by changing the speed of the advancing ships or the difficulty level of the problems. From this perspective, the game was absorbing and I did have to *think math*.

While I'm not crazy about using video game formats to teach children, I do see their place. However, making the entire game more appealing would be a better way to go—one doesn't have to blow up aliens and monsters to keep a child's interest. I see the arcade approach more as a simple solution, rather than a well-thought-out approach to education. *Dragon Mix* is one such educational program that took the traditional, easy way out in meeting the interest/education factor. *New* approaches to educational software should be encouraged as the inventory of shoot-em-up learning games continues to build.

HCM



Using A Data Base System

by Bill Crouch

So, you couldn't wait to start typing into your powerful new data base program? And now, with a disk nearly full, you realize that your hastily-built format just won't work.

Wouldn't it have been nice if someone had told you the right way to set up your system in the first place . . .

The person using a microcomputer as an aid in a small home business, club, or organization usually only needs three programs to lift the burden of routine handiwork: a word-processing program, an electronic spreadsheet, and an information storage and retrieval program (known in computer circles as a "data-base management program"). Much has been written about the proper usage of word processers and spreadsheets, yet the novice data-base user does not have the same support. Except for the minimal "how-to" information contained in the typical program manual, the data-base user is left to struggle in the mire of unfamiliar terms and confusing commands.

This article gives a brief introduction to data bases and their jargon and then moves step-by-step through the process of solving a problem using a typical data-base program. Readers who think through this process with us will be in a much better position to assess their needs in order to either purchase or use a data-base program. The information contained in this article applies to any data-base program running on any computer.

Background

What is a data-base management program and why use one? A "data base" is a collection of information organized around some topic or theme. We have many noncomputerized data bases in our lives. Obvious examples are an address book, a listing of property maintained for insurance purposes, or a Christmas card list. An example of a computerized data-base product is the telephone directory.

If we are dealing with a sizable volume of information, or if the information we are keeping frequently changes, we can benefit from a data-base management program. Anyone who has tried to maintain a mailing list or (can you imagine) the telephone directory by hand can testify to the need for some way to easily add and remove names, change addresses, and quickly sort the list into alphabetical or zip code order. A good data-base program allows us to do just that.

To illustrate the process of setting up a typical data base, we will design a hypothetical inventory for a large computer-users club. (See "Steps In Design," next page.) In our imaginary club, we purchase some products at wholesale—or obtain public domain software—and then loan them to our members. Our examples here will be suggestive of what *can* be done with this type of material; they are not an exhaustive treatment of the situation.

Terminology

Every area of knowledge has its own special words that allow us to talk specifically about what we are doing. Computers are no exception. If we are going to be able to apply what we are learning to an actual data-base program, we will have to become familiar with the few terms listed below.

If you are keeping formal records of one kind or another, you are probably familiar with the physical objects used. Your information might be kept on a form consisting of one or several pages. The form would contain a number of questions, each one followed by a blank

space in which you can write your answer. The blank space might be short if it is to contain the abbreviation for a state of residence. It might be very long if it is asking for a street address. All of the forms of the same kind might be kept in a file folder. Or, if there are many of them, they might have to be kept in two or more folders.

From time to time, you might want to go through all of your forms and summarize the information contained in them. You might want to list together all of the forms of a certain kind in alphabetical order and add up various types of information, providing totals at the bottom of the summary. This kind of summary is the main product derived from such an assortment of forms, and it is called a *report*.

Figure 1.
Software & Equipment Report Samples

INVENTORY (REPORT 1)

Product Name	Inventory Number	Cost Each	Price Each	On Hand	On Lend	Year to Date

PRICE LIST (REPORT 2)

Product Name	Inventory Number	Price Each

PROPOSED PURCHASE (REPORT 3)

Product Name	Inventory Number	Need	Cost Each	Total

INVENTORY VALUE (REPORT 3)

Product Name	Inventory Number	On Hand	Cost Each	Value

An electronic filing system is similar, but it uses its own special language for the parts of the system. Instead of a file folder, we have a *file* as the largest storage unit in our system. A data file holds all of the information on a subject that the computer can deal with at one time. So our user's club might have one file for its inventory, and another one for its Christmas card list. If our file is very large, we might have to keep it on two or more data disks.

Data files are made up of *records*. If you were the secretary of a large computer-user's club and had a file containing all information on your entire membership, then everything you needed to know about a single member would be one record. A record is the logical equivalent of a form. Just as a form may be made up of more than one page, so some data-base programs let us have more than one screen-page of information in a record. A screen page is all of the information that we can view on our computer screen at one time.

"The natural thing to do is to make a list of the fields that you want to include in your data base and then set it up. In this case, the natural thing to do is the wrong thing to do."

And just as a form is made up of separate questions and blanks to fill in, so a record is made up of *fields*. A field is one item of information in one record. Typical fields in a member's record might be last name, phone number, or zip code. An item on a form might have room for a long or a short answer. A field works the same way. In fact, the person who sets up the data base must specify the maximum number of characters that can exist in each field. The unit used to measure *field length* is the *character*. A character is one letter, number, or space. A social security number would be 11 characters in length (123-56-8911).

Steps In Design

We should always follow 10 basic steps in creating a record-keeping system on a computer. These steps apply whether we are using an off-the-shelf data-base management program or are writing a record-keeping program ourselves. If followed with care, these steps will ensure that your system will give you the results that you want and need. Although I have been using data-base management programs for years and have even written a data-base management program, I must still follow the same design steps listed below. There are no real short cuts.

1. Read the Manual

This first step should be obvious, yet it is seldom done. *Read the manual first and do the exercises carefully*. That's not much to ask when learning to use a new program, but many people start out by inserting the disk, turning on the computer, and trying to set up a file.

You should have a pad of paper at your side while working through the manual. Take notes on any program limitations (e.g., a maximum of 24 fields per record) or problems. Try to find out the answers to your questions from the dealer who sold you the program or from your local user's group. After all, if you have trouble doing the sample problems, think of the trouble you'll have when you try to solve a real problem with the program.

2. Do Design Work on Paper

"Why bother writing anything down? We have a computer, don't we?" The greatest single problem in any area of serious computing is the tendency to jump into the middle of the process before taking time to work out on paper just what we are trying to do. If you have a word-processing program, you can use it to do the design paperwork. Whatever you do, don't start to set up your data base in the machine until you reach step 9. You'll be sorry if you do.

3. Determine Your Desired Products and Work Backwards

The natural thing to do is to make a list of the fields that you want to include in your data base and then set

it up. In this case, the *natural* thing to do is the *wrong* thing to do. If you approach it this way, you are likely to have a field or two which you never need, and to forget a field vital to some report.

You are using a data-base management program because you want to create some kind of product, usually something printed out on paper, a report of some kind. If you start with a list of carefully-designed reports to be produced and work backwards to the fields needed to make those products, you will be sure to have all of the fields you need, and will not waste valuable machine space by cluttering up your file with unneeded information.

If you need to duplicate an existing manual report, your choices are simple. If this is a new report or you want to make changes in the existing system, you may want to sit down at a typewriter (or word processor) and make up a report example containing sample data. (See Figure 1.) Once you have sample reports in hand, the rest of the process will proceed smoothly. If you also plan to view data on the screen, you can create sample report screens on paper, taking into consideration the size and layout of your computer's screen.

4. Make a List of Fields

If it isn't used in a screen or a printed report, you don't need it. Write down each item on each report. If it is data that will need to be entered, put it on one list. If it is data that can be computed by the program, put it on another list. (See Figure 2.)

Now look at the list of computed fields. Write down the information that the computer will need to figure out these items. Are they already on your fields list? If not, add them. Then write down any needed formulas (VALUE = ON HAND times COST). (See Figure 3.) Will your data-base management program do this kind of operation? If you aren't sure, go back to the manual and check.

Figure 2.

Entered Fields	Computed Fields
Product Name	Proposed Purchase
Inventory Number	Total
Cost	Value
Price	
On Hand	
On Lend	
Year to Date	
Maximum Items to Stock	(Not printed but used in the Proposed Purchase Report)

5. List Field Characteristics

Most data-base programs want you to determine at least two things about each field: one is the maximum field length. Some field lengths are easy to determine. A field which contains a short zip code would have a length of five, a state abbreviation would have two, and a local telephone number would contain eight characters. But what about a last name or street address? These take a little research. If you specify a length that is too short, then you will have to abbreviate some of the longer entries. Few people like to see their last name abbreviated. If it is too long, it will waste space and may not fit on your mailing label or form. Try scanning your list of fields, looking for the longest examples. Also be aware of printer or report form limitations (e.g., if you have 3-1/2 inch mailing labels, no address line can exceed a total of 35 characters).

The other item to be determined is whether the field is to be designated as a numbers-only field (numeric field), or as a field that contains both letters and numbers (alphanumeric field, sometimes called a "string"). As a general rule, all fields should be set to alphanumeric unless you need to do math with them. Just because a field contains numbers does not mean that it should be treated as a numeric field. There is seldom a need to multiply your telephone number by your zip code. In one program, I erroneously set a field which should have contained a Social Security number as a numeric field. When I entered a Social Security number, 560-60-8735, the computer took the dashes to be minus signs and changed it to -8235 by subtracting the second two numbers from the first—and saving the results. (Some programs also predefine types of fields according to the kind of data that these fields will store—such as a dollar sign or the date.)

"Just because a field contains numbers does not mean that it should be treated as a numeric field. There is seldom a need to multiply your telephone number by your zip code."

6. List Fields in Logical Order

The trick in designing a form is to lay out the form in as natural an order as possible. The following form would be very hard to fill out:

City _____
Last Name _____
Zip Code _____
Street _____
First Name _____
State _____

We have come to expect to be asked for address information in the order of name, street, city, state, zip code. Any major variation in this order confuses the person entering the data. To some degree, the same can be said about any block of data. Some arrangements will be clearer and more natural than others. Re-arrange your fields list into the order that you feel is most logical and easiest to use.

7. Determine Fields for Sorting

One of the most useful tasks that can be performed by a data-base management program is arranging information into some specified order, or "sorting." You may want to print mailing labels which have been sorted into zip-code order as required by the post office. Or you may want the same information sorted by last names. You will find many useful ways to arrange your data when the computer does all of the work for you.

Some data-base management programs require you to determine the fields that you will use for sorting at the time you design the file. If so, give careful thought to the way you want the data presented in the reports. Programs of this kind often get bogged down by the presence of numerous sort keys, which also quickly eat up disk storage space. (See Figure 4 for final field layout.)

8. Discuss Your Results with the Others Involved

No matter how good you are at figuring out things, others will have insights that you missed, and needs you forgot to consider. While it is wise to involve anyone else who needs the information you are storing at each step in the design, it is imperative that others be involved at this point. The next step calls for setting up the file in the computer. Things that are just ideas now will be harder to change as information is entered into the computer. An hour now could save days later.

Figure 3.

FORMULAS USED IN COMPUTED FIELDS:

NEED	= MAXIMUM minus ON HAND minus ON LEND
TOTAL	= PROPOSED PURCHASE times COST
VALUE	= ON HAND times COST

9. Set Up the File

At last we can turn on the computer. Now is the time to review the steps given in the manual and to actually set up the file and the reports. If you have completed the previous eight steps and have all of your notes available, this step should be easy.

10. Test It

Make a copy of your data disk and enter about a dozen records. Then run each of your reports and check to see whether they came out the way you expected. If you made a serious design error, don't be afraid to start over again. It is easier to redesign your data file at this stage than to enter a large amount of data and have to redo it later.

If it works properly, go back and enter the rest of your data. Save the original data disk while it's unused. Now if you ever need another copy of this data base, perhaps for another year's data, you can make a new copy of your blank data disk and use that.

A Personal Application

Now that we have thought through the process in theory, we should take a few moments and attempt to apply it to an individual problem. We could keep track of many things, but let's pick something related to computers.

Because it doesn't take long to fill your shelves with a lot of floppy disks (or tapes), many containing several programs, you may lose track of just what is where. We will start by reading the manual. Although we are using a simple data-base program, we find no limitations that would be a problem for this application. Let's say our example limits us to 23 fields, but we won't use nearly that many.

We are careful to do all of our design work on paper, listing in the next steps the things we will need to keep track of and the various decisions we make.

We want three different products from our data base. First, we want an alphabetical listing of our programs and the numbers of the disks that they are on. Previously, we decided to sequentially number all of our disks and keep them in boxes, with the range of disks inside clearly marked on the front. Second, we want a listing of our programs by category. If we want to play an educational game, we will know our choices and where to look. Third, we want a report which gives us the dollar value of our software collection for insurance purposes. Many of our programs were purchased and would be expensive to replace. Some are "public domain" software, which is distributed free by our local computer club.

Figure 4.

Fields:	Field Type:	Field Length:
Product Name	Alpha	20 ← Primary Sort Key
Size	Alpha	10
Order Number	Alpha	15 ← Secondary Sort Key
Cost	Numeric	5
Price	Numeric	5
On Hand	Numeric	2
On Lend	Numeric	2
Year to Date	Numeric	3
Maximum Items to Stock *	Numeric	2
Computed:		
Need (Max —On Hand —On Lend)	Numeric	2
Total (Need * Cost)	Numeric	6
Value (On Hand * Cost)	Numeric	6

The reports might look like this:

BY NAME
Program Name: Disk #: Comments:

BY CATEGORY
Category: Sub-Category: Program Name: Disk #: Comments:

VALUE REPORT
Program Name: Cost:

Now we can look at our three reports and make a list of the fields used. It might look something like this:

Program Name
Disk Number
Comments
Category
Sub-Category
Cost

The final steps involve listing the field characteristics, arranging the fields in logical order, and choosing our sort keys. These three options are reflected in the following fields list:

Fields	Type	Length	Sort Key
Disk #	Alpha	20	No
Program Name	Alpha	10	Yes
Category	Alpha	15	Yes
Sub-Category	Numeric	5	Yes
Cost	Numeric	5	No
Comments	Alpha	40	No

Now we can talk to those who share our system. If it looks correct, we can now set up our data base and test it with some real data. Figure 5 shows part of one report.

Conclusion

Data-base management is one of the most useful functions of a computer. Its potential is limited only by the user's imagination and the relative unfamiliarity of the process. Unfortunately, the proper way to use a data-base management program is not obvious. The user needs to think through the process carefully before going to the computer. Time spent working on paper will be richly rewarded by the ease in which the data base is created and by its usefulness. You will find that a systematic approach to problem-solving with your computer always pays off in an improved product and less wasted time. The above process has been refined and tested, and it guarantees maximum usefulness from your data base program.

HCM

Figure 5.

File: MY DISKS
Report: EXAMPLE 5

Disk #	PROGRAM NAME	CATEGORY	SUB-CATEGORY	COST	COMMENTS
2	Space Zoom	Game	Arcade	0	Too slow
2	Subs	Game	Arcade	0	
5	Dueling Digits	Game	Educational	39.50	Arcade action
3	Hex	Utility	Programming	0	Dec/Hex convert
4	Tracer	Utility	Programming	49.95	Debugger
1	ZipWriter	Word Processor		239.95	Excellent

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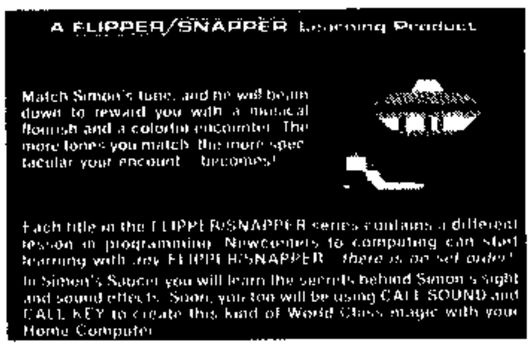

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