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80micro

A WAYNE GREEN PUBLICATION

the magazine for TRS-80* users

®

The Creator

I'M GOING TO GIVE YOU this \$295 software package for 10 bucks. If you don't want to spend \$10, you'll find the source code in this magazine. It's yours to type in and use. I'm doing this because I want to make a statement. If this program is worth \$10, then what should some others be selling for? Most commercial software is vastly overpriced. I want to make a splash, set a standard,

continued on page 74



TRS-80 IS A TRADEMARK OF RADIO SHACK, A DIVISION OF TANDY CORP.

80micro 1/83

#36

M I C R O T E R M

More and more hardware and communications services are allowing speeds up to 1200 baud. Soon, some may be going faster than that. Today's terminal software simply can't keep up. But now there is an alternative. Micro-Systems Software introduces MicroTerm, the high speed terminal.

Model III MicroTerm will communicate, without insertion of null characters, at 4800 baud. Guaranteed. No cop-outs, no question. MicroTerm is so fast that you can exit from the terminal to the main menu, adjust video width, open the buffer, turn on the printer, or any one of dozens of other functions, and return to the terminal model **without missing a thing!**

MicroTerm continues to input from the RS232, even while at the main menu. This is the only terminal capable of such an astounding feat. MicroTerm offers you most of the features that "Brand X" smart terminals have, plus it gives you: • Ultra high baud rate operation (up to 9600 in certain cases). • Input while at menu. • Easy to use translation tables. • Easy to use phone number listings. • Maximum auto dial support — most major brands. • Direct file transfer companion program included at no extra cost (compatible with DFT). • DOS commands from menu without exiting program. • Over 34K of capture buffer (in a 48K TRS-80). • Can be set to automatically dial telephone and transmit buffer at preset time without any operator intervention.

And many, many more great features, MicroTerm is so fast you must see it to believe it. The various menus are displayed so fast, they seem to jump out at you. Status of various functions can be displayed and altered in split seconds.

For the computerist who wants the ultimate, state-of-the-art terminal software, there is no other choice.

MicroTerm retails for \$79.95, but registered DOSPLUS owners can purchase it for only \$59.95. \$20.00 off the retail price! MicroTerm comes complete with the terminal program, the direct file transfer program, some standard translation tables, and documentation.

Don't delay, order yours today! Specify when ordering: Model I or III and whether you want it on 40 or 80 track media. Requires a 16K TRS-80 with one disk drive. We recommend 48K for serious communications work. MicroTerm will be available beginning June 30, 1982.



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SOFTWARE, INC.**

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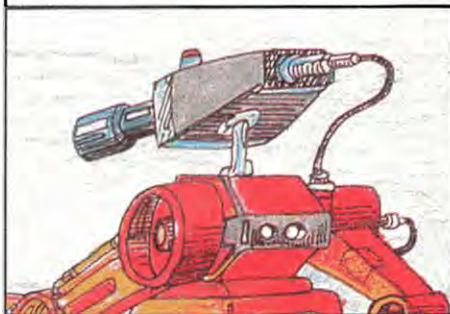
80 Contents

Features

74. The Creator

Some myths die hard, such as the quickest way to riches is to write a super program.

Bruce Tonkin



100. Forthwrite

The second generation of word processors is upon us. One newcomer, Forthwrite, deserves to be ranked with the best of them.

Wynne Keller

104. Selling Your Software

So you've decided to put your program on the market. Should you sell it through a publishing house? Neil tells you how to begin.

Neil J. Salkind

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117. The Art of Documentation

Here's a step-by-step explanation of how to write clear, concise manuals for your programs.


G. Michael Vose

154. How to Copyright

You've spent a lot of time and effort writing and debugging a program. Of course you want to protect your idea from theft, but how?

Anthony T. Scarpelli

156. Planetary Orbit

 If you're interested in knowing a planet's location at sometime in the past or future, use this program to calculate its position.

Don Carrera

Articles

110. The Great Beyond

This version of Basic is much more powerful than Microsoft's. Use it to write sleeker code.

Terry Kepner

126. Mailing List Compiler

Your Color Computer can be used to produce address labels and maintain mailing lists.

Gerald Sprouse

132. Hardware Hacker—Part IV

In his finale, Philip M. Van Praag ties together three devices to make up a powerful Peripheral Support Interface.

Philip M. Van Praag

146. A Pascal for All Seasons

If procedure-oriented languages intrigue you, Alcor Pascal may be the answer to your needs.

Bruce Powel Douglass

178. Block Titles for the Mod II

Print block letter titles on your fan-fold printouts to make them more readable.

George Berman

180. The Garbage Collector

The price you pay for strings with variable lengths can be a bargain if you collect your garbage efficiently.

Bob Snapp

188. Lunar Lander

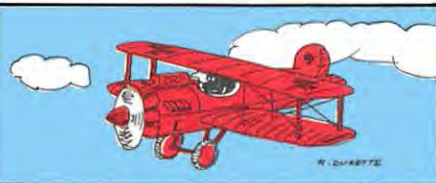
Games are rarely written for the Model II, but here's one that lets you make a lunar landing.

Nat R. Koch

192. Dogfight

Envision yourself as a flying ace sitting in a cockpit shooting the enemy's biplanes.

Ralph White




197. Partially Disabled Break

When you invoke the executioner in TRS-80 unintentionally, you'll be glad to have this program on hand.


Stephen Mills

200. New Tricks for an Old Dog

 In the early days of 80 Micro, you might have punched in a word processor by Delmer D. Hinrichs. If you did, these mods should be a cinch.


Duane Hope

216. Outbreak

 A Basic version of the popular arcade game featuring the amazing bouncing ball.

Tom Hanson

221. Judge 80

 Stu's son failed to qualify in the Pine Wood Derby when his racer was misjudged. So Stu didn't get mad; he replaced the judge with his 80.


Stuart Cole

227. Denominational Computation

You don't have to be a Reverend to benefit from this financial statement program.


Gerald Sprouse

232. DSAVE

 A way to take the risk out of saving disk files to tape.

John Hodgson

238. Windchill Determiner

 Now you have a way to determine just how cold you will be on those frosty winter mornings.

John L. Cranmer, Jr.

242. Getting the Most from the Model II

Use supervisor calls and other tricks.

La Verne E. Olney

252. CC Monitor

Tired of machine language forcing you to PEEK and POKE your Color Computer to death? Read on!


Sergio Zigras

80 Contents

258. Interrupt Your 80

Without a hardware mod, your 80 is immune to rude interruptions.
Douglas C. Fisher

268. Building a Better Adventure


 Knowing about parsing can help you create The Great Microcomputer Adventure Game.
Dan Cataldo

270. Optimize Your Code

Make your favorite programs run faster with a little help from a stopwatch.
Robert W. McTernan



276. PENRAM

 A machine-language utility to edit random access memory.
Roxton Baker

292. Repairing a Disk Crash

If one of your Color Computer disks crashes, you could lose several programs. To rescue them, try the steps outlined in this article.
Philip Martel

298. Discipline for the DIR Command

Confused by the order your Color Computer prints the directory? This utility makes your directory look the way you want it to.
Gerry Schechter


302. APL Primer—Part II

Vectors were your favorite part of high school physics class, right? This month, Margaret tells you how to use them in APL on your 80.
Margaret M. Grothman

310. Cassette Merge

You can combine old Color Computer programs with new ones. This technique tells you how, and you won't have to retype anything.
John Nicolettos

316. Bit Smitten—Part VI


 Good looking title and credit pages

for your programs are easy to set up with this utility.
Jay Chidsey

324. Tape File Manager

The four routines of Tape File Manager will increase the speed with which your buffer can read and write data to and from the tape.
Roger W. Faulds


342. DROSSDOS/8E

 Since operating systems can be inadvertently frustrating, KTI's faithful observer asks, "Why not stop the pretense and make them purposefully frustrating?"
David Busch

348. When OK Isn't

Tired of the same old prompt?
Ed Deming

352. BASTEP

 Catching bugs a step at a time.
Alan D. Smith

358. A Port-Mapped A/D Converter

Monitor your freezer and play Pong, too!
M. Parris

Departments

8. Remarks

The need for more secure computer systems and a call for better TRS-80 graphics.
Wayne Green

12. Proof Notes

Custer's Revenge invades the sanctity of Microdom.

16. Input

Disgruntled Model II owner who wants a hard disk. A call for a SuperScripsit printer driver for an Epson. Let's have more Line Printer VII articles. Praise of the Word Machine. Knock on MONEY DOS.

30. Debug

Colorful Computer fixes. Escape from SuperMaze. Curing jack o'lantern drool.

34. Aid

Credit union software. Smith-Corona and Scripsit. Request for government general ledger program. LEX 11 schematic.

37. Commander 80

The ghost of Thomas Wolfe haunts Jake as he returns to his home (in what he unfondly calls "Gray" Britain) and discovers the Dragon.
Jake Commander

40. The Gamer's Cafe

The odyssey ends up in Vegas.
Rodney Gambicus



410. Reload 80

412. Fun House

Leap Year. Sands of Time. Perpetual Calendar.
Richard Ramella



425. Applications

Putting the final touches on the build-your-own LNW.
Dennis Kitz

366. Calendar

435. Index to Advertisers

436. New Products

TDK floppy disks and cassettes. Telex communications for CP/M owners. C.C. Mailer. Medical lab software. Model I expansion mainframe. Computer-Assisted Home Energy

80 Contents

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The left bracket, [, replaces the up arrow used by Radio Shack to indicate exponentiation on our printouts. When entering programs published in *80 Micro*, you should make this change.

80 formats its program listings to run 64-characters wide, the way they look on your video screen. This accounts for the occasional wrap-around you will notice in our program listings. Don't let it throw you, particularly when entering assembly listings.

Article submissions from our readers are welcomed and encouraged. Inquiries should be addressed to: Submissions Editor, 80 Pine Street, Peterborough, NH 03458. Include an SASE for a copy of our writers' guidelines. Payment for accepted articles is made at a rate of approximately \$50 per printed page; all rights are purchased. Authors of reviews should contact the Review Editor, 80 Pine Street, Peterborough, NH 03458.

Management. Nutritional management software. Color III conversion plans. Brevi-T abbreviation utility. Educational Software Library. C for Model 16. Bazul's Quest.

450. 1982 Index to Articles

460. 1982 Index to Reviews

465. Index to LOAD80s

45. Reviews

Pac-Droids. C.C. Mailer and C.C. Merger. Make your computer talk with Chatterbox. Trashman, a string-cleaning utility. Options-80, a stock-market utility. Log Electronic Notebook. Rental Property Investment Program. Black Death, a gem of garage-punk programming. SuperScripts.

72. Review Digest

Address Factory for the Color Computer. PrintCC allows your TRS-80 act as a buffer for your parallel printer. Astro-Blast, not just another space game for the Color Computer. The Moses Lightpen. Color Computer Katerpillar.

370. News

Enter the Dragon, a new 6809 micro taking Britain by storm. Tandy's scheme to market its color machine outside the Radio Shack chain hits some rough water. The Source officially opens its new computer center.

394. The 1982 Readers' Choice Awards

May we have the envelope, please...



396. The 80 Micro Hall of Fame

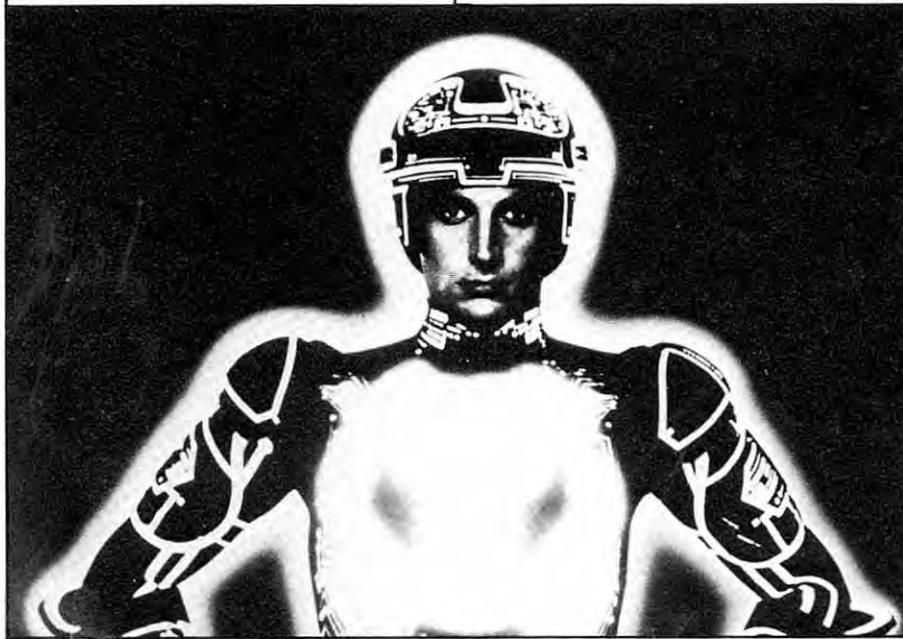
Wherein immortal software is enshrined.



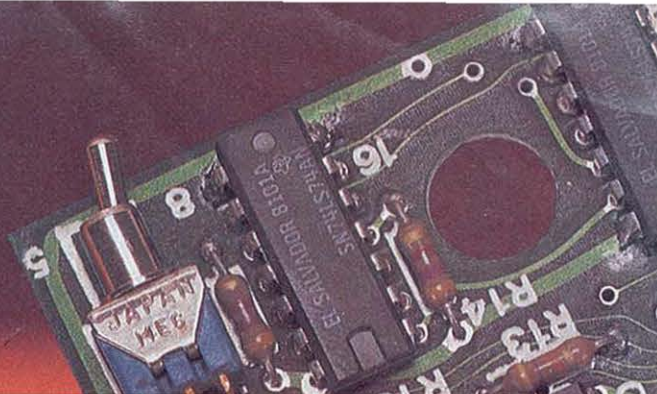
400. Feedback Loop

A program to forecast the weather. Unmodified Model I word processing. Okidata ribbons. Model II Scriptit and Epson woes. Epson tractor-feed problems. SuperScriptsit-Epson incompatibility.

Terry Kepner



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SD: single-density DD: double-density

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board you can buy. The LNDoubler 5/8 has more features, more options and more software support than any other product of its kind.

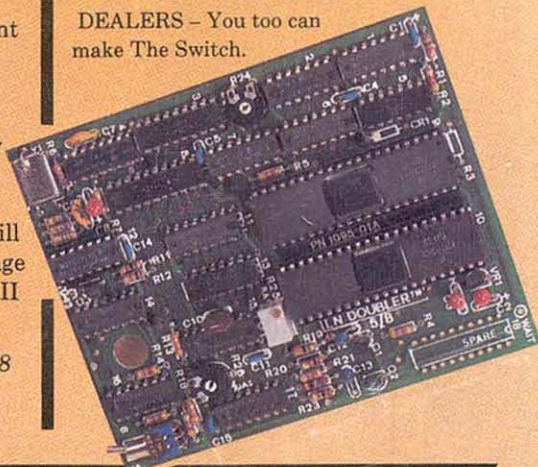
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*8" drive operation requires special cable, 8" double-density requires 3.55MHz CPU speed-up modification or LNW-80 4MHz computer. TRS-80 is a trademark of Tandy Corporation.

As a key person in a small business, you may not have thought much about security for your computer. Oh, you may want to keep payroll information confidential, but why should you worry about your mailing list, customer information, supplier information, sales records, and so on?

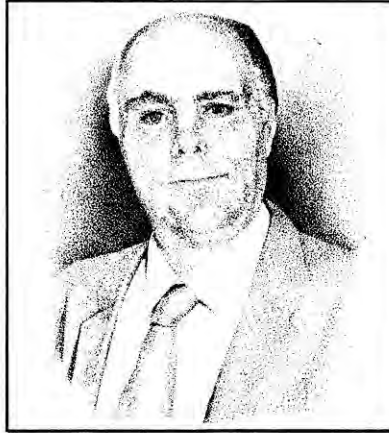
You're right—this is not a major problem so far. But in the longer run, you may want to keep in mind the need for establishing an ever more secure computer system.

We are heading toward the time when even smaller businesses are going to have executives communicating with the office computer while on business trips. Salesmen and reps are soon going to be getting sales data and placing orders over the phone via computers. Indeed, more and more of our business and records will be accessible over the phone, and thus prone to interception or even malicious interference.

Few people who have not worked for the phone company have even a hint of the extensive monitoring of calls that Ma Bell does. Your calls *are* being monitored. The system is set up so that calls can be monitored from anywhere in the country without giving you a hint that anything is amiss. Now, how are we to know that Ma won't start setting up to automatically record *every* digital communication going over her lines? There's no serious problem technically. Then Ma's minions can check what is going over the lines when it is convenient and, if it is interesting, look back through months or even years of recorded data.

With an increasing amount of Ma's communications going by microwave, we know from recent articles in the technical magazines that it's easy to intercept these communications without leaving any trace. The interception and recording of all digital communications by firms interested in selling business information to your competitor could be a growth industry. Government agencies can also listen in to these calls and get a good inside look at what is going on.

One malicious employee with access to your computer can raise holy hell with sales records, customer files, payroll, and so on. Do you really want to have your business computer system working on the basis that no one is ever



The need for more security

going to get mad and try to get even?

All of this leads up to the obvious need for security. To some degree, we are in a similar situation to that faced by the software firms in that no known security system seems to be really secure. Worse, the more you try, the more your computer is tied up with the security system and the more frustrating the whole thing can be to use.

The first step is to recognize the importance of the problem. The next is to start tackling it. We can do this best via articles by those few people who have already been working in the field. This will help the rest of us understand what work has been done so far so we won't waste a lot of time redoing it. This will also spark some original ideas in the rest of us. I suspect that the very complexity of ICs that can be designed today may hold the key to a relatively simple encryption/decryption device.

One of the difficulties of encryption keys is the ability of a computer to try an incredible number of keys in a short time. This might be nullified with a system similar to a combination lock, wherein a time delay accompanies each

failed try, thus defeating the speed of the computer. I'm sure that if we have enough brains working on the project, we'll come up with some fine solutions. We're going to need them.

The State of Graphic Arts

Computer graphics are moving ahead so fast that most of us can't keep up with the developments. They've been making the consumer magazines in recent weeks, spurred on by their use in *Tron* and other recent films. I really didn't need to go to still another computer show, yet how could I stay away from one right down in Boston, just a bit over an hour away?

It must be excessively depressing for the higher management at Tandy to go to shows like this and see how far computer graphics have developed, yet to have so little available via the TRS-80 systems. The uses for color graphics for business are so manifest that the handwriting on the wall really can't be ignored. There were Apple computers all over the place at the show, but only one TRS-80 that I saw.

The Color Computer has a lot of promise for such applications, if Radio Shack would provide their stores with the documentation, accessories, and programs to back up the system. I am hearing rumors that there are some cracks appearing in the xenophobic armor at Tandy and that at least a few of the people there are fighting to change age-old tradition and allow the sale of support products from outside firms.

The powers at Tandy realize all too well that the computer sales are the only thing that has kept the firm growing. They see these sales getting to be more and more of the total Tandy sales. This is a two-edged sword. With no end in sight for computer sales, it is a firm foundation for keeping the whole firm growing. But with increasing competition from a growing number of firms with better computers, better software, and more accessories, the bubble could burst.

If you add up the support Radio Shack has in the form of peripherals and software from outside firms, no other system can approach it. But Radio Shack customers have to go outside...generally by mail order...to reach this market.



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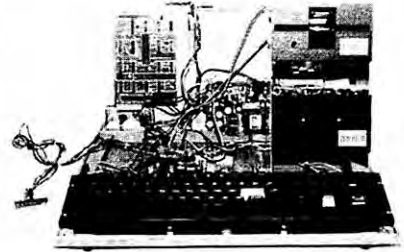
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REMARKS

The announcement that Tandy will be selling the Color Computer through independent computer stores could bring some relief, yet considering the discouraging discount schedule, this may not turn into a significant outlet. It *could* get some action if computer stores carrying the Color Computer start stocking up on third-party accessories and software. That could turn out to be a significant market, with the software and accessories bringing in the profits rather than the computer itself.

You know, I get letters now and then

from readers who wonder why I don't toady to Radio Shack instead of taking them to task. I try, as best as I can, to reflect the educated opinions in the marketplace, not just my own. I talk with Radio Shack-owned stores, with independent Radio Shack store owners, and with many people in the industry. From all this, I get a fair idea of what is really going on, not just what Tandy sends out for PR or publishes in their pamphlet, which is generally self-serving. I don't go out of my way to be critical of Tandy, but then I don't avoid it

either. I try to call it as I see it. If some readers have facts of which I'm not aware, I'm open to getting them and revising my ideas. The Tandy people are extremely secretive, which, of course, begs for guessing. I know of no other firm in the industry that even comes close to Radio Shack in that aspect.

Will Radio Shack notice what's happening with color and get cracking with some good advanced color computers? Or are we going to see the color graphics battle won by Japan with entries such as the Sony SMC-70 and the new NEC? ■

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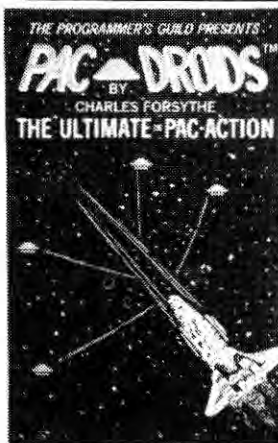
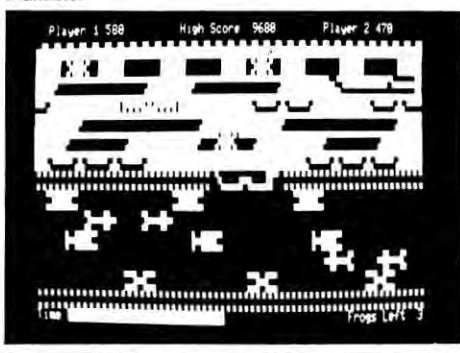
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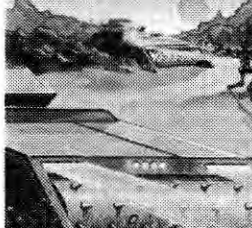
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The headline read, "Atari outraged by video-porn." The object of the company's wrath was Custer's Revenge, a video game that involves raping an American Indian woman tied to a post.

The company's solution was to announce a law suit against American Multiple Industries, the makers of Custer's Revenge.

Apparently, Atari's people have been in the game room so long that they've forgotten what the real world is like.

You cannot mention a medium in which pornography doesn't have a substantial piece of the market. Literature, art, film, cable TV, video recorders, magazines—in each case, somebody has found a way to make a buck from sleaze.

Computer games will be no different, and there is nothing Atari can legally do about it.

That's the way it should be. Consumers do not need a Big Brother telling them what's good for them. And Atari has no right to impose its moral sensibilities on the public, however justified their outrage might be.

Atari's intent is obviously to protect their wholesome family image. Custer's Revenge offers it an easy vehicle to prove how moral and righteous it is. But Atari's anger serves only to evade a much more important point.

Games like Custer's Revenge appeal to racist and sexist attitudes that are engrained in American culture. And while the computer industry may not actively encourage those attitudes, it has done little to alter them.

How many computer games seek to create positive images of oppressed and minority groups? How many arcade games—many of which are Atari's—provide anything more than vicarious, sensual entertainment? And how do the violent microworlds those games create help to foster a peaceful, more tolerant society?

Atari is correct to excoriate cheap junk like Custer's Revenge. But its moral indignation would carry a lot

Video porn is here for good

more weight if it also took some steps toward bettering its own products. Pac-Man may not have raped any Indian women lately, but he also hasn't done much to improve the world we live in.

—E.M.

Model II owners may not make up a large part of *80 Micro's* readership, but they sure are vocal. Hardly a week goes by when we don't receive some mail pleading for more Model II material.

Well, we've taken some steps to correct the situation. Starting in April, we'll be publishing conversion tables for some of our Model I/III programs. This will let Model II people share in the wealth of useful and interesting software they've heretofore only been able to look at.

Naturally, we encourage and welcome original Model II programs.

Next month promises to be an interesting issue. Our "To Copy or Not to Copy" letter has inspired a number of our readers to express in no uncertain terms how they feel about software protection and piracy. We'll be printing a batch of those letters, along with reactions from several software manufacturers.

Also, we'll be publishing the results of our first Young Programmers Contest. The contest has been successful beyond our expectations, both in numbers and in quality. We're sure you'll be as open-mouthed as we are about what America's youth is producing at their computers these days. ■

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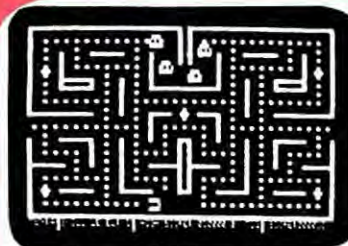
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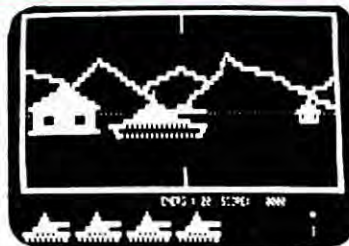
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SCARFMAN

This incredibly popular game craze now runs on your TRS-80! It's eat or be eaten. You run Scarfman around the maze, gobbling up everything in your path. Try to eat it all before nasty monsters devour you. Excellent high speed machine language action game from the Cornsoft Group. With sound. Price: A



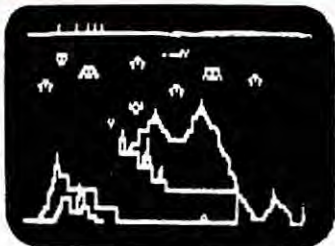
ARMORED PATROL

A realistic tank battle simulation. Your view is a 3-D perspective of an alien landscape. Maneuver your T-36 tank to locate and destroy enemy tanks and robots that lay hidden, ready to assault you. Clever graphics create the illusion of movement and dimension. From Adventure International. With sound. Price: B



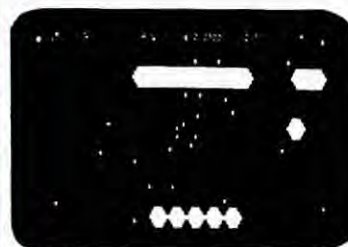
REAR GUARD

Deadly waves of enemy Cyborg craft attack your fleet from the rear. You are the Mothership's sole defender. You have unlimited firepower but the Cyborgs are swift, nimble attackers. Your abilities are tested hard in this game or lightning fast action and lively sound from Adventure International. Price: B



STRIKE FORCE

As the primary defender of a world of cities under deadly alien attack, your weaponry is the latest: rapid fire missiles, long range radar, and incendiary "star shells." Your force field can absorb only a limited number of impacts. A complex game of strategy, skill and reflexes from Melbourne House. Price: A



BOUNCEOIDS

Huge boulders careen off the walls. You're in the middle, in danger of being flattened. Keep your wits about you as you blast these "bounceoids" from the screen. Large ones break into many small ones. Clear a screen, and enter a fast-paced challenge stage with a chance for big bonus points. From the Cornsoft Group. Price: A



CATERPILLAR

An arcade favorite! Stop these multi-sectioned crawlers before they creep down through the mushrooms. Zap one and it splits into two smaller bugs, each with its own sense of direction. There are moths and tumble bugs too. It all adds up to lots of fun for kids and adults alike. From Soft Sector Marketing. With sound. Price code: A



DEFENSE COMMAND

The invaders are back! Alone, you defend the all important nuclear fuel canisters from the repeated attacks of thieving aliens, repeatedly. An alien passes your guard, snatches a canister and flies straight off. Quick! You have one last chance to blast him from the sky! With sound and voice. Price: A



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You have to paint the floor white. We give you the paint and brush. Sounds easy? Hah! You'll be confounded by stray dogs, snakes, sloshing buckets of turpentine, even a ravenous "paint eater." A crazy, imaginative new game with ten selectable levels of skill for new or seasoned game players. Lot's of laughs. Price: A



SUPER NOVA

Asteroids float ominously around the screen. You must destroy the asteroids before they destroy you! (Big asteroids break into little ones). Your ship will respond to thrust, rotate, hyperspace and fire. Watch out for that saucer with the laser! As reviewed in May 1981 Byte Magazine. Price: A



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-80 Microcomputing
80 Reviews, Jan '82

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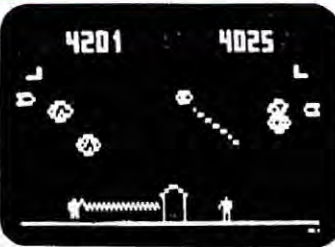
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As you look down on your view, astronauts cry out for rescue. You must maneuver through the asteroids and meteors. (Can you get back to the space station?) Fire lasers to destroy the asteroids, but watch out, there could be an alien Flagship lurking. Includes sound effects! Price: A



OUTHOUSE

You are the mighty protector of this small (but important) wooden structure. For reasons unknown, a bizarre gang of miscreants wish to vandalize, loot and otherwise destroy the little "half moon house." Your patrol craft has lasers and smart bombs to deal with this terror. From SSM with sound. Price: A

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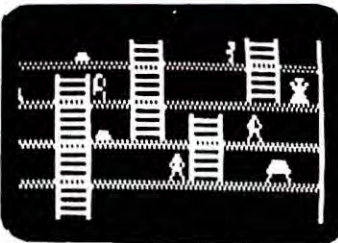
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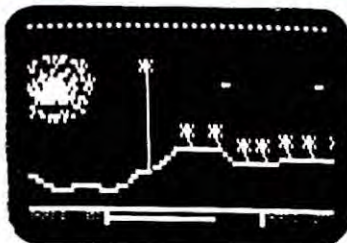
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C: TAPE: \$24.95 • DISK: \$24.95



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Trapped at an enemy building site, your fate seems certain. Your laser is empty and evil Mzors are closing in. You'll have to climb ladders and think one step ahead of the various monsters. A challenging game for agile minds. From Fantastic Software with voice (Disk has larger vocabulary). Price: B



SEA DRAGON

Your submarine, the U.S.S. Sea Dragon, penetrates a mined enemy channel. Armed with missiles and torpedos, you engage the enemy while navigating unknown waters. Succeed or come to a salty end in this game. 29 screens of horizontally scrolling seascape and sound from Adventure International. Price: B

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As you can see, all the best games from the top producers are joystick compatible. These games are fun without the joystick but we hope that you are one of the many thousands who enjoy the advantage of real joystick action.

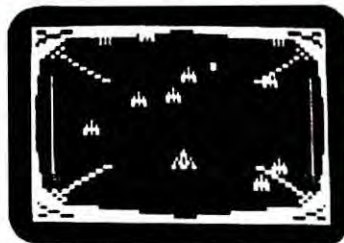
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3. PENETRATOR - Rave reviews
4. STELLAR ESCORT - Fast and Challenging
5. CRAZY PAINTER - Unique game concept
6. PANIK - Remarkable Voices
7. DEFENSE COMMAND - Tough struggle
8. CATERPILLAR - Good rendition
9. ROBOT ATTACK - With voice
10. SEA DRAGON - Amazing "Seascape"

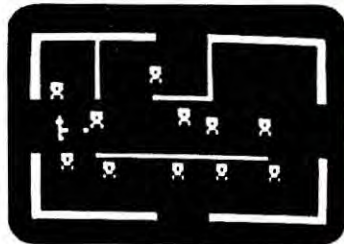
STELLAR ESCORT

The latest super action game from Big Five. As the Federation's top space fighter you've been chosen to escort what is possibly the most important shipment in Federation history. The enemy will send many squadrons of their best fighters to intercept. With sound. Disk version has voices. Price: A



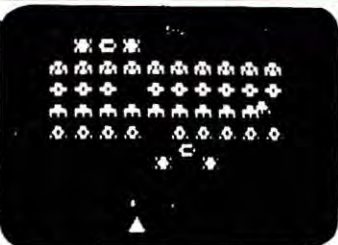
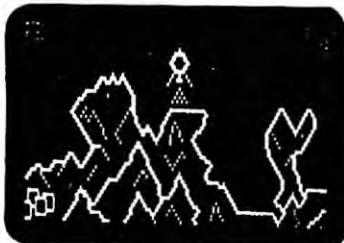
ROBOT ATTACK

Talks without a voice synthesizer, through the cassette port. With just a hand laser in a remote space station, you encounter armed robots. Some march towards you, more wait around corners. Careful, the walls are electrified. Zap as many robots as you dare before escaping to a new section. More robots await you. Price: A



LUNAR LANDER

As a vast panoramic moonscape scrolls by, select one of many landing sights. The more perilous the spot, the more points scored -- if you land safely. You control LEM main engines and side thrusters. One of the best uses of TRS-80 graphics we have ever seen. From Adventure International. With sound. Price: A



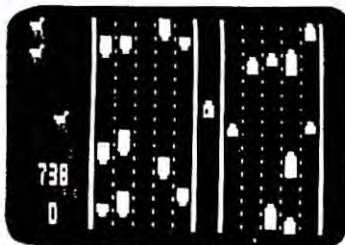
GALAXY INVASION

The sound of the klaxon is calling you! Invaders have been spotted warping toward Earth. You shift right and left as you fire your lasers. A few break formation and fly straight at you! You place your finger on the fire button knowing that this shot must connect! With sound effects! Price: A



LASER DEFENSE

In this game of ICBM's, high-energy lasers and particle beams, you control the U.S. strategic defense satellite system. From your viewpoint high above the globe, you intercept Soviet nuclear missiles in flight and attempt to destroy their scattered missile silos. With sound from MED Systems. Price: B



CHICKEN

Will the chicken cross the road? That's up to you. Can you guide these helpless little chicks across the perilous 10 lane super highway to safety? Or will you bumble, littering the blacktop with a storm of chicken feathers? A humorous yet challenging game of nerves from SSM with sound. Price: A



PENETRATOR

Soar swiftly over jagged landscape, swooping high and low to avoid obstacles and enemy missiles attacks. With miles of wild terrain and tunnels to penetrate, you're well armed with bombs and multiple forward missile capability. From Melbourne House. Features sound, trainer mode and customizing program. Price: C



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Hard Disk for Model II

I have been led down the primrose path by Tandy in buying a Model II. I was under the impression that a reasonably-priced hard disk unit would soon be on the market.

Can anyone tell me what it would take to replace my single disk drive in the Model II with two thinline types such as the Tandon TM848-2?

I'm not in favor of adding an extra expansion box for them. I would like to see them built in, as in the Model 16. I have a Model II service manual and it appears that the disk controller could support such a drive, but I'm not certain about the power requirements.

I am certainly not the only Model II owner with this ambition. With so many in-cabinet upgrades available for the Model III, why can't someone do it for the Model II?

Tom Chaapel
Ronco C & E Inc.
41 E. Market St.
Corning, NY 14830

The hard/soft disk system (HSDS) from Racet Computes modifies TRSDOS 2.0a to work with many hard-disk units.—Eds.

Lots of Problems

Your September and October "Reload 80" sections contain an outstanding utility. When combined, the two short programs become one utility invaluable for Assembly-language routines or subroutines. Many conversion programs have appeared in the magazine in the past, but none as comprehensive as this. It's a real gem.

As a novice Assembly-language programmer one thing has eluded me (and I suspect others as well). When source listings are given you need the hexadecimal starting address, hexadecimal ending address, and hexadecimal entry point to change memory locations.

How do I read a source listing to determine the above-mentioned addresses?

I just purchased Radio Shack's disk-based Series-I Editor/Assembler (Cat. #26-2013) that includes a version of TRSDOS 2.3B which is not compatible with TRSDOS 2.3. This upgrade utility does not permit the Basic command to



Please do not submit any letters longer than 300 words for the Input, Aid, and Debug columns. *80 Micro* reserves the right to edit any letters submitted.—Eds.

return to Basic to set the number of files or to set memory.

All my machine-language utilities that operate under TRSDOS 2.3 will not run under TRSDOS 2.3B. To quote from the pages that come with the Editor/Assembler, "Old TRSDOS disk used under the new TRSDOS must be upgraded before use. Once upgraded, a system or data disk becomes a new TRSDOS data disk."

When I contacted Radio Shack I was told that they don't know how to enter Basic through this TRSDOS version, and that TRSDOS 2.3B is unsupported by Radio Shack and no manuals are planned for its use. I was told that this version of TRSDOS was written specifically for the Series-I Editor/Assembler.

Does anyone have anything to offer regarding using TRSDOS 2.3B?

Jerry Reiser
93 Scotland Hill Road
Spring Valley, NY 10977

Write Your Own Driver

The new SuperScriptit Word Processor has some interesting features to recommend it over the standard Scriptit. Its modular construction (much like TRSDOS, where a resident supervisory module calls in various overlays to do specific tasks) offers a choice of six specific printer drivers, plus a serial printer driver; but, of course, only Radio Shack printers are provided for.

An appendix in the manual on "How to Write Your Own Driver for a Non-Radio Shack Printer" does nothing to dispel the confusion.

Has anyone put together a driver for

the Epson MX-80 to interface it with SuperScriptit?

Paul Martin
P.O. Box 1331
Punta Gorda, FL 33951

New Sound Routine

In the modifications to "Space Chase" by Charles E. Gillen (*80 Micro*, October 1982, p. 31) he states, "The modified program should work equally well on Models I and III..."; this is not quite accurate. The sound routine in this program is one commonly used; I have found it in several game and music programs in *80 Micro*. Unfortunately, this routine does not work on the Model III.

I've developed a routine to modify a number of these programs. It gives approximately the same results from the same USR input values and works with either the Model I or III.

```
DATA 243,205,127,10,62,1,14,0,69,238,3,  
211,255,13,40,4,16,251,24,244,37,32,246,251,  
201
```

This routine has only 25 bytes instead of the 29 in the original routine. This means that you must reduce the limits of the For...Next loop that reads the data by four. Also, if you POKE the data into a string, you must reduce the length of the string.

For example, in Mr. Gillen's modified program:

```
Line 50—Change "ZZ$=STRING$(29,0)" to "ZZ$=STRING$(25,0)"  
Line 60—Change "FOR ZZ=Z3 TO Z3+28" to "FOR ZZ=Z3 TO Z3+24"
```

Some of the programs use CMD" T" to remove the buzzing sound from the notes. That is not necessary with this routine since the interrupts are disabled at the start of the routine and enabled again before the return to Basic.

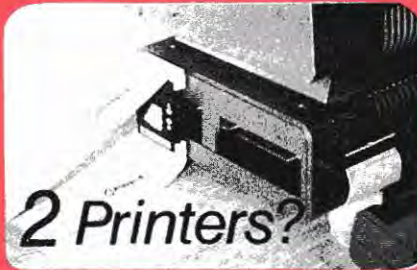
David H. Siebenthaler
54 W. Maplewood Ave.
Dayton, OH 45405

WP Comparison

Mr. Robinson's insight into the details of word processing, and his ability to explain them to the reader, are most evident. However, I believe he missed

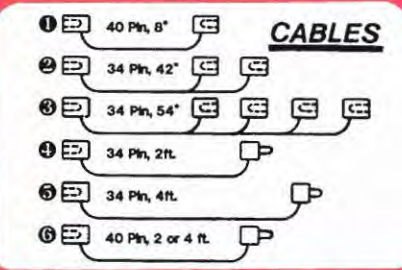
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GREEN SCREEN WARNING

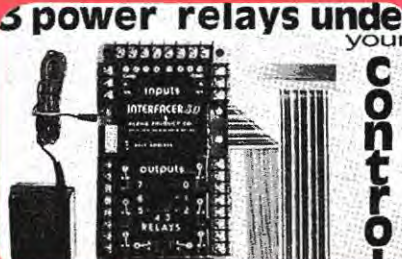
IBM and all the "biggies" are using green screen monitors. Its advantages are now widely advertised. We feel that every TRS-80 user should enjoy the benefits it provides. But **WARNING:** all Green Screens are not created equal. Here is what we found:

- Several are just a flat piece of standard colored Lucite. The green tint was not made for this purpose and is judged by many to be too dark. Increasing the brightness control will result in a fuzzy display.
 - Some are simply a piece of thin plastic film taped onto a cardboard frame. The color is satisfactory but the wobbly film gives it a poor appearance.
 - One "optical filter" is in fact plain acrylic sheeting.
 - False claim: A few pretend to "reduce glare". In fact, their flat and shiny surfaces (both film and Lucite type) ADD their own reflections to the screen.
 - A few laughs: One ad claims to "reduce screen contrast". Sorry gentleman but it's just the opposite. One of the Green Screen's major benefits is to increase the contrast between the text and the background.
 - Drawbacks: Most are using adhesive strips to fasten their screen to the monitor. This method makes it awkward to remove for necessary periodical cleaning. All (except ours) are flat. Light pens will not work reliably because of the big gap between the screen and the tube. Many companies have been manufacturing video filters for years. We are not the first (some think they are), but we have done our homework and we think we manufacture the best Green Screen. Here is why:
 - It fits right onto the picture tube like a skin because it is the only **CURVED** screen **MOLDED** exactly to the picture tube curvature. It is cut precisely to cover the exposed area of the picture tube. The fit is such that the static electricity is sufficient to keep it in place! We also include some invisible reusable tape for a more secure fastening.
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- A last word. We think that companies, like ours, who are selling mainly by mail should list their street address, have a phone number (for questions and orders), accept CODs, not every one likes to send checks to a PO box, offer the convenience of charging their purchase to major credit cards. How come we are the only green screen people doing it? Order your ALPHA GREEN SCREEN today. \$12.50



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the point of the Word Machine's real utility.

I have been interested in, working with, and fascinated by word processors and text editors for years. This includes WP/34 for the IBM, WordStar, Select, Scripsit, and Electric Pencil. I have also observed the reactions of clerks and secretaries in offices when told that they would have to learn to use a word processor. The reaction is generally negative. It takes a good secretary about a month to lose the fear of using this *thing*. It takes another month to gain some confidence, and then it's mostly a matter of how much the secretary is willing to put into it to get more out of it. The majority of users don't need or use up to 80 percent of what these word processing programs offer. Yet they have to go through the initial ordeal to learn to use the 20-50 percent that they do use.

I believe much software on the market today is the result of contests between first-rate programmers. These results approach programming perfection, but do not give the user what he really needs. The average secretary, hobbyist, or home user uses a word processor mainly for letters and notes, memoranda, small reports, and one or two-page advertising text.

The Word Machine is designed for these people. It takes about ten minutes to be able to use this menu-driven program. The screen is self-prompting, and the choices are clear and simple.

The Word Machine is written in Basic, which, as Mr. Robinson points out, is not as fast as Assembly language. Individual routines in the Word Machine can take longer than in the more expensive programs. We do, however, invite comparison with any of the Assembly-language programs on the market.

We have designed the Word Machine for use with the TRS-80 Models I and III, with Centronics (Radio Shack line printers) or Epson MX printers. The Model I owner without the lowercase hardware modification can even get lowercase printout if his printer has a lowercase font. The Epson version allows variable line spacing. I am convinced that these features satisfy 100 percent of the requirements of 99 percent of the people who want to reap the rewards of a word processor.

Gary Himler
P.O. Box 3322
Granada Hills, CA 91344

Dan Robinson Replies

Choice of a word processing program is a personal matter. My personal belief is that a word processor written in Basic can't compete with a machine-language program. Basic's editing commands can hardly be simpler for a secretary to learn than those of a well-written program like Scripsit. Moreover, in the Word Machine's tape version, having to make substitutes for every comma or colon can hardly make the work easier.—Dan Robinson

Impartial Reviews

Bruce Powel Douglass' review of Newsprint 7.0, by Prosoft (80 Micro, October 1982) is a glowing report of that program's virtues and capabilities. On looking further through the magazine, I found on page 215 an ad for a game called Regilian Worm by Bruce Powel Douglass, and marketed by Prosoft. In my mind, this raises a question concerning the objectivity of the reviews in your magazine.

While a product review by someone having a business relationship with the product's supplier can be fair and impartial, 80 Micro has an obligation to inform readers of any known business relationship between a reviewer and the company that markets the product being reviewed.

R. B. Ormsby
135 Marshglen Point, N.W.
Atlanta, GA 30328

At the time Bruce Douglass' review was accepted, Regilian Worm was not yet being marketed by Prosoft. We are, however, sensitive to the kinds of conflicts of interest you mention. While we can't claim a track record of 100 per-

cent, we try to screen out reviews by people with vested interests.—Eds.

Trying Harder

As a Radio Shack computer service technician, I take exception to Wayne's "Remarks" (80 Micro, October 1982), that state, "... otherwise, you are helpless at the hands of the Tandy service people, who seem to have little responsibility to the stores that work with them—or to the customers."

It is unfair to condemn all service people as uncaring based on a few experiences. With any product or service, there are going to be unhappy customers, especially from the service end. However, many of us strive to provide customers with the fastest, most courteous service at the lowest possible price.

We are not the only company selling microcomputers. So if our customers put their faith and money into our products, it's only fair that they be treated in a proper manner. If it weren't for them, I, and many others, would be out of a job.

Paul Gaitanis
461 Westover Hills Blvd.
Richmond, VA 23225

Model III Dialer

The article "Telephone Dialer" by Jim Hickey (80 Micro, June/July 1982) works fine on a Model I, but the Model III cassette port operates differently. The dialer uses the remote control for the cassette deck. When a 4 is output to port number 255, the contacts on the jack close to complete the circuit and turn on the relay. Likewise, a 0 sent to the same port turns off the relay. The Model III controls the remote through port 236.

```
40 OUT 236,2
60 OUT 236,16
400 RESTORE:PRINT CHR$(28);:PRINT @128,"COMMAND :
";CHR$(30);:L=20:GOSUB 800:IN$=W$
405 PRINT CHR$(31);
410 IFIN$ "LIST" THEN CLS:PRINT:GOTO490
490 READNA$,NO$:IFNA$ "END"THENPRINT:PRINT:LINEINPUT"Press
ENTER to continue";A$:PRINT@,CHR$(31);:GOTO
400ELSEPRINTA$,,:GOTO490
511 IFNO$ "0"THEN520
610 OUT236,2:FORLP 1TO300:NEXT:OUT236,16:GOTO400
800 LINEINPUTW$:RETURN
```

Program Listing 1

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PLUS after PLUS after PLUS



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1 Drive \$4199
2 Drive \$4799



Color Computer 16K \$249
w/16K Ext. Basic \$335
w/32K Ext. Basic \$449



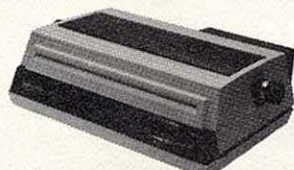
Model III 16K \$799
Model III 48K
2 Disk & RS232 c \$1899



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*MODEL III 32K	831.50
MODEL III 48K	914
*MODEL III 48K	864
Model III 48K	
2 Disk & RS232 c	1899
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Color Computer 16K w/extended basic	335
Color Computer 32K w/extended basic	449
‡Color Computer 32K-64K w/extended basic	510
Pocket Computer 2	230
Model 16 1DR 128K	4199
Model 16 2DR 128K	4799
DT-1 Data Terminal	599
PT-210 Portable Terminal	779

MODEMS

Lynx Direct Connect MI/MIll	235
Hayes Smart Modem II	235
R.S. Acoustic Coupler AC-3	134
R.S. Modem I D.C.	130
R.S. Modem II D.C.	210

PRINTERS

Daisy Wheel II	1715
DWP-410	1335
Smith Corona TPI Daisy Wheel	599
Epson MX80	599
Epson MX80 FT	549
Epson MX100	735
CGP-115	199
DMP-100	315
DMP-200	599
DMP-400	1029
DMP-500	1569
Microline 80	325
Microline 82A	425
Microline 83A	679
Microline 84 Parallel	1029
P. C. Plotter Printer	199

DISK DRIVES

R.S. Model III 1ST-Drive	679
Tandon 40 Track MI	289
Color Computer Drive 1	315
Color Computer Drive 0	470
Primary Hard Disk MIll	3999
Primary Hard Disk MIll	1999

ETC.

CCR-81 recorder	52
C. C Joysticks	22
16K RAM N.E.C. 200 N.S. chips	25
64K Ram Chips	75
Color Computer Flex D.O.S.	99
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The flashing cursor routine at line 800 can be replaced on disk systems (Disk Basic) by a Line Input; this saves memory and is more efficient.

Change or delete the lines in Program Listing 1 to make a dialing program work on a Model III.

*Tom Lake
15 Silver Lane
Chappaqua, NY 10514*

Hexagon Speaks

I was impressed by the comprehensive review of word processing programs in your September issue. As the author of Hexspell 2, I would like to comment on your Spelling Checker section.

Mr. Robinson commented he found Hexspell "a bit slow." No doubt with many programs to review he could not spend a long time with Hexspell—otherwise, he would have found it speeds up in use. Hexspell reorders its word list to bring the most-frequently used words to the front, where they are found fastest. This leads to a noticeable increase in speed. Hexspell was designed for people who wish to read through a document before sending it

out. As such, it runs only at the user's reading speed, and contains provisions to slow down.

The choice of a word list for a spelling checker is difficult. Mr. Robinson favors difficult-to-spell words in place of words like cat and dog. Some people would be upset to hear that such words are incorrect every time they run a spelling check. Mr. Robinson points out that all spelling checkers miss some obvious words. A large dictionary contains some 500,000 words, so even the largest TRS-80 spelling checker misses 85-90 percent of possible words.

Choosing the perfect word list is such a personal matter that Hexspell avoids it. Instead, Hexspell concentrates on adapting its original word list to the user's requirements. It does this by learning new words, and rearranging its list according to frequency of use.

While comparative reviews are useful they don't give the reviewer a chance to spend more time with a complex program.

*Bernard J. Hughes
Manager—Hexagon Systems
P.O. Box 397, Station A
Vancouver, BC
Canada V6C 2N2*

Dan Robinson Replies

Mr. Hughes has an excellent program in Hexspell 2, and I tried to convey that fact when describing the program's features in my review. Construction of the master word list and the spelling correction procedures are perhaps more a matter of taste and style than efforts towards some fixed goal.

Most of us wouldn't use the half-million words in a large dictionary, even if we knew them all. Our working vocabularies will be limited and rather similar, with the addition of professional words tucked away in an auxiliary file.

Hexspell begins with a shorter word list and tailors that list to the words that the writer uses most often. Hexspell also supports an auxiliary list of the user's words, which brings the total dictionary to the neighborhood of 50,000 words. Hexspell requires more effort on the part of the writer when he first uses the program in order to have a word list closely suited to the writer's needs. It's a fair exchange.

The question of speed is more a matter of how you produce documents. If all the writing is done as a batch and set

aside for proofing, one document after another, and then printed as a batch, stand-alone programs won't differ too greatly in speed. On the other hand, if you write the copy, check the spelling, and print it before going on to the next document, then a dictionary program integrated into the word processor is much faster—and more expensive.

Word list selection and the correction process are a matter of choice. Hexspell's other virtues, such as the ability to process numerical data and define foreign character sets, aren't found in any other program. Hexspell is a good program, and for many will be the first choice.

*Dan Robinson
1625 Higgins Way
Pacifica, CA 94044*

More LP VII Articles

I purchased a Line Printer VII from Radio Shack and am most pleased with it. I read the article you published about it in your April 1982 issue, but I'm still in the dark about its complete operation. The manual supplied by Radio Shack is about as useful as most of their documentation.

I would like to see more articles giving practical applications and programs using the graphics mode to show its capabilities to the fullest.

*Robert E. Wesley
116 Court St. #7
Plattsburgh, NY 12901*

Trick Fix

Mike Keller's "Trick or TRS-80" (80 Micro, October 1982) is perfect for our haunted house display this Halloween. I did encounter a problem, though; my operating system defaults to three files. This causes M2\$ to occupy address 32768, which results in an overflow error. The solution: Specify less than three files.

Further modifications to the program included running it once to pack the strings, and deleting the remark and data lines. I moved F\$, M1\$, and M2\$ to lines 90-92 and deleted the GOSUB at line 90 also. As long as the program is not saved in ASCII format, all is well, although listing the program can be confusing, and LLISTING it can drive your printer up the wall!

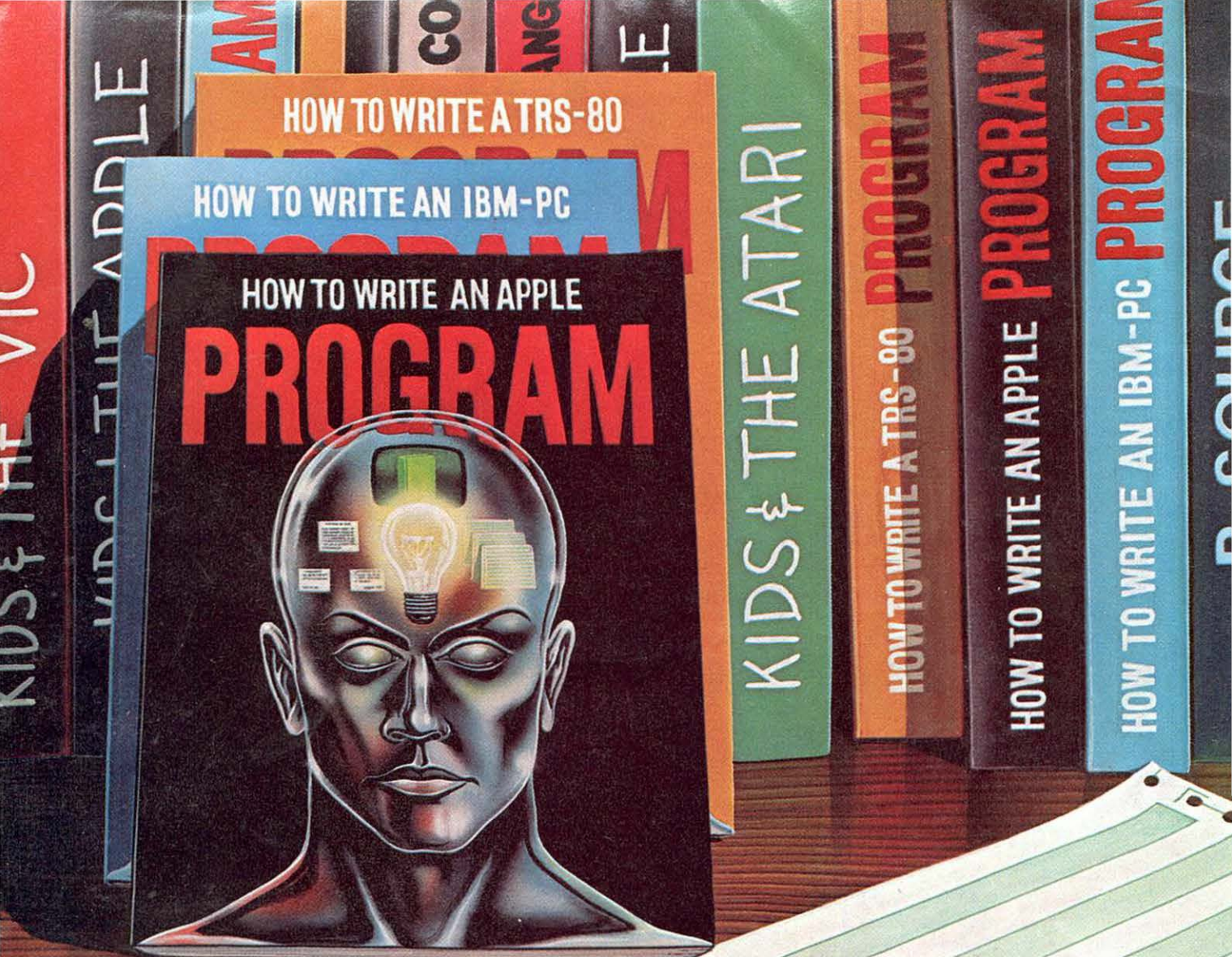
I added line 145 to prevent the face from scrolling off the screen: 145 IFF<

ERROR Trap

The DOSPLUS II Model II operating system, listed in our November 1982 New Products section, is a joint creation of PowerSOFT (11500 Stemmons Freeway, Suite 125, Dallas, TX 75229) and Micro-Systems Software Inc. (4301-18 Oak Circle, Boca Raton, FL 33431). PowerSOFT's contribution was inadvertently omitted.—Eds.

Regarding my Patch for Scrip Patch that you published in your October 1982 issue (Input, p. 22), I apologize for not being more explicit. The Basic address of 26347 wasn't a direct conversion from 66DFH (26335), which is what you printed. 26335 causes a load file format error.

*Bill Geib
8185 State Road
North Royalton, OH 44133*



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323 THEN F = 323 ELSE IF F > 349
THEN F = 349.

Thanks to Mr. Keller for a neat and timely program.

*Bill Schreiber
P.O. Box 1034
Boone, NC 28607*

A Horror Story

I ordered, from various suppliers, a Model III with 16K, an extra 32K of memory, a single Percom drive, and a Lynx modem. When I opened the computer I saw that I was not competent to install the drive and memory, so I put it back together and took it to a nearby Percom dealer. He installed the drive and the memory, and for a few weeks all was well. Then I began to have problems booting disks; a technician told me that it was probably the ribbon cable that connects the drive controller to the CPU board.

One night a thunderstorm struck; I had unplugged the power cords but didn't disconnect the telephone lines from the modem. The modem and the CPU were damaged. Emtrrol Systems (the Lynx people), fixed the modem and didn't charge me a penny.

I took the computer to the non-Radio Shack technician and waited three weeks for a new CPU board. The board was bad; I waited again for a new board. It too was bad, or my computer had a mysterious problem. The non-Radio Shack technician was embarrassed to have had my computer for so long. If I had bought from Radio Shack, I could have had the damage fixed in a couple of days at the Computer Center. The resolution was satisfactory; they let me trade in my equipment for a new Model III with factory drives. So, for a few hundred dollars difference, I have a new machine and am rid of my headache. From now on Radio Shack will service my equipment.

*David Dalton
3558 Bowens Road
Tobaccoville, NC 27050*

The Word Is Worth It

The "Word Machine" review (September 1982) is good for more than just "a few personal letters." My wife has done several papers using "The Word Machine" with a minimum of learning and no hassle. I have also used it and

found it more than adequate.

It is true that an under-\$50 word processor will not compete head-to-head with the big boys, but it doesn't destroy the budget. Maybe writers don't need this inexpensive tool, but many of us find such a program affordable and usable.

*Kenneth Held
19224 Castlebay Lane
Northridge, CA 91326*

Video Genie

I have a Video Genie, also known as the PMC-80, and which was subject to an article "What's a TRZ-80?" by Mr. Lindsay in your January 1982 issue.

The Genie is much improved over the model described by Mr. Lindsay. I wish he had described the hardware mod to make large characters controllable from software (OUT 255,8 won't do it, and PRINT CHR\$(23) leaves the size normal but double-spaces).

When you turn on the machine, it does not prompt Ready, but Ready?. The machine uses ports for cassettes and printer rather than memory latching, and the external cassette is not at Port FE. Port FE selects the cassette

drive, default is #1, but OUT 254,8 selects #2 (via the DIN socket) and OUT 254,0 selects #1, which is built into the machine.

The current Genie has a 1.5K ROM (from 3000H up) that adds a lowercase driver, a flashing repeating cursor, screen print, renumberer, and a machine-code monitor. This is the same area of RAM utilized by the Aculab ROM (the British equivalent of the ESF) so I've installed a switch to disable the internal ROM when I use the Aculab. There is also an internal amp and speaker for sound output via the cassette port.

In *80 Micro*, November 1981, "Customized Commands" by Mr. Rupert described a merge utility. I have converted this to a Basic routine that loads into System RAM unused by Model I non-disk machines and adds the commands. (see Program Listing 2).

Save—to close off the current Basic program in memory and allow another Basic program to be entered or loaded from cassette.

Merge—to append the last program to that previously saved.

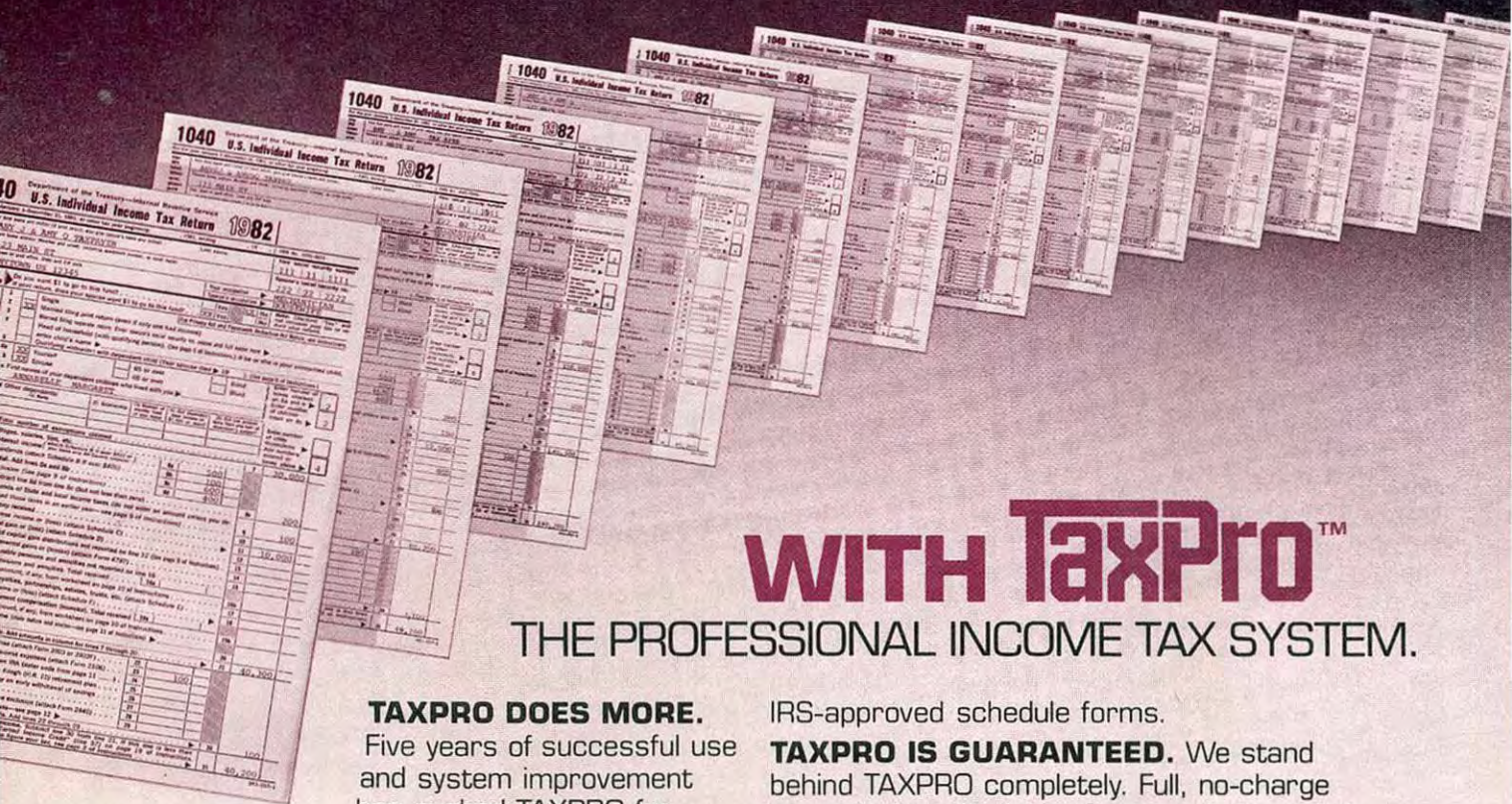
RSET—Warm Boot, to reset memory size without initializing System RAM, useful if you wish to load a

```

10 CLS
20 PRINT "To save the existing program in memory, enter
'SAVE'."
30 PRINT "Then 'CLOAD' the next program you wish to append
to"
40 PRINT "the existing program. Ensure that the second
program"
50 PRINT "has line numbers GREATER than the first program."
60 PRINT "The two programs are then joined by entering
'MERGE'."
70 PRINT "In addition 'RSET' will initiate the Memory
Reserve process without initializing System RAM."
80 PRINT
90 PRINT "This routine does not occupy user RAM, but it is
located"
100 PRINT "between 16477 (405DH) and 16510 (407EH) in System
RAM."
110 POKE 16801,93:POKE 16802,64: 'Initialize SAVE.
120 POKE 16780,112:POKE 16781,64: 'Initialize MERGE.
130 POKE 16795,181:POKE 16796,0: 'Initialize RSET
140 POKE 16509,PEEK(16548):POKE 16510,PEEK(16549)
150 FOR I= 16477 TO 16505: 'Load M.C.
routine.
160 READ X: POKE I,X: NEXT I
170 PRINT:PRINT:INPUT "Ready to continue, if so press
'NEWLINE':";X:NEW
180 DATA 42,164,64,237,99,125,64,42,249,64,43,43,237,99,164
190 DATA 64,195,114,0,42,125,64,237,99,164,64,195,114,0
    
```

Program Listing 2

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machine-language program into high memory but forgot to reserve.

*John Megson
25 North Road
Bourne, Lincs
PE10 9AP
England*

More Speed for Space Duel

I have a modification for Dave Edick's "Space Duel" (80 Micro, August 1981). In the original game the ship moves too slowly. My modification in Program Listing 3 will speed it up.

*Uwe Scariot
Maerkische Str. 90
D-4600 Dortmund 1
West Germany*

More Modifications

Richard Straw's "JKL Minus Blanks" modification for NEWDOS+ (80 Micro, September 1982, page 290) is a welcome addition. For those who have lowercase modifications in the Model I keyboard, the printer goes into a series of line feeds when it encounters the control code ASCII values used by video memory. This occurs because the ASCII values for the capital letters are shifted from 65-90 to 1-25.

A few extra instructions in the PRNT sequence fix the problem by testing to see if the ASCII value in the A register is less than 27, then converting if it is. I added three lines to the program (see Program Listing 4).

I also found that, changing the ORG in line 250 from FFDBH to FDCEH, I was able to use the ULCDVR lowercase driver that resides from FDD0 to FFFF in my

48K system. Otherwise, the two programs occupy the same memory area.

*Stan Treitman
150 Glen Road
Wellesley Hills, MA 02181*

Almost Satisfied

Let me express my satisfaction with your magazine and its contents.

May I suggest more coverage for the professionals in the software field who are using TRS-80s as their development tool?

*C.W. Medlock
Pro/Am Software
220 Cardigan Road
Centerville, OH 45459*

Scriptus Update

The Scriptus review (80 Micro, August 1982, page 101) was fair, although slightly ancient. To bring you up to date, the program now works on all the current DOSes for the Model I or III. The same disk boots on either machine, thanks to Kim Watt.

It is also compatible with all Scripsit versions, and can convert the Model I version 1.0 for use on the Model III. A sideline effect is that Scripsit's backup protection was removed for the user's convenience.

The program has also been updated to include chaining, killing, and merging of files from within Scriptus, as well as the alphabetized directory. A Pause command has been added to facilitate inserting a name in a form letter, or changing print wheels. Scriptus now includes details for use on the

Daisy Wheel II and other Radio Shack printers.

The Scriplus 3.0 disk is \$39.95; all previous owners can upgrade their older versions for only \$15, which includes the new, larger manual.

*Dennis A. Brent, President
Breeze/QSD Inc.
11500 Stemmons Freeway, Suite 125
Dallas, TX 75229*

Patching Service

Many thanks to Dan Robinson for the comparison of word processing products in the September issue. It must have been an exhaustive research effort.

Due to a recently announced change in version numbering policy by Lazy Writer's author, we are now offering our enhancements to that program in the form of a patching service. This allows us to keep up with changes in Lazy Writer that might not be reflected in the version number.

By applying our LZ Patches to a user's specific version, we will be able to avoid incompatibilities. The price for this service is \$29.95 (the original price of LZ Patcher). We are equipped to patch version 1.9 and later. Anyone who wishes more information can call me at (505) 294-4966.

*Mike Keller
Imaginuity Inc.
13423 Desert Hills NE
Albuquerque, NM 87111*

Talking Down

I have enjoyed 80 Micro for several years, but especially Mr. Keynes' recent MONEY DOS articles. They have, however, an almost imperceptible Jehovah-like background air, and I get the feeling he is writing down to me.

This was particularly true in the recent article on commodities trading in which he says, in essence, "This is a good program but you should see the one I'm using (but you can't, goody, goody)!" He even emphasizes this on his WATS line encyclical when he proudly announces his modification is "not available at any cost." His stature would have been much taller had he not even mentioned his personal, unavailable, much superior modification.

*H. S. Banton Jr.
Doctors Building
Union Springs, AL 36089*

```
92 CC+CC+1, PRINT@832,ES;
100 IF PEEK(14400)=32 PO=PO-1
110 IF PEEK(14400)=64 PO=PO+1
123 IF PEEK(14337)=1 AND CC>2 THEN1000
```

Program Listing 3

```
360 PRNT LD A,(DE)
361 CP 27 ; TEST FOR ALPHABETIC/LC MOD
362 JR NC,PR2 ; GO IF NOT
363 ADD A,64 ; CONVERT TO STANDARD ASCII
370 CP 80H
```

Program Listing 4

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• Diablo 1650 • Diablo 630 • Epson MX-80 with FT (Serial) • Epson MX-80 with Graftrax 80 (Parallel) • Epson MX-80 with Graftrax 80 (Serial) • Epson MX-80
FT (Parallel) • Epson MX-80 with FT (Parallel) • Epson MX-80 with Graftrax 80 and FT (Serial) • Epson MX-80 with Graftrax Plus (Parallel) • Epson MX-80 with Graftrax
80 and FT (Parallel) • Epson MX-100 with Graftrax Plus (Parallel) • Epson MX-100 with Graftrax Plus (Serial) • Epson MX-100 with Graftrax Plus (Serial)
• Epson MX-80 with Graftrax (Serial) • Epson MX-100 with Graftrax Plus (Parallel) • Kogyosha (All typewriters) • NEC 8023A (Parallel) • NEC 8023A (Serial)
MX-100 with Graftrax (Serial) • IDS Paper Tiger 460 • Kogyosha (All typewriters) • NEC Spinwriter 5520 • NEC Spinwriter 5520 • NEC Spinwriter 5530 • NEC
IDS Paper Tiger 440 • IDS Paper Tiger 460 • NEC Spinwriter 5520 • NEC Spinwriter 5525 • NEC Spinwriter 5530 • Quime Sprint 5 • Quime Sprint 5
• NEC Spinwriter 5515 • NEC Spinwriter 5520 • NEC 3525 • NEC 3530 • Olivetti 121 • Quime Sprint 5 • Radio Shack Line Printer V • Radio Shack Line Printer V
NEC 3510 • NEC 3515 • NEC 3520 • NEC 3525 • NEC 3530 • Olivetti 121 • Quime Sprint 5 • Radio Shack Line Printer V • Radio Shack Line Printer V
Line Printer I • Radio Shack Line Printer II • Radio Shack Line Printer IV • Radio Shack Line Printer V • Radio Shack Line Printer V • TI 745 • TI 745 • TI 745
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Just in Time

The article "Cheaper Upgrade" was just in time.

I purchased a 16K RAM kit from an advertiser in *80 Micro*; getting the Extended Basic ROM was a little harder. I went to several Radio Shack Computer Stores while on vacation in Tampa and St. Petersburg, and locally in Lexington, KY. They all said no to my purchase of a ROM chip.

The local Radio Shack franchise, however, was more than happy to order it for me, and kept after the back order until it arrived 3½ weeks later. I installed it with the article's help and everything worked fine.

*Steven Lewis
1513A Maple Lane
Corbin, KY 40701*

Fatal Error?

What would you say if a friend asked you to wrap a bare wire around your wrist and then plug the other end into a wall outlet? I'm sure the answer wouldn't be printable here.

Well, in the article "Cheaper Upgrade," author Richard Tucker suggests just that. Although he does specify the grounded side of the outlet, I would hate to think of the results from a poorly wired outlet or deteriorated wiring. A quick check with a ground fault indicator would help, but I think a smart move would be to clamp the wire to a water pipe. Other than that small (but possibly fatal) error I enjoyed the article.

*Michael Janke
20620 Gulfstream Road
Miami, FL 33189*

TRSDOS 1.3 Zaps

I would like to provide the following zaps to TRSDOS 1.3 for the Model III. To provide a 30ms track stepping rate

DRS	RB	Existing byte	New byte
2	9F	0C	0B
3	AE	0C	0B
3	DC	1C	1B
13	9D	0C	0B
35	30	0C	0B
35	63	0C	0B
36	49	1C	1B
38	6A	58	5B

Table 1

you must change the nine bytes listed below. Following Apparatus's Superzap format, the disk relative sector (DRS) is in decimal and the relative byte (RB) of the sector is in hex (see Table 1). The zaps can be applied using Superzap or the debug facility of TRSDOS.

While making zaps, you might want the error messages printed on the screen instead of the error code and then having to ask for the error message to be printed. All it takes is a one-byte zap. On DRS 304, RB 2C you will find the

byte to be 20H. Zap this to 18H.

If we do not want to input the date or time on power up, it will take a six-byte zap—three bytes for the date and three bytes for the time. On DRS 12, beginning at RB 70H, you will find 21 3B 51. Change this to C3 2E 4F. This takes care of the date. For the time, at DRS 12, relative byte BA, you will find 21 54 51. Zap this to C3 2E 4F.

*Tom Ash
P.O. Box 584
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Thanks Mr. B.

After reading my article "The Colorful Computer—Part II," Alexander Benenson kindly called an error to my attention. The Draw command could only produce a restricted number of angles (eight). The following is a short program suggested by Mr. Benenson to illustrate the further capabilities of Draw.

```
10 PMODE 3,1: PCIS : SCREEN 1,1
20 DRAW "BM 128,96 M + 12, -16
M + 12, +16 L25"
30 GOTO 30
```

This draws an equilateral triangle near the center of the screen. Draw becomes even more powerful than I realized. Mr. Benenson also suggested a technique I was not aware of. Instead of using DRAW "BM" + STR\$(X) + "," + STR\$(Y) + \$\$ where X and Y are the coordinates of the starting point, the following can be used instead: POKE 200, X : POKE 202, Y : DRAW \$\$.

My thanks to Mr. Benenson.

*Franklyn D. Miller
8871 Falmouth Drive
Cincinnati, OH 45231*

Escape from the Maze

Daniel Phillips wrote in the May Input column that he couldn't get out of Roy Green's "SuperMaze" (80 Micro, March 1982, p. 148). I had the same problem until I changed line 960 as follows: 960 IF X = A(101) AND D = 2 THEN 1100.

*Roger Bury
Box 1404
Ukiah, CA 95482*

Wiping Up Halloween

After typing and editing Mike Keller's "Trick or TRS-80" program (80 Micro, October 1982) I found that moving the face toward the left of the screen leaves a trail of blanks from the lower right corner of the mouth. Not wanting my ghoul to drool, I began to search for the demon that haunted my program. A thorough examination of the program solved the mystery.

To cure Jack's salivations, add one



Fixes for flaws

additional asterisk to line 470, and change the following lines to read:

```
490 FOR X=START TO START + 217:
READ CHAR: POKE X, CHAR: NEXT X
760 MIS = RIGHT$(F$, 62)
```

*Phillip C. Funderburk
513 Longleaf Road
Summerville, SC 29483*

Missing Delete

I forgot to include the delete function when I wrote my Do-It-Yourself Data Base. I wish I could say it happened in the 80 Micro editorial offices but it evidently slipped into the bit bucket under my own desk. My apologies to all—especially to those who wrote to me asking "Where is it?"

Insert lines 5000-5030 into the program.

```
5000 INPUT "ENTER RECORD
NUMBER TO BE DELETED.":SN
5010 IF SN = -1 THEN RETURN
5020 DA(SN,0) = "D"
5030 GOTO 5000
```

Operation consists of entering the record number to be deleted each time the prompt appears. The record number to be deleted comes from a print of the records. When all records have been deleted, enter -1 to return to the menu.

*Karl L. Townsend
103 Knollwood Drive
Lansdale, PA 19446*

16K Screen Veil

Mike Keller's "Screen Veil" program (80 Micro, September 1982, p. 286),

written for a Model I, states, "The NEWDOS80 calls are compatible with the Model III." This is true, except for one call; line 00141 of his listing should read:

```
447B 00141 INSERT EQU 447BH;
```

instead of:

```
4410 00141 INSERT EQU 4410H;
```

Also change the ORG address in line 121 to FB00H (64256). This makes the entire routine usable by 16K machines.

*David Rinaman
P.O. Box 7127
Buena Park, CA 90620*

Graftrax Fix

As an Epson MX-80 owner, I was excited about Thomas McNamee's "Graftrax 80" (80 Micro, September 1982, p. 190). After entering the program listings, certain bugs appeared that can be traced to the way the Model I and Model III handle certain print codes. I have no doubt that the program works just fine on a Model III, but the following revisions should be made to Program Listing 1 to correct for the Model I hanging up on LPRINT CHR\$(0), CHR\$(10), CHR\$(11), and CHR\$(12):

```
530 LPRINT CHR$(125);"";CHR$(27)
"L";:POKE 14312,CC:LPRINTCHR$(8);
540 FORT = 1TOCC: IFG(T)=0 OR
G(T)=10 OR G(T)=11 OR G(T)=12
THEN POKE14312,G(T) ELSE LPRINT
CHR$(G(T));: NEXT
```

Program Listing 2 should also be modified as follows:

```
50 LPRINTCHR$(27)"K"CHR$(L);:
LPRINTCHR$(8);
80 IFA=0 OR A=10 OR A=11 OR A=12
THEN POKE14312,A ELSE LPRINT
CHR$(A);
```

These changes correct the hang-up problem.

For those with disk drives who don't like to type endless lines of data statements, sending the array G(T) to an appropriate sequential access file (OPEN "O",1,"DATA/DAT": PRINT #1, CC - 1: FOR T=1 TO CC: PRINT#1,G(T): NEXT T : CLOSE) permits the use of the data directly in

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In a recent press conference, the Apple Computer Company stated, "The largest installed base CP/M system in the world today is the Apple II with the Z80 card from Microsoft." In a recent full page ad in the Wall Street Journal, Apple announced CP/M for the Apple III. Commodore, refusing to be left behind, has recently announced their "Emulator" series of computers that support CP/M. There are even rumors that the new Tandy 16 will support a version of CP/M.

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another program without having to enter the data. Note that the first item in the file is the number of characters (CC-1) so appropriate DIM G(CC-1) statements can be made.

*Peter Chamalian
Contest Software
P.O. Box 1188
Burlington, CT 06013*

Survey Fix

I've made some corrections and improvements to my "Survey" program (80 Micro, June/July 1982). In the loader program LOADFILE/BAS, page 252, change line 170 to 170 IF EOF (1) THEN N = 1 : GOTO 210.

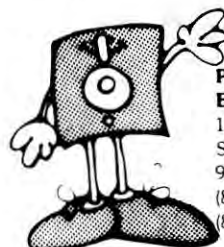
In lines 230, 290, and 470, change the variable N to (N-1). Be sure to include the extra set of parentheses. Finally, insert the line 415 IF F = 1 then 430. These changes correct the count for the numbers entered.

In the main program "Survey" (page 249), change line 460 to 460 INPUT“(N)EXT, (S)TOP, OR (ENTER) TO PLACE CALL”;A\$. Add the following line to allow a graceful exit: 475 IF LEFT\$(A\$,1) = "S" THEN PUT #1,NN; CLOSE:END, and add 485 IF LEFT\$(TN\$(X),3) = " " THEN TN\$(X) = RIGHT\$(TN\$(X),7) to allow seven-digit calls to be placed correctly.

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1008 Kehoe Drive
St. Charles, IL 60174*

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Does anyone know of any credit union software available for TRS-80s? We would like a spreadsheet already set up with the proper income/expense categories that credit unions use; or accounting software set up for credit unions.

*Scott Daniels
9 Joval St.
East Lyme, CT 06333*

Smith-Corona and Scripsit

I have a Model I and am thinking of buying the new Smith-Corona TP-1 printer as the letter-quality output for my Scripsit system. I tried the printer on a similar system at the dealer and found that the line-spacing command (>LS=2) did not work. The printer ignored the command and did not print the text double-spaced. I like the printer and would like to buy it. Does anyone know the cause and cure for this problem?

*K. Rallapalli
3184 Linkfield Way
San Jose, CA 95135*

Pen Pal Wanted

I have a Model I Level II and am interested in voice synthesis. Has anyone found a way to synthesize speech without a voice synthesizer? If you know how to do this in Basic, please write.

Is there anyone under 15 who would like a computer pen pal? I am 12 years old.

*James Waese
644 Huron St.
Toronto, Ont.
Canada M5R 2R9*

Needs Patch

We use Radio Shack's VisiCalc (Cat. #26-1566) on our Model I, Level II 48K with two Radio Shack 35-track disk drives and a keyboard modified for true lowercase operation. We have an Epson MX-80 printer (connected to the printer



port on the Expansion Interface). Electric Pencil runs perfectly.

Much of our work requires column and row labels. Does anyone have a patch or program to allow upper and lowercase output to the printer and screen? We have NEWDOS80 and NEWDOS PLUS as well as TRSDOS.

*Jay Combe, Executive Director
U.S. Association of House Inspectors
126 Bala Ave.
Bala Cynwyd, PA 19004*

Governmental GL

I am in search of a governmental general-ledger program for our small city's three disk Model II. All available GL programs are business-oriented with sales, cost of sales, and so on.

Governmental accounting deals with budget revenue, expense, cost centers, and nonrelated fund groups. I am reluctant to attempt to translate a business-oriented program to this governmental requirement; I might end up with an unusable product.

Is there anyone who can help me with this problem?

*M. M. Gantar
Village of Golf
Golf Road
Palm Beach County, FL 33436*

Orchestrating Language

I have a Model I and an Orchestra-80 board. Does anyone know how to use this board directly with Assembly language?

*Mark Hickenbottom
1165 Ricardo Court
Seaside, CA 93955*

Study at Home

I have a Model III with two disk drives and would like to find individual disk or cassette programs for my chil-

dren to practice math by grade levels for home use (grades 5-12 not inclusive).

Does anyone know where I can find this kind of software?

*Frederick P. Hoffman
287 Ball Road
Grass Valley, CA 95945*

LEX 11 Schematic

I purchased a LEX 11 modem, made by the Lexicon Corp., Miami, FL. I wrote to Lexicon requesting a schematic, which was rejected. The reason for the rejection, they just don't supply any information.

I can understand not supplying schematics while in warranty, but the unit is out of warranty and requires modifications I cannot make without a schematic.

Can anyone help me find a schematic?

*Francis A. Stengel Jr.
349 Stony Road
Lancaster, NY 14086*

Network Aid

We have just installed two Network 3 systems with 18 Model IIIs, and are interested in compiling a list and communicating with other educators using the Network 3.

We would also like to know if there is a Pascal compiler capable of working with this configuration. As usual, not enough information is available on NBasic, which is part of the system. Any information on NBasic would be appreciated.

*LeRoy Price
Benton Community School
Van Horne, IA 52346*

Needs a Password

I would like to get a copy of the 1793 Floppy Disk Controller Manual (about the 1793 FDC in the Model III) by Western Digital.

Also, what is Basic's password in TRSDOS 1.2 or 1.3 for the Model III? I would like to write programs that interact with Basic, but need to disassemble it first.

*V.S. Gavande
3005 W. Terrace
Austin, TX 78731*

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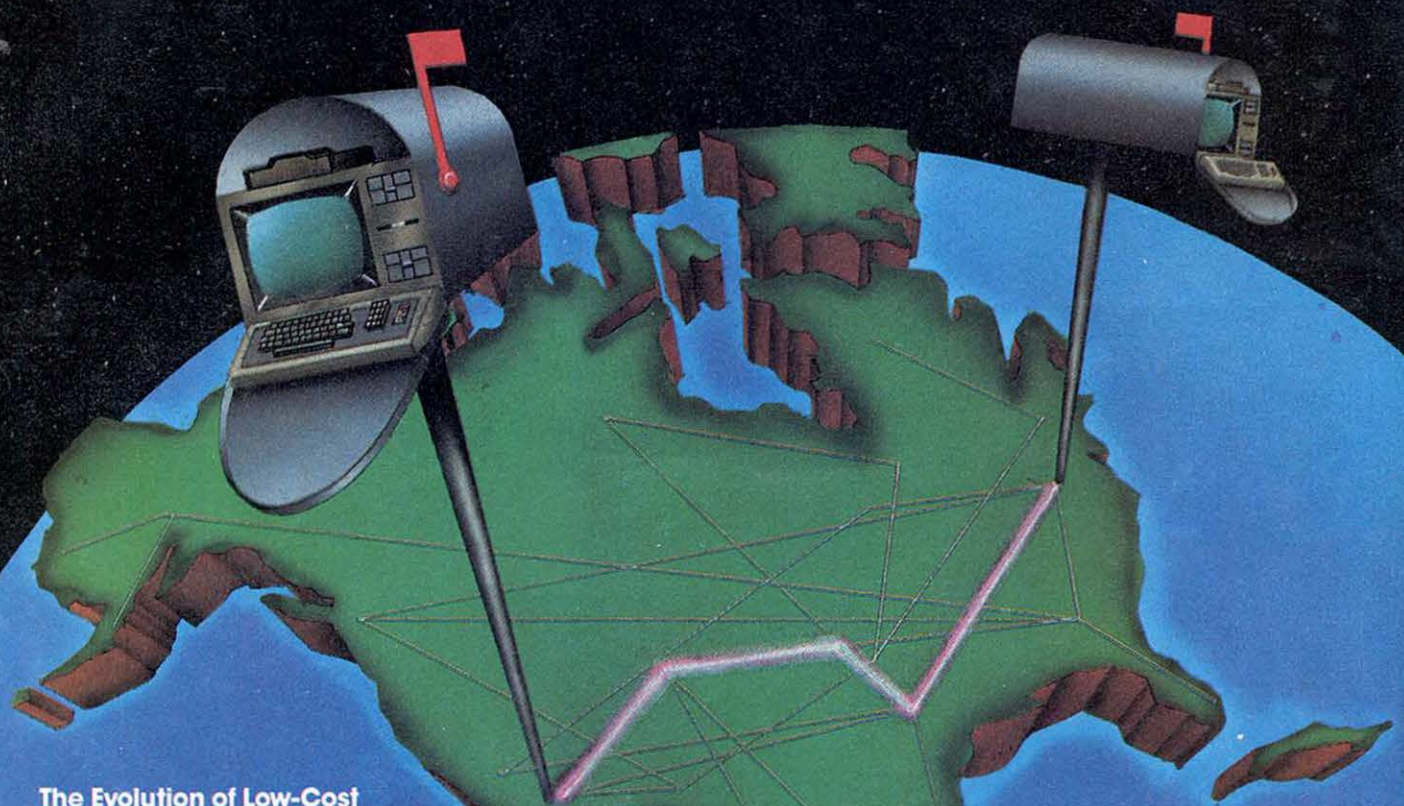
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(Jake Commander, 80 Micro's technical consultant, is visiting his native England after a two and one half year absence.)

When the TRS-80 Color Computer hit the U.S. market in 1980, you could buy it for less than \$400. Not so when it hit the British market. Those curious chieftains at Tandy UK decided to foist it on a destitute populace for £439—about \$750.

But, Tandy doesn't have the market to itself any longer. There's a toy firm called Mettoy based in Wales, see. And this clever entrepreneur named Richard Wadman convinced them to look at the possibility of manufacturing a 6809-based computer. They looked. They liked.

Mr. Wadman was not a dullard. He knew that the 6809, being a Motorola chip, would be in its element in a setup involving other Motorola chips, such as a color video display generator. And wouldn't it work oh so well with a Motorola synchronous address multiplexer?

Mr. Wadman didn't stop there, either. How about having Microsoft take care of the extended Basic in ROM? No problem. How about making the cartridge pinout the same as the TRS-80 color machine? Of course. How about 32K as standard? Naturally. And a real keyboard? And plenty of software? And a parallel printer output? And a price of £200 (about \$360)? Bye-bye Tandy Color Computer.

The name of this little giant killer of a color computer might strike fear into the hearts of many executives in Texas. It is called The Dragon, which is the national symbol of Wales, where 1,500 of these beasts are cranked out every week.

Come on, computer experts. You should see a pattern emerging here. The situation is remarkably similar to one that existed a few years ago.

In 1976, you could go to a Radio Shack store in the United States and buy a wonderful new gadget called a 4K Model I Level I TRS-80 for \$400. You could get away with an el cheapo cassette recorder for storage, and it wasn't too difficult to get an electronics nut to convert the portable TV to a TV/monitor. Up and running for \$400—not a bad deal. I'm convinced that Radio Shack owes its success with the TRS-80 to this relatively painless way of



A dragon threatens Tandy

getting hooked into microcomputing.

Meanwhile, what was happening on the other side of the pond, back in the United Kingdom? Not a lot. While America was devouring all it could get, Tandy UK was preparing for its part in the TRS-80 success story. Unfortunately, it seems that Tandy UK management wasn't using its brains.

Instead of giving the less affluent British people a chance to buy a micro for £200 (the exchange rate at that time), Tandy hit Joe Public smack in the face with a bill for about £500.

Importing that American technology must have been costing Tandy UK a lot of money. Or, more likely, Tandy UK was making a fortune.

In the UK, the system came complete with a Tandy monitor and a Tandy cassette recorder whether you liked it or not. Just to rub it in, the cassette recorder was the type that left magnetic glitches on your program or data whenever you stopped it with the remote on/off.

Good deal, eh what? Commodore proceeded to wipe the floor with Tandy, and that blasted PET machine became a

dominant force in a large part of Europe.

Tandy should have learned from the experience, but it didn't. Here comes the TRS-80 Color Computer (a year late), and I'm already getting a sense of déjà vu. As the PET did a few years ago, The Dragon could also leave the Tandy management with its mouth hanging open.

I'm not saying Tandy UK will have its nose rubbed in it yet again. I don't have to, do I? It's going to happen whether I say it or not. Tandy is already doing the usual things—dropping the price and introducing a more aggressive marketing campaign. Tandy will no doubt rip The Dragon to pieces, accuse Mr. Wadman of stealing their design, and try to sue him.

I've met Mr. Wadman, and, as I've said, he's no idiot. He used the Motorola setup as used in the TRS-80 Color Computer, designed his own input/output circuitry, and placed it in his own box with 32K and a high-quality keyboard. The Dragon will withstand any scrutiny Tandy cares to give it. Sorry boys, you'll have to try harder.

Just in case the boys at Fort Worth are feeling sorry for their British counterparts, I can gleefully tell them that The Dragon will be in America at the start of 1983. I've been told the target price is \$350 for the U.S. market. Mr. Wadman wouldn't divulge where it will be sold, but he said it will be in a big chain store that "has a big catalog."

The Dragon is likely to scorch some profits at Tandy, whether UK or stateside. I can't wait to watch the feathers fly. (See related story on page 370.)

Escaping Depression

Gloom. Gloom and despondency seem to be the operative words here. More than 3 million people unemployed in a nation of 55 million. Unemployment continues to climb.

From the gathering gray clouds overhead to the dwindling gray crowds at the pub, there's a gloomy acceptance of the whole situation. Statistics from major breweries show that people aren't buying as many drinks as they used to. If the British are staying away from the pubs, something has to be exceptionally wrong.

However, microcomputing seems to

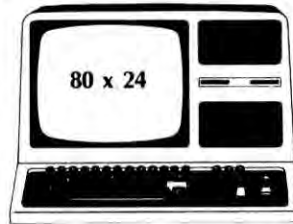
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be alive and well. Software sales in a couple of stores in Birmingham have increased an unbelievable 1,000 percent over last year, with hardware sales trailing miserably at 500 percent.

Not only are microcomputers doing well, but the video industry's growth has been exponential since I was last here. (The two industries aren't as unrelated as you might think—they both involve the sale of hardware and software.) Every other hardware store is running its own video library, causing fierce competition on High Street with many overzealous traders going broke. But, all in all, the video business has blossomed, and a video recorder is almost as common a household item as a color TV.

Why are these two industries growing so rapidly amidst all the financial depression? Well, I've formed a little theory.

We might be going back to the caves—in a high tech way, of course. Back to the three-bedroomed, semi-detached suburban retreat equipped with TV, video equipment, and, in a healthy number of cases, a microcomputer.

After all, who wants to brave the gloom when all this perfectly harmless technological escape exists? All you have to do is while away the hours in electronic wonderment and the cold harsh realities of a recession disappear into the English fog. Just keep up the mortgage on the cave and the escape remains secure. ■

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- While it is fashionable to advertise all-machine-code systems, our system is primarily written in BASIC...with embedded machine code for the speed sensitive areas. What this means is that our system is **easy to modify**, yet extremely fast. This is very important since many users like to have custom modifications made (either by them or us) so as to fit some unique requirement. Our manual has a section devoted exclusively to such modifications...Remember all-machine-code systems are extremely difficult to modify.
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- Zip order is "sub-alphabetized".
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- Optional second address line.
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ing while the printout will be in "natural" order.

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The GAMER'S CAFE

by Rodney Gambicus

One step beyond the neon glow

When we left Eugene and headed south on Route 5, I had visions of San Francisco dancing in my head. We would set up the Cafe somewhere in Berkeley, bask in the sun, and rake in the dough. So when I woke up one morning to find ourselves in the middle of a God-forsaken desert, I was understandably upset.

Mad Max had been driving for 36 consecutive hours and when I looked into his eyes and saw little white rabbits hopping around, I knew we were in trouble. "Neon," he whispered. "Neon and phosphor. Microcosmic oneness. Hey Stella, put back those ash trays. Hit me, hit me, hit me. . ."

He paused, and stared wildly at the vast sandy wasteland that threatened to swallow us. Then he screamed, "Blackjack!"

And I knew where he was taking us: Las Vegas.

* * * * *

I was about to voice my objections when suddenly a hitchhiker appeared from nowhere on the side of the road. Max swung the van over and the fellow, dressed in a three-piece suit and carrying an umbrella, hopped in.

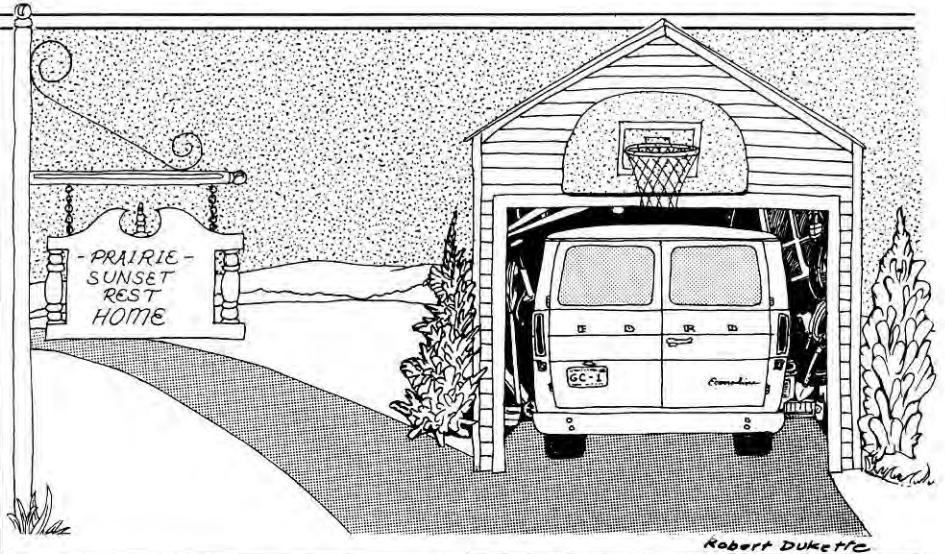
"Hi," he said. "I'm Jackson Dott, marketing coordinator at Microcomputer Games, a division of Avalon Hill. Want some information on our latest games?"

"Gee, I guess so," I said.

He then proceeded to tell us all about Fredericksburg, Close Assault, and Diplomacy, all due for release this month.

Fredericksburg is a two-player Civil War game, giving Generals Ambrose Burnside and Robert E. Lee a rematch to see whether Burnside can avenge the famous Union defeat. Close Assault is a one- or two-player World War II game, featuring hand-to-hand and infantry combat and other war-like stuff. Both are actually board games, with the computer handling combat resolution.

Diplomacy is a whirl of pre-WWI alliance-forming and backstabbing. I said it sounded like you needed a diabolical



mind to play it. Dott agreed. Max merely gurgled.

"By the way," I said. "Have you guys gotten any negative feedback on V.C., that microcomputer game of operational-level combat in Vietnam?"

"Not at all," he replied. "If you play the game, you'll find out it portrays any type of guerrilla warfare. And the idea is to make friends with civilians, not to kill. Say, can you pull over here? This is where I get off."

We stopped and he climbed out.

"Thanks for the lift, fellas," he said as he started to walk into the desert.

* * * * *

Winthrop had been sulking ever since Eugene, when Mad Max came aboard and cleaned Winthrop's clock in Sea Dragon. He'd taken to playing endless games of Black Death on our PMC Model 1/2, sucking on oolong tea and eating dry Cap'n Crunch. I was worried about his teeth, which were beginning to grow moss.

It happened shortly after we pulled into Las Vegas (or Lost Vagrants, as Max calls it). Winthrop booted up Sea Dragon in a final desperate attempt to overtake Max. Unfortunately, he didn't know that I'd accidentally spilled some Milk of Magnesia on the disk, creating several horrendous bugs. Suddenly, Winthrop's torpedoes were bouncing off ships and attacking his subs. When he surfaced for air, his supply decreased. Every time he hit the down arrow, his sub blew up. The final straw came when the nuclear reactor turned into a smile face and started whistling the theme song to "Leave It to Beaver."

Winthrop fled the van screaming. We chased him into Caesar's Palace, pick-

ing up his clothes as we went along. We finally caught him at one of the crap tables, but not before he'd swallowed the dice and thrown everybody's chips all over the room. Needless to say, the police took him away in a rubber truck.

Well, it turned out that the city attorney owned a Model I, and we were able to strike a deal. We gave him all our Big Five games, and he agreed to put Winthrop in the Prairie Sunset Rest Home instead of the slammer. And that's where he is now, pushing the nurse call button and yelling, "Dive! Dive!"

* * * * *

A short time later, I was at the poker table looking at a straight flush I didn't have when a waiter came up with a telephone. It was Soft Sector Marketing calling to tell me about three new games they've got scheduled for release this month.

Sneak Thief is Larry Ashmun's first totally original arcade game. You defend the gold treasure on an alien planet (as most of them are), zapping aliens (what else?), or dragging them off to jail (no rest homes here). Vexus is a 3-D arcade game from Factory Programming in which you pilot a spaceship through a tube in the sky, shooting down aliens as they approach. And Rally, also from Factory Programming, simulates driving a race car through a graphics maze, picking up flags and being pursued by "villainous cars" (their words). All three are Alpha or TRSSTICK joystick-compatible.

The folks at Soft Sector also want everybody to know that Color Computer versions of Alien Defense and (probably) Caterpillar are on their way.

When the waiter came to take the

phone, I noticed something suspiciously familiar about him.

"Say," I said, "Aren't you the former Boston Red Sox second baseman Pumpsie Green?"

"No," he said, and walked away.

* * * * *

When I got back to the van, I knew immediately that something was wrong, because the van wasn't there—only Mad Max, our two Pocket Computers, and the PMC. It took a while to get the truth from Max, who was air-guitaring to Jimi Hendrix's "Voodoo Child" wafting from a GTO waiting at a stop light, but it turned out that he'd lost the van in a crap-shoot with the head nurse at Prairie Sunset.

Well, we had enough money for a cheap motel room, and one sole remaining disk with Galaxy Invasion on it, so we figured that life could be worse. We could be in San Francisco, soaking up the sun and making lots of money. Who needs that kind of aggravation? ■

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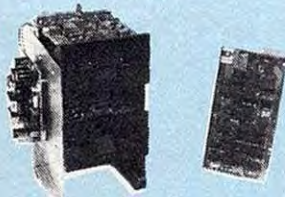
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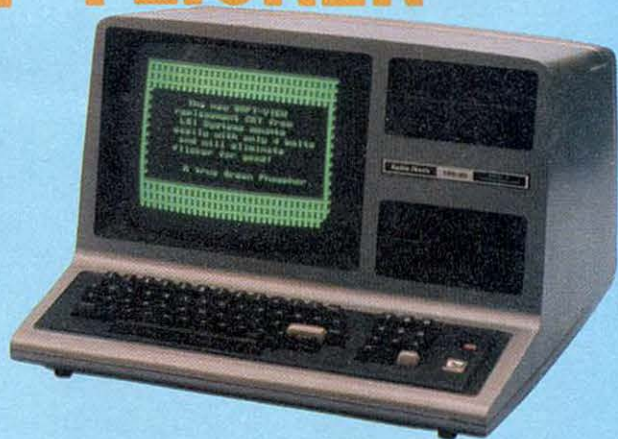
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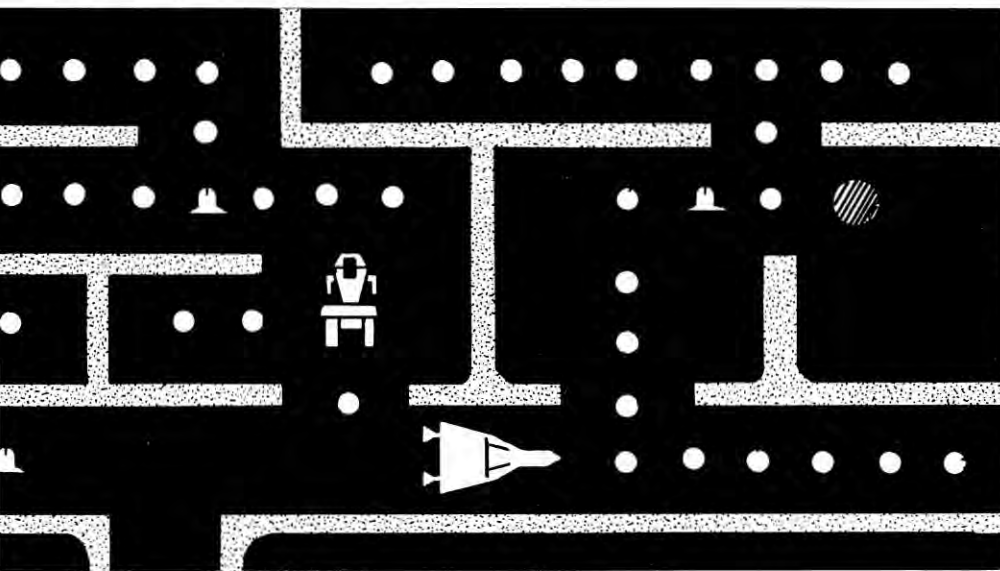
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★★★★

Pac-Droids
Programmer's Guild
P.O. Box 66
Peterborough, NH 03458
Color Computer
\$19.95

by **Kerry Leichtman**

If a game clone is to be successful, it must imitate the original's good points, and add a few new twists of its own. Pac-Droids does just that. This new Programmer's Guild game is the best Pac-Man clone I've seen for the Color Computer.

The object of play is the same as the original game; you run around a maze gobbling up dots, energizer pellets, and drones. Rather than being a smiley face profile, you command a blue spaceship. Your enemies, the red drones and a blue drone robot, attempt to converge upon your ship until you eat an energizer pellet. Then they become scarce.

The game is more difficult than Pac-Man, and as a result more fun. The blue drone robot occasionally leaves dangerous droppings, called mines, in the maze. Running into one of these droppings will destroy your ship, as will taking on the powerful blue drone robot itself.

You are supplied with a weapon to use against these killers—the super bomb. Used properly, the super-bomb will destroy the blue drone and its mines. But the super bomb is not all

that discreet—it will also blow away your energy pellets. The super bomb will destroy everything in its path until hitting a force field (maze wall). So, if within one corridor you are faced with a charging blue drone, one of its mines, and your last energy pellet, close your eyes and take your fate. If you super-bomb your last energy pellet, you've also super-bombed your only hope in fighting the red drones.

You start the game with three ships and three super bombs. You can use all three super bombs with any one ship, but I don't recommend it. According to the documentation you get an extra ship and an additional super bomb for every 10,000 points. You also get a new maze for every 10,000 points, with a maximum of four different mazes. I can't verify that first-hand for reasons I'd rather not discuss. But I do know that if you use all three super-bombs, say, with your first ship, and then that ship gets destroyed, your next ship is likely to encounter a rejuvenated blue robot drone and its mines—with no super bombs to defend itself.

Charles Forsythe's use of the Color Computer's main attribute, color, is to be applauded. The monitor is alive with color, especially the title page. While I was researching (playing) for this review, many people stopped to watch the display (and laugh at my ineptness). The sound is less exciting. In fact, I kept turning the volume down to lessen the barrage.

A minor complaint is the seemingly slow reaction time when opting for keyboard input rather than joysticks. Your ship is more likely to be tracked

REVIEW CONTENTS

Pac-Droids	44
Bits 'n Bites About Computing: A Computer Literacy Primer	45
C.C. Mailer and C.C. Merger	45
Chatterbox	48
Trashman	53
Options-80	54
Log Electronic Notebook	57
Incoprop	58
The Information Society As Post Industrial Society	61
Black Death	62
Tiny Compiler	63
The Grafyx Solution	65
SuperScriptsit	69
Review Digest	72

Our reviewers use a five-star rating system. One star represents the low end of this spectrum, while five stars represent the spectacular and high end of the spectrum.

down by the enemy when using the arrow keys than when directing movements with a joystick.

Another complaint, less minor, is that you only get three attempts before the game is over. Now I can understand the greed of arcade machines when they limit your play to three chances for a quarter. I remember getting five balls for a dime on pinball machines and three plays for a quarter. (And my father remembers the nickel movie.) But the point is, if no one is interested in machine turnover, why not allow for more than three plays a game?

For little kids the three-tries-you're-out is okay, because they take the time to master the play. But for an aging editor like me who didn't practice by dropping \$20 a week into Pac-Man, three tries is too few to get anywhere. I'm sure I'll never see the other three mazes. My highest score was 7,400. 10,000? Bah, humbug!

Complaints aside, Pac-Droids is one of the better games available for the Color Computer. ■

★ ★ ★

***Bits 'n Bytes About Computing:
A Computer Literacy Primer***
by **Rachelle S. Heller &
C. Dianne Martin**
Computer Science Press
11 Taft Court
Rockville, MD 20850
Hardcover, 174 pp.
\$17.95

by **Mary Gasiorowski**

As you read this page, stop for a moment and think about those who can't read—the illiterate—those who can't deal with the written word.

There are many more who can't deal with or understand computers—the computer illiterate. At a time when our lives are becoming increasingly computerized—from our alarm clocks, washing machines, and automobiles to our businesses—it is increasingly important that people understand what computers can and cannot do, how to use them, and the implications of computer use on our society. *Bits 'n Bytes About Computing: A Computer Literacy Primer* addresses this problem.

Bits 'n Bytes was written for the classroom teacher to serve as a source, and perhaps as a textbook. It covers a broad range of topics: what is computer literacy, where did computers come from, how do computers work, what computers can do for us, and how computers will affect our lives. Each chapter is organized into content, a list of key ideas (vocabulary words), a set of activities (including information on the purpose of the activity, and the materials and time required for each), and a list of related readings for teachers and students. In addition, an appendix includes a software evaluation checklist to help teachers evaluate educational programs for the computer. An extensive index aids in relocating specific topics or other references.

Computer literacy is a topic that can be introduced (to a varying degree of depth) at any age. However, there are few books that can be used at the elementary level. *Bits 'n Bytes* is one of those few. As a source book, it provides background material for the teacher, who can then decide how much to present to the students.

The broad range of activities can be used from elementary through junior high-school classes. The activities and

related readings are the best features of the book. The lists of related readings at the end of each chapter are extensive and varied, covering all aspects of computers, their history, and their use and misuse, and are clearly marked as to their intended audience (teacher, student, or both).

Some sample activities from the book include:

- making a scrapbook of the materials you collect about computers;
- writing a short story or poem that describes how you feel about computers;
- making a history time line showing the important events in computing history;
- making your own simple calculator using three wooden gears;
- preparing an oral report and poster about the use of computers in some area of life; and
- collecting want ads to see what computer-related jobs are being offered and what the qualifications are.

Bits 'n Bytes does not cover a specific programming language, as many introductory books do. The authors feel there are already many good programming books available, and more importantly, they did not want to commit their book to a particular language. This leaves the choice of a language—Basic, Pascal, Logo, or any other—to the discretion of the teacher or the situa-

tion of the system available.

Computer literacy has been defined by the National Science Foundation and the Minnesota Educational Computing Consortium as knowing how computers work, the step-by-step technique for problem solving, social implications, being aware of computer applications, having a historical perspective on computers and future trends, and a person's attitudes toward computers. *Bits 'n Bytes* was written to address these topics. The authors admit, however, that on some topics they present a byte (a larger unit) of information, while on other topics, only a bit (the smallest unit). Don't expect to teach from this book alone!

Computer literacy is becoming a critical issue, and two important aspects of teaching the subject need to be summarized here. Computer literacy must be addressed to all ages. *Bits 'n Bytes*, as a source book, meets that challenge because it includes material for all ages and it leaves the presentation to the teacher. In addition, there is much to learn about using computers effectively and avoiding their misuse. It would be nice to have all that information in a single book; but that book does not yet exist. *Bits 'n Bytes*, with its thoughtfully prepared list of activities and related readings, is a very good place to start. ■

★ ★ ★ ★

C.C. Mailer and C.C. Merger
Trans Tek
194 Lockwood
Bloomington, IL 60108
Color Computer, 16–32K cassette
or 32K disk systems
C.C. Mailer, \$20; with
C.C. Merger, \$35

by **Scott L. Norman**

C.C. Mailer and C.C. Merger are convenient, inexpensive programs for Color Computer owners who prepare "mass" mailings of moderate size. C.C. Mailer is a stand-alone program that allows the user to maintain address files for the preparation of mailing labels. C.C. Merger is used to combine such files with text files created by Trans Tek's C.C. Writer word processor. The

package contains all the options necessary to sort address lists for selective mailings, and to customize form letters with properly formatted inside addresses and salutations.

C.C. Mailer

This is the heart of the system.

While C.C. Mailer is available on cassette, disk systems are far superior for the file manipulation required by this sort of program. Although dual disk drives give you even more freedom, most of my comments will specifically relate to single-disk operation.

C.C. Mailer is menu driven, and leads you through the process of entering data for your files in a very painless fashion. Up to 11 data fields are available, including two different code fields that can be used for sorting. Disk system records are limited to a total length of 128 characters; 720 such records can be accommodated by a 32K disk system. This is misleading, though. If only one

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THE ORIGINAL

Simply stated, Telewriter is the most powerful word processor you can buy for the TRS-80 Color Computer. The original Telewriter has received rave reviews in every major Color Computer and TRS-80 magazine, as well as enthusiastic praise from thousands of satisfied owners. And rightly so.

The standard Color Computer display of 32 characters by 16 lines without lower case is simply inadequate for serious word processing. The checkerboard letters and tiny lines give you no feel for how your writing looks or reads. Telewriter gives the Color Computer a 51 column by 24 line screen display with *true lower case characters*. So a Telewriter screen looks like a printed page, with a good chunk of text on screen at one time. In fact, more on screen text than you'd get with Apple II, Atari, TI, Vic or TRS-80 Model III.

On top of that, the sophisticated Telewriter full-screen editor is so simple to use, it makes writing fun. With single-letter mnemonic commands, and menu-driven I/O and formatting, Telewriter surpasses all others for user friendliness and pure power.

Telewriter's chain printing feature means that the size of your text is never limited by the amount of memory you have, and Telewriter's advanced cassette handler gives you a powerful word processor without the major additional cost of a disk.

...one of the best programs for the Color Computer I have seen...

— Color Computer News, Jan. 1982

TELEWRITER-64

But now we've added more power to Telewriter. Not just bells and whistles, but major features that give you total control over your writing. We call this new supercharged version Telewriter-64. For two reasons.

64K COMPATIBLE

Telewriter-64 runs fully in any Color Computer — 16K, 32K, or 64K, with or without Extended Basic, with disk or cassette or both. It automatically configures itself to take optimum advantage of all available memory. That means that when you upgrade your memory, the Telewriter-64 text buffer grows accordingly. In a 64K cassette based system, for example, you get about 40K of memory to store text. So you don't need disk or FLEX to put all your 64K to work immediately.

64 COLUMNS (AND 85!)

Besides the original 51 column screen, Telewriter-64 now gives you 2 additional high-density displays: 64 × 24 and 85 × 24!! Both high density modes provide all the standard Telewriter editing capabilities, and you can switch instantly to any of the 3 formats with a single control key command. The 51 × 24 display is clear and crisp on the screen. The two high density modes are more crowded and less easily readable, but they are perfect for showing you the exact layout of your printed page, *all on the screen at one time*. Compare this with cumbersome "windows" that show you only fragments at a time and don't even allow editing.

RIGHT JUSTIFICATION & HYPHENATION

One outstanding advantage of the full-width screen display is that you can now set the screen width to match the width of your printed page, so that "what you see is what you get." This makes exact alignment of columns possible and it makes hyphenation simple.

Since short lines are the reason for the large spaces often found in standard right justified text, and since hyphenation is the most effective way to eliminate short lines, Telewriter-64 can now promise you some of the best looking right justification you can get on the Color Computer.

FEATURES & SPECIFICATIONS:

Printing and formatting: Drives any printer (LPV7/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminus, etc).

Embedded control codes give full dynamic access to intelligent printer features like: underlining, subscript, superscript, variable font and type size, dot-graphics, etc.

Dynamic (embedded) format controls for: top, bottom, and left margins; line length, lines per page, line spacing, new page, change page numbering, conditional new page, enable/disable justification.

Menu-driven control of these parameters, as well as: pause at page bottom, page numbering, baud rate (so you can run your printer at top speed), and Epson font. "Typewriter" feature sends typed lines directly to your printer, and Direct mode sends control codes right from the keyboard. Special Epson driver simplifies use with MX-80.

Supports single and multi-line headers and automatic centering. Print or save all or any section of the text buffer. Chain print any number of files from cassette or disk.

File and I/O Features: ASCII format files — create and edit BASIC, Assembly, Pascal, and C programs, Smart Terminal files (for uploading or downloading), even text files from other word processors. Compatible with spelling checkers (like Spell 'n Fix).

Cassette verify command for sure saves. Cassette auto-retry means you type a load command only once no matter where you are in the tape.

Read in, save, partial save, and append files with disk and/or cassette. For disk: print directory with free space to screen or printer, kill and rename files, set default drive. Easily customized to the number of drives in the system.

Editing features: Fast, full-screen editor with wordwrap, block copy, block delete, line delete, global search and replace (or delete), wild card search, fast auto-repeat cursor, fast scrolling, cursor up, down, right, left, begin line, end line, top of text, bottom of text; page forward, page backward, align text, tabs, choice of buff or green background, complete error protection, line counter, word counter, space left, current file name, default drive in effect, set line length on screen.

Insert or delete text anywhere on the screen without changing "modes." This fast "free-form" editor provides maximum ease of use. Everything you do appears immediately on the screen in front of you. Commands require only a single key or a single key plus CLEAR.

*...truly a state of the art word processor...
outstanding in every respect.*

— The RAINBOW, Jan. 1982

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TRSDOS™ 1.3 Users**

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- SDIR map showing location of any file.
- SDIR single stroke commands.
- SDIR list files a granule at a time.
- SDIR sort by name, extension, size, starting location or back as it was.
- SDIR rearrange order for special needs.
- SDIR most modifications either temporary or permanent.
- SDIR create, kill, rename, change attributes or reposition files.
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REVIEWS

drive is available, capacity will be reduced because of the need to reserve space for the operation of the sorting option.

A fresh disk contains four programs: Mail, a short loader; C.C. Mailer itself; SORTCOM, the sorting routine; and Copy2, which is used to copy files in a two-drive system. C.C. Merger is an optional fifth program on the disk.

The user's first task is to make a back-up for a working copy. Since file control is manual, with the data file name being defined in the program, you have to make a fresh back-up disk for every address file. As far as the program is concerned, all data files are called CCMAILER/DAT.

You begin by running the Mail program. If there is a data file on the disk, it is automatically loaded at this point; if not, you will be prompted for a title for your new file. This will be displayed on subsequent listings and data requests. You are also asked to specify the date; C.C. Mailer keeps track of the last update, a rather professional feature. At this point, the main menu comes up:

- (U) UPDATE THE FILE
- (P) PRINT A FILE REPORT
- (L) PRINT LABELS
- (S) SORT THE FILE
- (E) EXTRACT FROM THE FILE
- (F) UPPER/LOWERCASE CONVERSION
- (Q) QUIT AND RETURN TO BASIC

The U option is used to build a file and to add, change, or delete records. A second-level menu guides you through the options. The data-entry/change screen identifies the fields by number. The 11 fields are:

- Title: limited to six characters, so MR&MRS will just fit.
 - First Name and Middle Initial: 15 spaces.
 - Last Name: 20 spaces.
 - First Line of Address: 25 spaces.
 - Second Line of Address: 20 spaces.
- Two lines are handy for specifying apartment numbers, company names, and so on. If this field is not used, it will print as a blank line on mailing labels, but C.C. Merger will delete it in the address portion of a form letter.
- City: 13 spaces, two positions allowed (e.g., New York can be written with a space).
 - State: Use the two-character abbreviations.

● Zip Code: Use the old five-digit codes. A nice feature is the disk program runs a consistency check on the zip code and the state abbreviation, and notifies you if there is a mismatch. You can ignore the message and proceed, which is handy for preliminary storage of data when you may not know the zip and want to leave the field blank.

● Telephone Number: 12 spaces, so you can't use parentheses around the area code. I use a single hyphen to separate it from the exchange.

● Code Field 1: Five spaces, with each treated as a separate one-character field for selection purposes.

● Code Field 2: Five spaces, treated as one field.

Data entry is easy; the command line prompts you for each field in turn. You can backspace and correct the field you're working on, but once it is entered, you must complete work on the record before the option to change anything becomes available again.

When using the Change or Delete suboptions of Update, you can identify the record in question by last name, or by one or both code fields. The codes are also used in doing selective printing, and generally add to C.C. Mailer's power and flexibility.

Code field 2 is pretty simple; think of it as a five-character, free-form keyword. You can search for any substring in this field, provided it is at least two characters long. To paraphrase an example from the documentation, if C.C. Mailer is used to maintain the membership list of some organization, then code field 2 might contain the month and year when each member joined, perhaps in the form MM/YY. If you wanted to identify everyone who became a member in 1980, you could just search for the substring /80.

Code field 1 enables you to encode status information about five categories, each having a distinct position in the field. When you specify the "mask"—the pattern—for searches on this field, you can indicate a "don't care" condition for any position with characters you know would not appear in the actual codes. For example, each position in code field 1 of our hypothetical membership list might contain either an A or an I to indicate active or inactive status in five specified activities. Should you wish to identify members participating in activities one and four, regardless of their other interests, then

TRS-80™

WOBOS™ I

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WOBOS I for Model III BASIC 03/01/82 12:34:56

PROGRAM MENU	UTILITIES
1 Your Program A	11 Data List
2 " " B	22 Sort
3 " " C	33 Renumbr
4 " " D	44 Append
5 " " E	55 Memory Dump
6 Graphics Synthesis	66 Map
7 Special characters 0-31	77 Size
8 " " 91-127	88 New Data Entry
9 " " 192-255	99 Device I/O

Illustrated above is the Primary Menu of WOBOS I for Model III. In addition to the features shown, the DEVICE I/O generates a separate 9-choice menu that will allow you to compile, update, sort and output your data files. It also includes a utility that will save both the DATA and WOBOS I on tape and/or disk.
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All games are 100% machine language for top quality graphics, music and sound effects. Games are also joystick compatible. Games are TRS-80 Lev. 2, MOD I/III compatible. Specify tape (16K) or disk (32K). Tape version will not transfer to disk.

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Joystick Compatible. ^{✓391}
Written by Y. Lempereur



the search mask might be A**A*.

As I mentioned above, every time you employ the code fields for a search, you are given the option of specifying whether a match should be found on either field, or both. That is, you can AND or OR the search criteria.

It is a good idea to sort the file whenever records have been changed or added. The sort option invokes a two-level reverse ripple sort that works on last names within each zip code. The program asks if there is a scratch disk on drive 1, but it will work on single-drive systems; it just requires more space on the disk. A nice, chatty routine, it gives you a running commentary as it loads the sorting and merging programs and goes about its business.

Printed Output

You can request a complete or partial printout of a C.C. Mailer file with the main menu's P option. The left side of the printout contains the four lines of name and address data for each record, formatted as they would be for labels. The telephone number and the two code fields are printed at the right of this material. Printouts of this kind are useful for archival purposes.

The real payoff is in the preparation of mailing labels. The L command gets you started. You are given the usual selection options, and can also ask for a trial print of a dummy label. This is to help you get your tractor-feed labels properly aligned in the printer, which is set up for one-inch-high labels, six-lines-per-inch feed. A final option is the treatment of the code fields. You can delete them from the actual labels, or have them printed. If you choose the latter, the codes will appear on the top line of each label, indented to comply with postal regulations.

C.C. Mailer's F command is important for professional-looking labels. The output options I've already discussed treat all text as uppercase. If you use the F command before printing, though, your labels and form-letter salutations will have proper capitalization. To be specific, F leaves the first letter in each alphabetic field a capital. Each succeeding letter is converted to lowercase unless it follows a blank, or a character whose ASCII code is less than 65; this takes care of punctuation marks. One result is that each half of a hyphenated name will be properly capitalized: Smith-Jones. MR&MRS is properly

converted to Mr&Mrs, and the name of the XYZ Corp. will come out Xyz unless you insert spaces: X Y Z Corp. The state abbreviation is left as two capital letters.

One more option, Extract, is used to copy data into a new file without code fields. The primary application is C.C. Merger; the extracted file is used for the inside address and salutation. The F option can be used before E, too. When E is invoked you are given the usual opportunity to specify search fields, and are then asked for a file name. With a single-drive system, you might as well be lazy and let the program assign its default name of CCMAILEX. If you have multiple drives, however, you can keep your extract files on a specific drive and designate this in the file name.

C.C. Merger is used to prepare form letters with individualized inside addresses and salutations. It requires an extract address file from C.C. Mailer, and a text file prepared with C.C. Writer. The text file has to have the proper embedded command to link with the address file, but that's easily accomplished; when preparing the letter, just omit the address/salutation section and replace it with the command /ms. When the program is run, it will print the proper inside address (three or four lines), skip two lines, and then print a salutation in the form "Dear TITLE LAST NAME," using the data from each extract record in turn. Note that suffixes such as Jr. or III will not appear in the salutation.

The /ms command can be stacked with other C.C. Writer commands. For example, to skip two lines before printing the inside address, use the combination /s2/ms. If you are preparing a series of letters with a common salutation

such as Dear Friend, put the salutation in the text file and precede it with /m. The individual inside addresses will still be printed.

The mechanics of running C.C. Merger are pretty simple. Assuming the two files are on hand, you just enter "RUN CCMERGER." You are prompted for the address file name, the text file name, and then the program takes off on its own. (By the way, that prompting order is the reverse of what the manual claims.)

File chaining is not supported by C.C. Merger, so you'd better not write anything like a 20-page form letter. If you must, you could take the manual's suggestion and run just the first page under C.C. Merger. Also, at this time the program will not allow you to insert a variable field in the middle of a letter to pick up a last name for personalizing. Bill Dye of Trans Tek says that the logic is all there, but he has not implemented this feature in order to keep a rein on the size of the package.

He also advises that C.C. Mailer owners insert LW=0: at the beginning of program line 1310 in order to properly handle the case of a blank Title field.

The two programs work well with each other and with C.C. Writer. The documentation accompanying my review copies had a few rough spots, mostly the result of the programs' rapid evolution. Bill Dye has a record of supporting his products, though, and I'm happy to report that recent supplements to the manual have cleared up the earlier problems; there should be no difficulty with material being shipped now. If you are involved with an organization that has to produce bulk mailings, the Trans Tek package can be of great assistance. ■

★ ★ ★ ★

Chatterbox

**VoiceTech Industries
P.O. Box 499
Fort Hamilton Station
Brooklyn, NY 11209
\$24.95**

*How to Make Your Computer
Talk for Under \$50*

by Earl Savage

If you have a little electronics know-how, the inexpensive VoiceTech method can give your machine the ability to talk back to you.

The manual title, *How to Make Your Computer Talk for Under \$50*, describes its contents very accurately. Even if you purchase every component at the local Radio Shack, you can build this synthesizer for \$49.51, including an edge-card connector and ribbon cable.

The Manual

The 38-page manual is well written. It contains an explanation of human

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THE BLACK HOLE

It was a dark day for the Galactic Empire as the dreaded Dortians launched their invasion. A lightning counter-attack by the Galactic fleet was successful however and destroyed the alien invading force. Only their leader has escaped and taken refuge at the bottom of a black hole. Your mission is to seek out and destroy this creature. Will you survive the perils leading to the black hole? Are you a match for the cunning Dortian leader? A great challenge!

BABLE TERROR

A tired knight, returning home from the crusades, you find your castle surrounded by a strange labyrinth. A peasant advises that your trusted staff has betrayed you and constructed the walls to prevent your return. With a sneer he tells you of the Bables and other creatures roaming the maze-like complex. Can you find your way through this maze where you can see but a few yards? In spite of danger lurking around nearly every corner, you are confident. Your travels have provided you with a flask of green liquid which allows you to become temporarily invisible. You are off to slay Bables and face other unknowns and reclaim what is rightfully yours. INCLUDES VOICE!



Joystick Compatible.
Written by Y. Lempereur

For the TRS-80, Lev 2, Mod 1/III.

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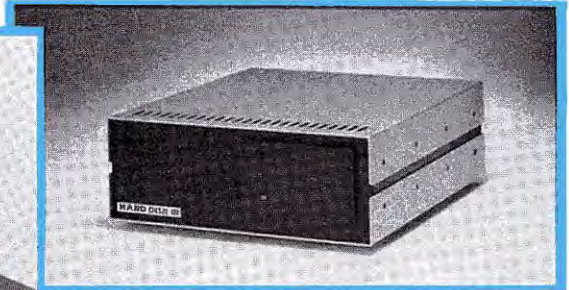
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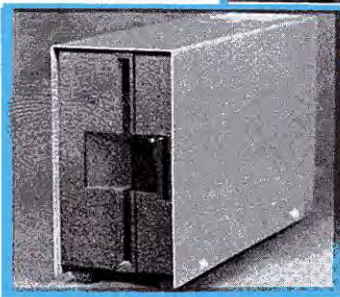
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speech and synthesizing methods sufficient to form a foundation for later computer programming. Without getting too deeply into the complex subject of phonemes and allophones, you get enough background to make your initial efforts useful.

Phonemes are the constituent sounds of a language; allophones are the acoustic signals/sounds of the phonemes. There are about 64 phonemes in English and the VoiceTech synthesizer uses a group of 64 allophones to create words.

This part of the manual emphasizes that programming speech uses the sounds involved—not the letters used to spell the words. The available allophones are listed with illustrations of their sounds and hints for their uses.

Another section of the manual gives programs for the Model I, the Model III, and two other computers. The programs are annotated, and include a thorough explanation of their features, using examples.

The manual also contains the parts lists and schematics of synthesizers for each of the computers it can be used with. One synthesizer connects to the printer port of the Model III or Model I. Another synthesizer connects to the expansion port of the Model I.

If you own a Model I, you can construct the printer port version; it is simpler because it needs no address decoding. Both versions operate identically.

The Kit

The contents of the starter kit depends upon what version of the synthesizer you decide to build. For all versions, you get a 3.12 MHz clock for timing control and the speech synthesizer integrated circuit, a 28-pin DIP switch.

To complete the printer-port version, you need 11 capacitors, four resistors, one potentiometer, one audio amplifier IC, and a speaker; all these components are readily available.

You can tap into your computer for the single operating voltage required (5 volts), or you can follow the manual directions and use an AC adapter and a voltage-regulator IC.

I found only two typographical errors in the manual. The data list of allophones contains an error (EH2 should be DH2 in line 52). The other is an unmarked capacitor in the schematic. Fortunately, it's not critical (a .1mfd works fine).

Be advised that the hardware section of the VoiceTech manual does not contain step-by-step directions for construction. Construction of the voice

*“Be advised . . .
the hardware section
of the VoiceTech manual
does not contain
step-by-step directions
for construction.”*

synthesizer is not too difficult. If you are new to electronics, find an experienced friend to give you advice and assistance.

Using the Synthesizer

With the program keyed in and the synthesizer connected, you're ready for some serious fun. The synthesizer needs no attention beyond turning it on and adjusting the volume. You will have speech right away because the program has a built-in message: "Welcome to VoiceTech, my name is Chatterbox."

When you are tired of hearing that message, you can program any words you wish. Keep the table of allophones handy when you key them in and edit them if you don't like the way the word comes out. Fortunately, the program makes editing easy.

The VoiceTech program is slow handling arrays and doesn't save the al-

lophones for the words that you generated. This program, however, is easy to use and understand. The algorithm can be easily adapted to your own needs.

The program generates a single-dimension array of the allophones' addresses you used to create your words. Just select and enter the allophones; the computer does the rest—finds the addresses, forms the array, and sends it to the synthesizer. You can modify the program to save or print out the arrays so that you can use the same words again later.

You can even add sound to your own programs—original or your modifications of existing programs. Just put the address arrays in your program and send them through a short talk subroutine when you want the computer to speak.

Summary

VoiceTech Industries has a good thing here. Where else can you get a quality synthesizer for such a small outlay of money and effort? Off-the-shelf synthesizers have been beyond the reach of most of us.

If you happen to be all thumbs and have no electronics assistant, write to VoiceTech. They have announced a completely assembled version. The price is unknown at this writing, but I'm sure it will be less than the current market prices.

The people at VoiceTech say they are working on the other half of synthesized speech: text to speech. I look forward to the time when my computer can read aloud in plain English what I typed into it! ■

★ ★ ★ ½

Trashman
Prosoft Software
P.O. Box 839
N. Hollywood, CA 91603

Model I, II, or III
\$39.95

by **Richard C. McGarvey**

Trashman is a small, invisible machine-language utility for the Model I and III that increases program speed

by cleaning up vacant, or trash, string locations. It uses only 578 bytes of memory, plus two bytes for each active string, and it reduces string compression time by 95 percent or more.

Trashman to the Rescue

Trashman oversees Basic programs and does a high-speed clean-up routine when needed. The result is that trash collection delays are reduced by 95 percent or better. Obviously, there will not be a noticeable increase in the speed of a program with relatively few strings. But in those programs that use hundreds of strings and especially string arrays, the time saved is outstanding. Table 1 shows the sample savings listed in the

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Why do I need it?

You need OMNITERM if you need to communicate efficiently with many different computers, or if you want to customize your TRS-80 for use with one particular computer. You need OMNITERM to SOLVE your communications problems once and for all.

What do I get?

The OMNITERM package includes the OMNITERM terminal program, four conversion utilities, a text editor, and setting files for use with popular computers such as CompuServe, the Source, and Dow Jones — just as samples of what you can do for the computer you want to work with. The package includes six programs, seven data files, and real documentation: a 76-page manual that has been called "the best in the industry." And OMNITERM comes with real user support. We can be reached via CompuServe, Source, phone, or mail to promptly answer your questions about using OMNITERM.

What do I need to use OMNITERM?

A Model I or Model III TRS-80, at least 32K of memory, one disk, and the RS-232 interface, or Microconnection modem. OMNITERM works with all ROMs and DOSes, and will work with your special keyboard drivers.

What will it do?

OMNITERM allows you to translate any character going to any device: printer, screen, disk, keyboard, or communications line, giving you complete control and allowing you to redefine the character sets of all devices. It will let you transfer data, and run your printer while connected for a record of everything that happens. OMNITERM can reformat your screen so that 80, 32, or 40 column lines are easy to read and look neat on your TRS-80 screen. It even lets you get on remote computers with just one keystroke! The program lets you send special characters, echo characters, count UART errors, configure your UART, send True Breaks and use lower case. It accepts VIDEOTEX codes, giving you full cursor control. It will even let you review text that has scrolled off the screen! Best of all, OMNITERM will save a special file with all your changes so you can quickly use OMNITERM for any one of many different computers by loading the proper file. It's easy to use since it's menu driven, and gives you a full status display so you can examine and change everything.

"OMNITERM has my vote as the top TRS-80 terminal program available today" Kilobaud Microcomputing, June 1981, pages 16-19.

OMNITERM is \$95 (plus shipping if COD) Call for 24 hour shipment. Manual alone \$15, applied toward complete package. Visa, M/C, and COD accepted. MA residents add 5% tax. Dealer inquiries invited.

Also available OMNITERM for the TRS-80 Model II and IBM personal computer. Contact Lindbergh Systems for details.

Lindbergh Systems

41 Fairhill Road, Holden, MA 01520
(617) 852-0233

✓ 135

Source: TCA818 CompuServe: 70310.267 TRS-80 is a™ of Tandy Corp.

REVIEWS

Number of Strings	Seconds Delay		Percent Improvement
	Normal	Trashman	
250	11.8	0.7	94%
500	45.8	1.6	96.5%
1,000	179.6	3.5	98%
2,000	713.2	7.8	98.9%

Table 1. Trashman Sample Savings

documentation for Trashman. My tests bear out these figures within reasonable limits (different TRS-80s run at slightly different speeds—my tests were a bit faster across the board).

Trashman is simple to operate and integrate, and it is virtually invisible. There are some special features to Trashman that can be used in normal operation. You have the option to deactivate Trashman at any time by simply issuing the command DEFUSR = ADDR: PRINT USR (-1). Trashman remains inactive until the above line is issued again and the last command is changed to USR (0). Trashman can also be totally removed by issuing the above command with USR (-2). Be sure you want Trashman gone before you use that one because there is no recovery.

Trashman can cause out-of-string-space and out-of-memory error messages. These errors come from Basic and are the result of specifying too much string space for Trashman. Lowering the value of bytes will correct the problem. Do not overestimate the string-space requirements. Even if you don't get an error message, you will not be getting optimum performance from Trashman. Granted, the compression

time will still be reduced, but it won't be as fast as it could be. A little experimentation on already-written programs and a little planning on new programs will help.

There is one additional error that can occur, but will not present an error message (at least not a written one). Failure to specify a minimum of two bytes for each active string will cause Trashman to step aside and let normal compression occur. The signal for this error is the lack of improvement in compression time.

The documentation for Trashman is short and simple. This goes for the operation of Trashman as well. All you need is a Basic program that uses a lot of strings and has delays as a result of cleaning up after those strings. As a programmer's tool, Trashman is indispensable. No need to sit and stare at a CRT while the computer is sweeping out the cobwebs. Trashman cleans your attic before it becomes an all-day job. Trashman has little or no visible effect on program time when only a few strings are used. If, on the other hand, string compression delays have been plaguing you, it's Trashman to the rescue! ■

★ ★ ★ ★ 1/2

Options-80
Box 471
Concord, MA 01742
Models I & III
\$125, disk

by Frederick Goldstein

Options-80 helps investors analyze the profitability of various options transactions based on the investors' convictions of how the stock will perform.

The program was written by Patrick N. Everett and Timothy J. Everett, who, after achieving success with the program, decided to market it. It comes

with an extensive instruction manual including a book list for supplemental reading. This review is based on tests performed on a TRS-80 Model I.

Before discussing this program I will review some basic options concepts. A call option buyer pays a premium to acquire the right to call stock away from the seller of the call (the option writer) at a specified price (the striking price) for a limited period of time. A put buyer pays a premium so he can put stock to a put seller (or writer) at a specified price for a limited period of time.

Option prices and the price of the underlying stock usually move in tandem. If an underlying stock increases in price, the call option probably will too, since

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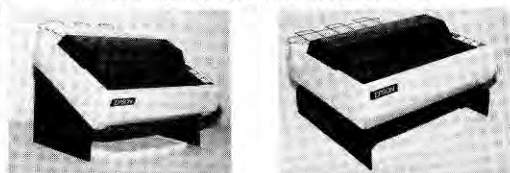
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REVIEWS

the call buyer can purchase the stock at a predetermined price. Likewise, if a stock drops in price, call prices also decline, because the right to purchase the stock is less valuable.

Put prices move in the opposite direction to call prices. As a stock declines, puts increase in value because the put buyer is guaranteed a specific price for his shares, regardless of the current market value. As stocks rise in price, puts decline in value since the right to sell stock at a lower price becomes less valuable.

The magic of options is leverage—the ability to invest in more shares than you could with an outright purchase of stocks. A call buyer makes a much larger percentage gain than an outright investor in stock. While the stock buyer must fund the full price of the shares either with cash or by borrowing, the option buyer funds only the premium, a much smaller amount. The percentage gain is based on a smaller investment, the option premium, rather than the full cost of the stock. Commensurate with the higher reward is the risk that the option will be worthless when it expires. You can use many types of investment strategies involving the buying and selling of stocks and their related put and call options, and you can project the profitability of these transactions in several ways. Since these methods involve time-consuming calculations, the computer comes in handy.

Options-80 analyzes a broad range of option-related trades involving puts and calls. The program has two types of analytical output, a chart and a table. Both present a projected percent gain or loss that will be realized if the underlying common stock increases or decreases by a range of percentages.

The program is easy to use. It provides prompts and menu choices to go from one feature to the next. Its error trapping is good; the only way to stop the program is to hit break or pull out the plug.

The method used for entering option prices is nice. A chart is presented that looks like the option page of most newspapers. The cursor shows you where to enter the next price. Unfortunately, if you make an error during data entry or if you want to change a price you must start over. A letter J is entered rather than price data to instruct the program to jump to the beginning of the chart. However, rather than re-entering each

field, you can hit enter to accept what was there before and keep hitting enter until you reach the field to be changed. Once the data is entered, you can store it.

In addition to handling dividends, the program provides a table of user-modifiable parameters. By including these factors in the calculations, the program attempts to make its projections as realistic as possible.

The first item in the parameter table is called a trading adjustment. Most options investors know that the prices quoted in the newspapers represent actual trades rather than the bid or offer. They also know that the bid is lower than the offer, and if you are a buyer you must pay the offer or wait with your bid. If you are a seller you will receive the bid or wait with your offer. To account for the difference between bid and offer prices, the program bases its calculations on the newspaper prices plus or minus the trading adjustment. As a result, the program simulates pricing conditions that would prevail if the stock and option trades were placed with a broker as a market order.

A commission adjustment and a commission rate are two of the other items in the parameter table. The commission adjustment is used as a per-share charge for a transaction and the commission rate is a flat percentage of the total transaction cost. These two items are added to approximate the brokerage fees.

Other fields in the parameter table include a factor for the cost of money, expiration date (for the trading month) of the option, and the scales to be used for plotting both the horizontal and vertical axes.

The program calculates a projected annualized rate of return on an investment as a function of anticipated annualized percent change in share value. After the program is loaded, it asks if you want to retrieve data from a file. If you do, the program displays the names of the stored securities along with the respective dates of the data.

At the completion of the file loading (or immediately, if no file is entered) the Call Transaction menu is displayed. It offers you many choices. If data was not loaded from a file, then you should select Enter Call Prices.

After the data is entered, one of the analytical choices is made. These are buying a call or the underlying shares, writing a call versus stock, opening a spread, selling a previously purchased

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call early, closing a write early, or closing a spread early. Other choices on the menu provide for changing parameters, saving or loading data, and the ability to go to the Put Option Transaction menu. The put menu is similar to the call menu in that it includes outright purchases, put writing, as well as the early reversal of these positions.

Each of the analytical routines works in a similar fashion. The bottom half of the screen displays a request to enter a maximum of three expiration months and strike prices. The system then analyzes them and plots a chart for each option series and strike price chosen.

The value of the system lies in its ability to graph several profit-and-loss curves on the same chart. According to the program developers, this feature helps you decide if option transactions on a security are likely to be profitable, as well as which option transaction

should be the most profitable.

As mentioned, in addition to the graphics displays on the screen, the program provides a numeric table of projections. You can only print graphs on printers with graphics capabilities. Unfortunately, my machine, the Line Printer IV, can't handle graphics, so the only printout I could get is the numeric table. However, the documentation tells you how to modify the code for printers with graphics.

I highly praise this program. It is easy to use, and it's hard to make it fail. The program has a built-in self-checking/teaching feature. If you hit break and then GOTO 3, sample data will be projected for testing purposes.

Option trading can be risky and market prices can be quite volatile. If you use this program, you should understand its output before making any financial commitments based on its data. ■

★ ★ ★

**Log Electronic Notebook
KSoft**

318 Lakeside Drive
Brandon, MS 39042
\$44.95 Model I 32K or 48K, disk
\$49.95 Model III 32K or 48K, disk

by Michael E. Nadeau
80 Micro staff

Log is an interesting cross between a data-base manager and a word processor, yet it performs a task neither does very well.

Advertised as an electronic notebook, Log lets you store data in an unformatted, page-by-page form. This method is good for applications where the field method used by most data-base programs is too restrictive, but requires a more specific form than word processors can offer.

The first use that came to my mind was to put notes for some research I had done on Log. These notes are on 5-by-9 index cards and hold excerpts from various references. Log seemed ideal for this application. And it was... almost.

Those index cards are awkward to work with when you sit down to write a paper. You end up with a dozen or so piles for a dozen or so categories, and you often forget some key data, or worse, lose it. Log, with its search func-

tion, solved the problem, but with a few limitations.

I could copy my data to Log in virtually the same format as on the cards, thanks to a handy tab feature. However, Log has no word-wrapping; i.e., if a word is too long to fit on a line, it is broken off and continued on the next line. Most word processors support word-wrapping, and it would have made my task a little easier.

You can put up to 1,024 characters on a page, adequate for the types of chores you would use this program for. KSoft has allowed for unlimited backups of Log, so if you break up the data, you can put a large data base on multiple disks. For my purposes, this was a minor nuisance as I had a lot of cards. It should cause no problem for most other uses, though.

My biggest complaint is I can't call up my notes and write at the same time unless I use a typewriter (or buy another computer). I could print out the data, but that defeats my purpose for using the program. The idea of being able to call up a reference just by typing in a key word is tempting enough to write on a typewriter, though. If this program could be coresident with a word processor, it would be a great boon for any writer who uses extensive notes.

One other complaint is that although you don't need a printer to use Log, its usefulness diminishes without one. If you use it to keep track of appoint-

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ments, important dates, or other simple tasks suggested by the documentation, a printer isn't as necessary. But if you keep programming or research notes on it, you will eventually want to print out all or part as a permanent reference.

You also need a printer to print out the documentation. Log does come with a check sheet that lists the commands, but it doesn't say much on how to use them. The documentation, though, is easy to follow. This isn't a very slick way of handling the matter,

but it beats some of the Xerox-of-a-Xerox abominations I've seen.

Log is very easy to use, and this is its strongest point. If it weren't, many of the tasks for which it is intended could be done better by pencil and paper. Its ease of use makes you want to find more and more jobs for it. Finding, manipulating (no block moves, though), and formatting data require few keystrokes, and the commands are easy to remember.

As it comes, Log is ready for transfer

to a TRSDOS 1.3 or 2.3 disk. Patches available for use with NEWDOS Plus, LDOS 5.1, DBLDOS, and TRSDOS (l/c) cost \$10 for the first and \$5 for each additional one. These patches are not provided by KSoft, but by the individual who wrote them, John T. Blair. KSoft includes the order sheet with each package.

I like Log, and I'm sure I'll find more uses for it. It's a little overpriced, but as far as I know, there's nothing else like it available. ■

★ ★ ★

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E-Z Software
P.O. Box 591
Novato, CA 94948
Models I & III, \$120
Model II, \$145

by Leslie E. Sparks

Although computers are useful tools for investment decision analysis, there are few programs available to take advantage of this ability. Available investment software generally deals with forecasting stock prices. This is only a first step in analyzing an investment. The final step, the one that counts, answers the question, "If everything goes as I forecast, will I make money with the investment?" And the answer to this question requires consideration of the time value of money. Incoprop is a software package that will help you with this last step for analyzing the returns from an investment in rental real estate.

The program uses the concept of internal rate of return (IRR), also called the discounted cash-flow rate of return, as the figure of merit for the investment. The internal rate of return is the discount rate that reduces all the future cash flows from the investment to the value of the initial investment. In other words, if you deposited the initial investment in the bank at the interest rate equivalent to the internal rate of return, you would get the same amount of money as you get from the investment. You want to select investments with high internal rates of return.

There are a few theoretical and practical problems with the internal rate of

return method of ranking investments. One of the most important is that some investments can give two values of the internal rate of return. This is especially likely when the investment has both positive and negative cash flows over its life. Generally, the false value is higher than the true one. Thus any program based on internal rate of return must be

"The program uses the concept of internal rate of return (IRR). . . as the figure of merit for the investment."

protected to ensure that the correct value of the internal rate of return is always returned.

Unfortunately, it is impossible to determine, at least from the documentation and an examination of the Basic code, if Incoprop has the required protection. Each sample problem I ran with the program returned the correct answer. But this doesn't prove that the program is protected. I would feel more comfortable with the package if this problem was explicitly dealt with in the documentation.

The first step in using the program involves filling out a worksheet. This worksheet is where you put your forecast information on rental and other income and expenses for the rental property. You are also asked to provide estimates of the expected appreciation of the property. The worksheet requests information on depreciation and your income-tax situation. The worksheet is a good idea because it forces you to con-

sider all the necessary information. Much time, thought, and care went into the development of the worksheet and the data requirements for the program. An example of this completeness is the provision for capital additions to the property any year in its life.

You'll find that it will generally require much work to get all the information needed for the worksheet, but if you don't want to do the work, you should not invest. The only problem I have with the worksheet idea is that once you have all the necessary information, you still must work to get the information in the format necessary for the computer. You will have to do some tedious calculations to get the data into the correct form. The program could provide some help in this area.

Data entry and editing are not handled very well. The data is entered one item at a time. If you make a mistake and don't catch it before you press enter, you cannot go back and correct that single item. You must go back to the beginning and review and correct each item. It is a workable method of handling data entry, but not up to the state of the art.

After all the data is entered, it is stored on a disk file and the computation program is loaded. You can supply your own file name or use the built-in default. As soon as the computation program is loaded, it asks for the file name, loads the file, and completes the computations.

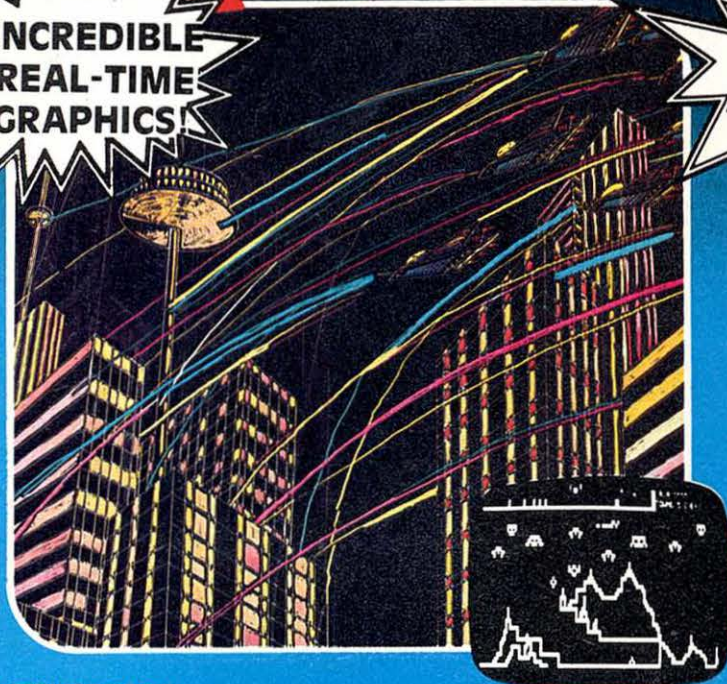
The results of the computations are displayed on the CRT and a printout option is provided. The results show the various cash flows for each year of the investment and the internal rate of return for the investment under the assumption that the investment is sold at the end of the year. The information is complete and is presented in a convenient form. This printout is the heart of

The ultimate games

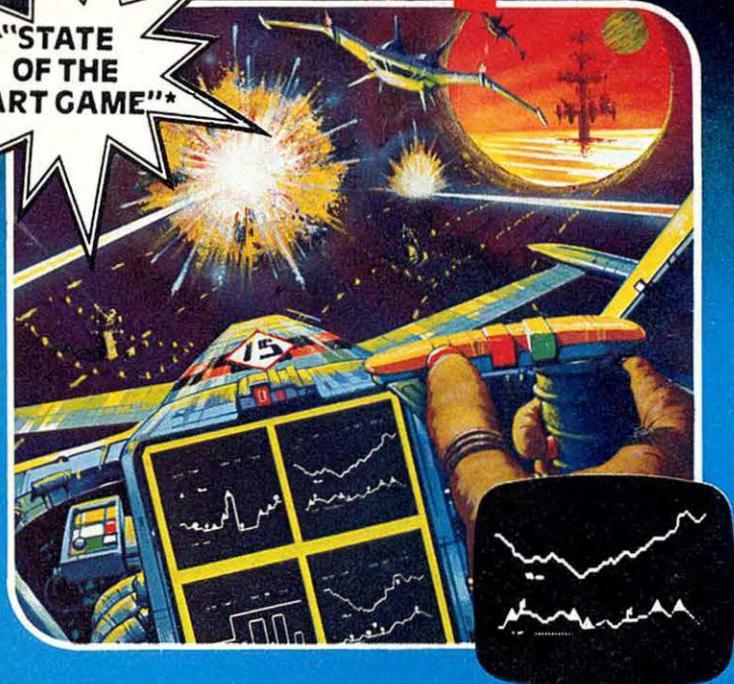
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the analysis and if correctly interpreted, will tell you everything you need to know about the profitability of the investment.

The program has a provision for handling taxes, a necessity for any investment program. The program will also help you figure your marginal tax rates. This is one of the better features of the program, although the program does not have the latest tax-law changes built in. But the documentation does provide a fairly good discussion of the impact of the 1981 tax law. They'll soon have to revise the discussion to handle the 1982 tax increase.

The printout includes most, but not all, of the input data. I wish that the printout had all the input data in the same format as the worksheet; this would make checking for errors in the data easier. When you have money on the line, you want to be sure that the calculated results are based on accurate data.

The documentation for the program is helpful at telling you how to run the

program. There are several figures showing how the screen should look as you enter the data. And there are also examples of the printout.

Unfortunately, the documentation does a very poor job of telling you how to use the program. You are left on your own as far as interpreting the results of the program. This is a major deficiency of the package. The documentation should contain a lucid discussion of the internal rate of return method, its advantages, disadvantages, and all the assumptions implicit in its use. (The assumptions are discussed, but the discussion lacks structure and completeness.) I would prefer to see the documentation divided into three or four sections: The first section would be an overview of what you can expect; the second section would show you how to run the program; the third section would show how to use the program. It should almost be a minicourse on the topic.

Any fourth section should contain examples showing the use of the internal rate of return method. The ex-

amples should concentrate less on showing how to run the program and more on how to use it. Examples of a good investment, a marginal investment, and a poor investment should be included. The examples should contain a complete discussion pointing out what makes the various investments good, bad, or marginal. With these additions the package would be superior.

The program accomplishes about 90 percent of the task. It is a useful tool that provides information essential for making intelligent investment decisions. Unfortunately, the missing 10 percent is in the areas most obvious to the user—data entry and documentation. Data entry, though useful, is somewhat elementary. The documentation is the serious deficiency. It doesn't provide nearly enough help at getting the most from the program.

If you purchase the program, be sure you get a good book on investment analysis so that you can understand what the program is doing and what the calculated results mean. ■

★ ★ ½

The Information Society as Post Industrial Society

Yoneji Masuda
World Future Society
4916 St. Elmo Ave.
Bethesda, MD 20814
Softcover, 171 pp.
\$12.50

by John P. Mello Jr.
80 Micro staff

Computopia. What is it? What will it be like? When will we know we are there? Those are some of the questions Japanese futurist Yoneji Masuda sets out to answer in *The Information Society*.

Masuda, a world-renowned authority on computers and the future, details how the social structure created by the Industrial Revolution will be transformed by the Information Revolution.

Technology's role during the Industrial Revolution, Masuda explains, has been to reduce physical labor. During the new age, it will be to reduce intellectual labor.

He proposes that transforming technology's role will transform people's

basic wants. Intellectual creativity will be more important than material consumption. Self-realization will transcend the demand for durable consumer goods.

The symbol of industrialized society—the factory—will be replaced by a new totem—the information utility.

Coercion will be reduced, Masuda maintains. Voluntarism and cooperation will be important components of the new age.

Sound rosey?

Many people are aware widespread dependence on computers presents an awesome potential for social manipulation. Masuda knows this potential exists, but he does little to explain why Computopia 1984 won't develop.

He gives two reasons why his information Fat City won't become a political Greasy Spoon. Neither will calm the palpitations of compuphobes.

Information science, like nuclear energy, is ultimate, he contends, ultimate in the sense that it "will bring immeasurable benefits to humanity if wisely used, but...could lead to destruction if used wrongly."

Why won't computers be used "wrongly?" Masuda says because "There is only one choice for us—the

road to Computopia. We cannot allow the computer, an ultimate science, to be used for the destruction of the spiritual life of mankind." But what if we're not consulted on the disposition of this ultimate technology? After all, how many of us were consulted on how nuclear energy should be used?

Masuda's answer to that is tied to his second reason for optimism. Changing the industrial society to the information society will be spearheaded by citizen action. This action will be "goal-oriented," he contends. He suggests those goals won't result in a repressive society.

Although Masuda's view of the future is stimulating, his prose is not. Much of his material becomes repetitious and appears vague. His writing style is a cross between a bureaucratic white paper and a report from a local school committee.

The book contains numerous charts, which are helpful in understanding Masuda's views. A glossary and index are also valuable accessories to the book.

Despite its assets, however, *The Information Society* remains one of those books you're constantly thumbing to the end to find out how many pages are left to read. ■

★ ★ ★

Black Death
Krell Educational Game Pak
Krell Software
 21 Millbrook Drive
 Stony Brook, NY 11790
 \$39.95

by Eric Maloney
 80 Micro staff

Never mind the spelling errors and sloppy screen displays. Ignore the wretched graphics and lethargic pace. Black Death is a gem of garage-punk programming.

This is the kind of software Stephen King might write after eating a spoiled tuna-fish sandwich. It's a Blue Oyster Cult album played backwards, Gahan Wilson on a full moon, Hunter Thompson through a quart of fermented cactus juice.

Most delightfully of all, Black Death is part of what the manufacturer calls

an education package. Either the people at Krell have a weird sense of humor, or some very strange ideas on education.

Black Death places you in a city—represented by a 10-by-13 grid—struck by the plague. Your job is to save as many people as possible, through either inoculation or quarantine. You start with 130 zeros, which change to 1's as your city's residents become visibly ill. The numbers increase with the stages of the disease, until they finally turn into cute little graveyard crosses.

People get sick only if they're next to someone who has already been afflicted. Thus, your best bet is to build a wall of inoculation around the outbreaks. But since plague diseases tend to be highly contagious, this strategy doesn't always work. It's wise to have the charnel wagons lined up and ready to go.

The game doesn't reach its potential until you play with someone else (as many as six can join the fun). Each person gets his own rat-infested city, and whoever emerges with the fewest deaths—uh—wins. The game can get

pretty exciting as you come down the stretch, matching your opponent corpse for corpse, looking for that one key inoculation that will bring you victory.

Black Death could be enhanced considerably with some imaginative sound routines and graphics. For instance, each time you lose a few victims, a death wagon could roll across the screen, accompanied by the sound of clopping horses and wailing mothers. Perhaps the game could end with a church bell tolling for the deceased. A few such touches would do much to liven up the program.

You have to buy the Krell Education Game Pak to get Black Death. This is unfortunate, because the other six games are awesomely mediocre. They're poorly designed, and full of spelling errors and typos. The entire package looks like it was thrown together in the back seat of a taxi, without so much as a cursory proofreading. Such shoddy merchandise does not speak well of a company that also sells a College Board SAT Prep Series.

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✓ 154

But Black Death is another story. Go play a few rounds with your 8-year-old sister, and then take her to see *Night of the Living Dead*. She'll never be the same. ■

★

Tiny Compiler
Aardvark-80
 2352 S. Commerce
 Walled Lake, MI 48088
Color Computer, 16K
\$24.95, tape or disk

by Scott L. Norman

Aardvark-80's Tiny Compiler is an attempt to give Color Computer owners a taste of high-speed compiled languages. It is written in Extended Color Basic and accepts a subset of the same language as source code. The ma-

chine-language object code can be executed immediately or saved and run at a later time. Options available at compilation time let you control the location of the object code in memory, which can be helpful when interfacing to other program segments.

The documentation is the strongest point of the entire package. It goes to unusual lengths to discuss the function of each block of program statements, and includes a listing of the entire compiler—nearly illegible, unfortunately!

Operation is fairly simple. After entering a PCLEAR1 command to free the maximum amount of memory, load the compiler and type in your source-code statements. Since the compiler uses line numbers 8000 and above, make a practice of including the line 7999 END in all source code. This allows you to test the code under the Basic interpreter without running into the compiler section. As a practical matter, I found it simplest to incorporate this line into my working copy of the compiler.

As received, the compiler limits the source code to 50 lines. The manual indicates the changes needed to increase this, however. Once the source code is

“The documentation is the strongest point of the entire package.”

entered, it can be run and debugged just like any other Basic program. Then it is time to compile.

The compiler is invoked with the command RUN 9000. You are asked to supply starting addresses for the object code and the variable table (which should be at least 2K higher). How do you choose them? Well, the program displays the highest address used by the Basic code, and the manual advises you

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to leave about 1.5K free between the highest address and the starting address. There are also defaults: Since typical short source programs will wind up below location 12500 (decimal), the compiler suggests 14000 for the start address of the object code. Similarly, the variable table location defaults to 16000.

The video display is misleading concerning these locations. For one thing, you are asked to supply addresses in hex, which is unnecessary; also, the variable table default is listed as 160000. Your final choice is whether or not you want to compile the program in one location and later move it to another, i.e., relocate the code.

After these three questions have been answered, the compiler goes into action. The address corresponding to the beginning of each line of source code is displayed as compilation proceeds. At the end of the process, you receive information about the last address occupied by the object code (necessary for subsequently saving the code), and a

table of transfer addresses for GOTO and GOSUB statements. At this point, the compiled program can be executed by pressing Z.

If you choose to run such a test, the complete variable table will be printed following execution. However, you will have to recompile before saving the object code. Should you wish to dispense with a test run and save the code immediately after compilation, press the enter key instead of Z. This returns you to the command mode, and you can execute a SAVEM or CSAVEM using the starting address that you supplied and the ending and transfer addresses furnished by the compiler.

However, major problems arise from the extremely limited set of Basic commands and words that the compiler can handle. To begin with, you must use fixed-point arithmetic; both variables and constants are restricted to positive integers, 0-64K. Although the four elementary mathematical operations are supported, there is no way to compile a program containing exponentiation,

trigonometric functions, INT, and so forth. The syntax of allowed commands is also extremely quirky. For example, the following versions of a For statement are legitimate (A and B are variables, nnn is a constant):

```
FOR I = A TO B
FOR I = A TO B STEP nnn
FOR I = nnn TO B
```

Note that you cannot use constants for both upper and lower limits, and you cannot use a variable for the step size. Even worse, you do not have the freedom to write a statement like FOR I = B TO nnn; the constant can only be the lower limit, as in the third example above.

There are many other examples. A statement like A = B - 125 is permitted, but A = 125 - B is not! Only one mathematical operation is allowed in any given statement, although you can have multiple statements per line. Dimensioned variables cannot be used as divisors or subscripts. Because of the

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fixed-point arithmetic, strict limits must be placed on the size of numbers in multiplication and division operations.

The result of these shortcomings is that the Tiny Compiler Basic cannot be used for any program involving serious computation. What is it good for? My first thoughts were that it could be used to write fast sorting or graphics routines. After all, it does support PEEKs and POKEs, and the limits it places on numerical quantities should not interfere with the computation of video memory locations. Any such efforts must contend with a major stumbling block, however: There are no Input or Read statements. In other words, there is absolutely no convenient way to get data into any program that is to be compiled by this product. There are DEFUSR and USR statements, but it seems unreasonable to require Basic users to use these (or a series of PEEKs) just to scan the keyboard.

Tiny Compiler has to contend with the fact that it must coexist in memory with the Color Basic ROMs and the source code, and therefore can't include every conceivable feature. Other Color Computer language packages have the same problem.

Any compiler unable to handle the most fundamental I/O operations is of value only as the basis for further do-it-yourself work, at best. There comes a time when any advantage in program speed just isn't worth it. ■

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The Grafyx Solution
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Model III
\$299.95

by Harley Dyk

The Grafyx Solution consists of a 4-by-5-inch circuit board that can be installed in a 16K (or more) Model III in about an hour. The complete installation consists of taking two ICs from your CPU board, plugging the Grafyx Solution board into these sockets, and placing the two ICs from the CPU board in the Grafyx Solution board. Next, you connect a 14-pin connector and nine micro-clips, and cut one trace

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REVIEWS

(the second cut is optional—it improves the quality of the graphics during screen updates). If you put the RF shield back on the CPU board, cut the shield and bend it to fit over the installed board.

The installation instructions are very detailed and well written. Installation requires no soldering. You might question the integrity of the nine micro-clip connections, but if you solder the nine connections (most of which are to IC pins), it makes removing the board more tedious.

The board contains 17 ICs (plus two from the CPU board), and several capacitors. Six of the ICs are 16K-bit

static memory chips giving 12,288 bytes of read/write memory. This 12K of memory does not use up any memory address space, but is organized into 12 pages and accesses one page at a time using the same scan and address lines that normally drive screen memory. This is accomplished by bank selecting. A test program at the conclusion of installation checks to see if all 12,288 bytes of memory are alive, and if all connections have been properly made.

Features and Use

The Grafyx Solution gives a resolution of 512 by 192, or 98,304 points, any of which can be set or reset. This is 16 times as many points as the stock Model III, giving four times the horizontal and vertical density. Three other resolutions of 256 by 192, 128 by 192, and 128 by 96 are also possible.

When you turn on the computer, you must enable the hi-res board with a few simple commands if using cassette, or simply type DO GB48 in TRSDOS on a 48K system. You can mix hi-res with the traditional 128 by 48 graphics and text; they exist independently of one another and you can clear the 1K of regular video memory or just the hi-res memory. This makes adding labels to graphs or mixing graphics and text easier than on an Apple computer.

You can easily mix the four hi-res modes in any combination, since in any mode you still address the screen using 0-511 horizontally and 0-191 vertically. When plotting lower resolution, the dif-

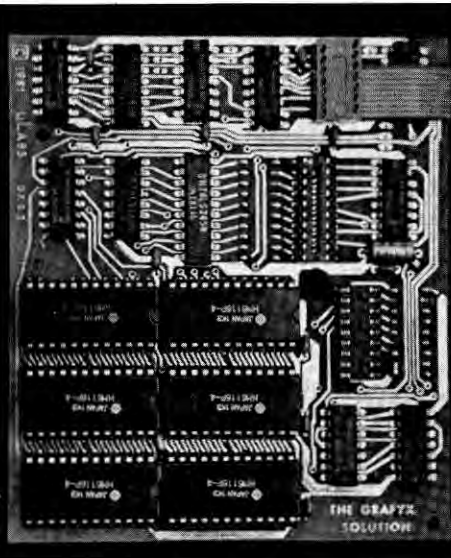


Photo 1. The Grafyx Solution Circuit Board

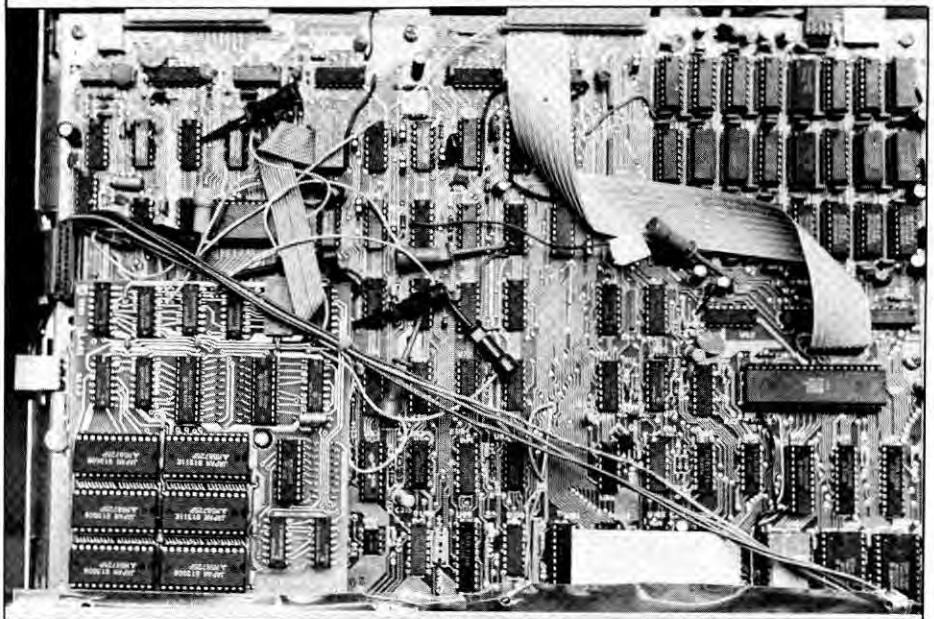


Photo 2. The Grafyx Solution Circuit Board Installed in the Model III CPU Board

ferent coordinates can address the same point or overlap other points. Since the hi-res picture overlaps (but is independent of) regular graphics and text, the hi-res display remains fixed even when scrolling graphics and text.

For the casual programmer, GBasic (on disk or tape) provides 14 commands that let you use the hi-res board effectively and easily. It takes only a short time to understand the 14 commands. GBasic takes over 5K of RAM leaving more than 32K in a 48K disk system running TRSDOS. Table 1 lists the 14 commands with a brief description of each.

An eight-page section of the Grafyx Solution's reference manual addresses the experienced Assembly-language programmer. This section explains how to access any of the 14 GBasic commands with a machine-language call and how to load the parameters for the commands into registers.

I've been using the Grafyx Solution for three weeks and find GBasic easy to use and powerful.

The disk accompanying the hardware contains over 30 files to help you use the hardware. Several Basic programs are included to quickly demonstrate the hi-res graphics by displaying spirals, graphs, roses, sunsets, string art, and random art. (See Photo 3 and the figures.)

The package also includes several utility programs. The first utility (the GTest program) checks to see if the hardware works properly. The SAVLOAD program lets you save any hi-res picture to disk or tape as a file and later load it back to the screen.

I wrote a short program that let me draw and erase hi-res pictures (using the four arrow keys) and then linked it to the SAVLOAD program so I could create any design on the screen and save it to disk. The fact that the hi-res graphics and text were independent was a useful feature. As I developed the program I could start drawing the picture, get an illegal function call for plotting beyond 511 in the X direction or 191 in the Y direction, fix the program, and run it again with the hi-res picture on the screen the entire time.

COLM80 is a utility program that lets you display 16 lines by 80 characters on the Model III screen. The characters are software generated and use hi-res for display. You can set inverse video in the COLM80 mode and the 80-character display appears compatible with all versions of DOS, EDTASM, and EDAS;

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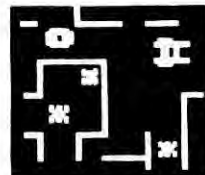
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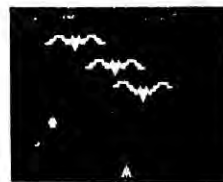
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however, it is not compatible with Scripsit.

The CHAREDIT utility used in conjunction with COLM80 allows you to create an entirely different character set (with up to 96 characters), any characters that you can form in a 5-by-9 matrix. This lets you use the computer to display foreign languages as well as special characters. To use this utility you'll need a disk system.

In addition to the utilities that come with the Grafyx Solution, Micro-Labs plans to sell additional software. Currently available programs include Bizgraph, which plots graphs with data generated by Radio Shack's VisiCalc package, a Draw program for drawing pictures, a Mathplot program for graphing functions, and a 3DPLOT program.

The Grafyx Solution is well built, beautifully documented, and performs as advertised. I find it difficult to believe that such a fine product can be produced by a small company and that Radio Shack hasn't offered such a feature

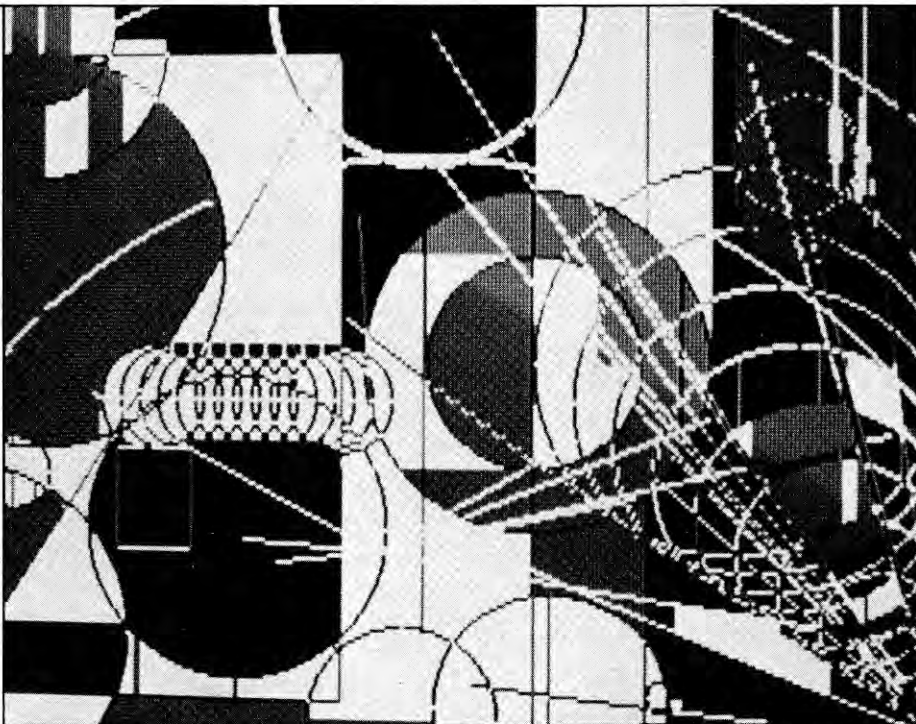


Photo 3. Art Created with the Circle, Box, Line, and Fill Commands

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&OFF—Clears hi-res from the screen but retains it in memory.

&CLS—Clears the hi-res screen and memory without affecting standard text and graphics.

&MODE(M), M = 1, 2, 3, or 4—Sets the resolution from a maximum of 512 by 192 to a minimum of 128 by 96.

&PLOT(X,Y,C)—Plots a point at point X,Y with color C where C = 0, 1, or 2; 0 clears the point, 1 sets it, and 2 complements it (turns to the opposite state).

&POINT(X,Y)—Reads the status of point (X,Y) and returns 0 if clear, 1 if on.

&LINE(X1,Y1,X2,Y2,C)—Draws a line of color C between points (X1,Y1) and (X2,Y2), color works as above, a color of three draws dotted lines, lines are drawn at over 2,500 points/sec (over 5 lines/sec).

&REV—Complements every point (changes it to the opposite state) on the screen.

&LPRINT(P), where P = 1, 2, 3, ..., 8—Sends a copy of the screen (including text) to the printer. It can handle 17 different printer models including Epson, Radio Shack,

Okidata, and Integral Data Systems (printers must have dot-graphics capability).

&BOX(X1,Y1,X2,Y2,C)—Draws a box with opposite corners (X1,Y1) and (X2,Y2) with lines of color C.

&CIRCLE(X,Y,R,C)—Draws a circle of radius R with the center at (X,Y). R can be up to 511. Parts of the circle can go beyond the edge of the screen. C is the color of the circle—see above.

&FILL(X,Y,S)—Colors in the shape around (X,Y), S = 0 for shading, S = 1 for solid.

&GET(X1,Y1,X2,Y2,Z%(0))—Stores the contents of a rectangular portion of the screen determined by the opposite corners (X1,Y1) and (X2,Y2) in a single dimensioned integer array Z%.

&PUT(X,Y,Z%(0),F)—Takes the contents of integer array Z% and places it on the screen starting at (X,Y) as the same size rectangle that existed when the &GET created the array. F = 0 to complement every point in the rectangle, F = 1 to place the array contents on the screen, F = 2 to AND the contents of the array and screen, and F = 3 to OR the contents of the array and screen.

Table 1. The 14 GBasic Commands

as an option.

The Grafyx Solution does not work with a Model I, and Micro-Labs does not plan to offer this option.

Please bear in mind, however, that the Grafyx Solution is not perfect. After I had installed the unit horizontal lines (which in any resolution must be made up of a series of short perfectly horizontal traces) still appeared to be stepping slightly up the screen. But, until 1,000,000-by-500,000 resolution comes along, the Grafyx Solution appears to have the highest resolution in an affordable system. ■

★★★★

SuperScripsit
Tandy/Radio Shack
Fort Worth, TX 76102
Catalog #26-1590
Models I and III
\$199

by Jeffrey Hix

The new features of SuperScripsit are exciting and make the Model III a serious competitor to the Model II for small business applications. The ability to preset 10 tab configurations, 10 user keys (commonly used phrases up to 127 characters long), and 20 printer-coded commands (each one up to 11 commands long) is very useful.

If more than 127 keystrokes are needed, one user key can call another user key. Documents longer than 11,821 characters can be saved to disk. SuperScripsit scrolls the disk as you edit the document and features file-compression capabilities. This review was compressed from 123 sectors to 105 sectors. You can scroll through the text up or down by word, line, paragraph, screen, or page with any of the four arrows. Individual line sizes are easily set using the adjustable tab guide line setting at the bottom of the screen. An alignment tab for columns is greatly appreciated when several numbers are involved.

The *SuperScripsit Reference Manual* is welcome documentation. You can find information by section or by index; overall, the documentation is complete and informative.

Lessons

SuperScripsit includes eight lessons

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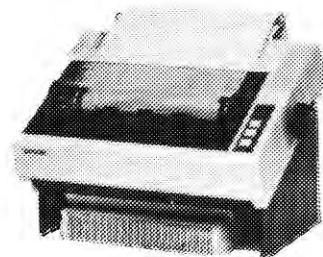
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Example: Normally to get the printer to print a emphised condensed letter from Dos you would have to go to basic and type in CHR\$(27)CHR\$(33)CHR\$(81) on the TEC with PH you just type control E control C, two keystrokes. Throw your manual away happiness is here with PRINTER HELPER.

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on four cassettes, a lesson book called the *Figures Book* in a three-ring binder, a reference manual, and a reference card. SuperScripsit includes two disks each for the Model I and III.

You will need a printer connected to your 48K Model III; two disk drives and the lowercase printer modification are required for Model I use. Model I owners will find the lesson samples, three new printer drivers, and the block-moving module on disk.

Learning SuperScripsit without a cassette player will be a challenge. The *Figures Book* is only a workbook as it was with Scripsit. A contents table is at the front. Each lesson lists objectives of that lesson.

The Help menu can be called from disk at any time and is useful when learning the system. It covers error messages, block moves, find, search, replace, proofread, header/footer setup, printing, and calling up a document. These modules cannot be used more than two at a time without the program calling them in from the disk. Error messages freeze everything until the break key is pressed to acknowledge the error.

Printers

Seven different printer drivers are included with SuperScripsit. Radio Shack Line Printers IV, V, VI, VIII and the Daisy Wheel II are specifically compatible. Drivers for Radio Shack's new series of printers are already included on the disk.

I used a Model I and an Epson MX-80 with Grafrax Plus. Check your owner's manual for DIP-switch settings. I tried three different parallel-printer drivers included with SuperScripsit and decided to use the DW2 default driver.

I first loaded and tested the demo printing document. Underline and bold printing worked as described. Double underlining printed as single underlining. Bold printing is a dot-by-dot graphics function. I recommend you use the enhanced mode to set up the printer codes and that you make all changes by these codes as the MX-80 lost the default settings made by SuperScripsit after the first change. I easily set 20 printer codes to change print styles and try features of the MX-80 with Grafrax Plus and made corrections to the demo printing document.

The Radio Shack LP VIII printer has a special driver included. Check your

owner's manual for DIP-switch settings. Bold printing slows it down and is on a letter-by-letter basis. Superscripts and subscripts look good if you have allowed the half line extra spacing to avoid typing on the line above or below. Printer codes enable you to print single characters not on the keyboard; see your printer manual. If you watch the paper carefully, you can mix type styles

"If you have Scripsit now, the decision to buy SuperScripsit needs careful consideration."

from an elongated large type to a condensed type. Tab settings can be reduced or expanded as needed. You can do some neat things with the LP VIII and SuperScripsit.

Radio Shack LP IV's special print driver includes print sizes I've never seen before.

I own a Radio Shack Daisy Wheel II printer. This is the printer that the programmers had in mind when they designed SuperScripsit. I can type 10 or 12 characters per inch or proportional type. Fifteen-character-per-inch wheels are available; a SuperScripsit print driver is still being developed by Radio Shack. SuperScripsit displays the actual line arrangement.

When I decided to try a sample document in the three different types, it was necessary to restart each time. The tab lines and the arrangement of the words on the page were adjusted each time. Lines marked for centering had to be remarked.

SuperScripsit gives you a choice of proportional, monoproportional, or nonproportional printing. Proportional spacing is slowest because each line is inspected by SuperScripsit to ensure even margins. Monoproportional spacing has the same objective, but it inserts extra spaces between words only. Nonproportional printing looks like a manual typewriter was used. Underlining includes spaces unless printer codes 15 and 14 are used. Other printer codes

can be set for wheel characters not on the keyboard. See the Daisy Wheel II manual for the codes.

Other printing features of SuperScripsit include selecting lines per page, spacing between words, spacing between lines, superscript, subscript, underlining, double underlining, bold printing, printer pause to change printer type wheels, and reverse top of form (for newsletter columns).

SuperScripsit vs. Scripsit

If you have Scripsit now, the decision to buy SuperScripsit needs careful consideration. What features are not now available to you? Scripsit works with only 32K memory; SuperScripsit requires 48K memory. How many disk drives are in your system? Scripsit works with only one drive because the entire program resides in memory; SuperScripsit must be in drive 0 because of the need to access modules needed to perform different functions.

Are good patching programs such as Scriplus from Powersoft workable for you? In my case, yes and no; I decided that I wanted an easier operation than available through Scripsit with Scriplus. (It was sufficient while waiting for the long-delayed arrival of SuperScripsit, however.) I also wanted a proportional type driver for my Daisy Wheel II printer.

In order to use Proofreader, a spelling checker from Aspen Software, it was necessary to create a separate ASCII file as it could not read the SuperScripsit file. Converting my existing documents saved on disk by Scripsit to a format used by SuperScripsit requires space for a second disk file created by SuperScripsit. The original disk file is not changed. I do not recommend trying to convert backwards to Scripsit.

Superscript seems to be derived from the Model II Scripsit cut down into modules. Some features such as chaining (attaching one document file to the bottom of the one you are working on), single-letter insertion, screen formatting, vertical centering of the entire page, nonprinted comment lines and multiple block markers, which were in Scripsit, are greatly missed.

Exchanging words or paragraphs must be done in a block move. Also, the time needed to produce the written report or letter can suffer due to the use of modules. The @ key is still used as the control key, but control D (delete) is

the only mutual control. All functions are done differently. I wish screen printing of the system setups were possible. Scripsit allows me to type a memo and print 10 copies without saving it to disk. SuperScripsit requires seven sectors for just a mailing label and requires it to be saved on disk and killed from TRSDOS if I do not wish to save it.

Bugs

Overall, SuperScripsit rates good marks for features, documentation, utility, and potential for adding future improvements easily. However, use of the header feature throws the page line counter off. The footer feature needs careful use; after printing the footer, the top-of-form feature failed to work. I had to add blank lines to the footer to roll the paper to the proper position. The page-calculating feature did not work for me as a footer nor for the Radio Shack manager who sold me the program. (Fort Worth insisted that it works for them just fine.)

The LS line space indicator failed to respond to changes made when reopening a document, and it affected printing. This was corrected using the block commands relative to line spacing. Editing by blocks could cause problems. I had to retype three or four lines from a previous draft twice due to errors in storage on the disk after block editing. Editing in front of a new page marker did hang up the computer for an extra moment, but it did straighten itself out; no loss of copy occurred.

Converting from SuperScripsit to ASCII removed the control-codes indicator, but not the codes themselves.

A rare problem was line feed or tab spacing missed by either the printer or SuperScripsit at the beginning or end of a line. Correction was made by going to that line and pressing the delete command at the end of the line involved. Except for a conversion from 10 spaces per inch to proportional printing, the correction worked. Why it happened, I do not know.

Side Notes

I do not recommend using SuperScripsit on other disk operating systems (DOS). It was specially designed for TRSDOS. I have attempted to discuss SuperScripsit only including a few comparisons to Scripsit. For a side-by-side comparison, see the September 1982 issue of *80 Micro*. ■

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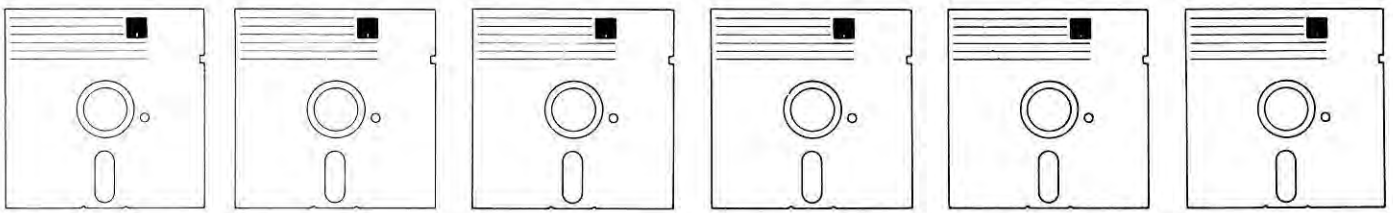
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REVIEW DIGEST

My Micro Speaks Basex, Paul Warne, Hayden Book Company Inc., softcover, 164 pp., \$9.95.

"Basex looks like an interesting beginner's language if you don't ask too much from it. The only problem is: How many beginners are going to be willing to tackle an offbeat language like this after learning Basic? Sure a newcomer to computing could learn Basex before being introduced to Basic, but that doesn't seem likely, given Basic's widespread popularity. One would be better off mastering Basic, then learning a higher-level language for speed." *Microcomputing*, November, p. 166.

TRS-80 Model III Programming and Applications, Larry Joel Goldstein, Prentice-Hall, Englewood Cliffs, NJ, softcover, \$12.95.

"Goldstein has taken a very simple, hand-holding approach to the Model III. He has chosen to assume little or no knowledge and he leads the reader carefully through the steps of using and programming his Model III. . . . Many people will not like this as much as David Lien's hand-holding books. Goldstein has a different style. But this is a solid and factual book." *80 U.S.*, November, p. 108.

Address Factory, Computerware, Box 668, Encinitas, CA 92024, Color Computer, \$17.95 tape, \$22.95 disk.

"If you write many letters or need mailing labels, the Address Factory can save you time and trouble. The program handles 55 addresses in a 16K Color Computer or 125 addresses in a 32K Color Computer. . . . You won't be able to use the Address Factory unless you own a printer. If you select the Print mode without a printer on line, the program will hang up." *InfoWorld*, October 25.

PrintCC, J. Gary Bender, Box 773, Los Alamos, NM 87544, Color Computer, \$15.

"PrintCC is designed to let your Model I or Model III act as a printer buffer to your existing parallel printer. Its basic purpose is to act as a buffer for printed data-like letters. It can support the Semi-graphics 4-mode (Set/Reset graphics) and screen dumping, force output in all capital letters or 64-character print width. . . . Would I buy the program? I just wish I had known about it before I bought my serial-to-parallel converter." *80 U.S.*, November, p. 111.

Basic Betting: The Microcomputer Edge, James Jasper, St. Martins Press, New York, 283 pp., softcover, \$9.95.

"Be forewarned: using this book is much more complicated than phoning your neighborhood bookie or making an educated guess at the Santa Anita racetrack. The programs are complex. For example, Jasper lists 22 items which he feels are crucial for picking winners in claiming races. By the time betters run the programs, they're liable to be blind from poring over the *Daily Racing Form* to get the information." *Popular Computing*, December, p. 156.

Astro-Blast, Mark Data Products, 23802 Barquilla, Mission Viejo, CA 92691, Color Computer, \$24.95 tape, \$29.95 disk.

"...another space game you may ask, well you may be right but this one is done with class. . . . The graphics are excellent, the sound is good, and the action is very good. I found myself looking for the coin slot to pay my quarter." *Color Computer News*, October, p. 26.

The Moses Lightpen, Moses Engineering, Rt. 7, Greenville, SC 29609, Color Computer, \$40 assembled, \$19.95 kit.

"The Moses Engineering Lightpen is a full function lightpen that interfaces with the TRS-80C joystick. A standard joystick modified to accept the joystick is included. . . . The program sampler includes some games, an event counter, color detector, and other applications software. All programs are written in Basic." *Micro*, October, p. 97.

Katerpillar, Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505, Color Computer, \$24.95.

"Katerpillar is very similar to the original. . . . Personally I prefer the joystick action over the roller-ball of the original. This factor along with the excellent color graphics and sound rates Katerpillar quite favorably with the arcade game." *Color Computer News*, October, p. 60.

Home Money Minder, Computerware, Box 668, Encinitas, CA 92024, Color Computer, \$19.95.

"Home Money Minder is merely an electronic checkbook with a few sorting and printing routines built in. . . . For \$19.95, you get a usable program that functions as advertised. If you are looking for more features and safeguards, wait until you get a disk drive before you devote a lot of time and effort to typing your checkbook into your computer." *InfoWorld*, October 25, p. 67.

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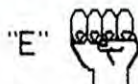
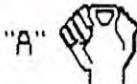
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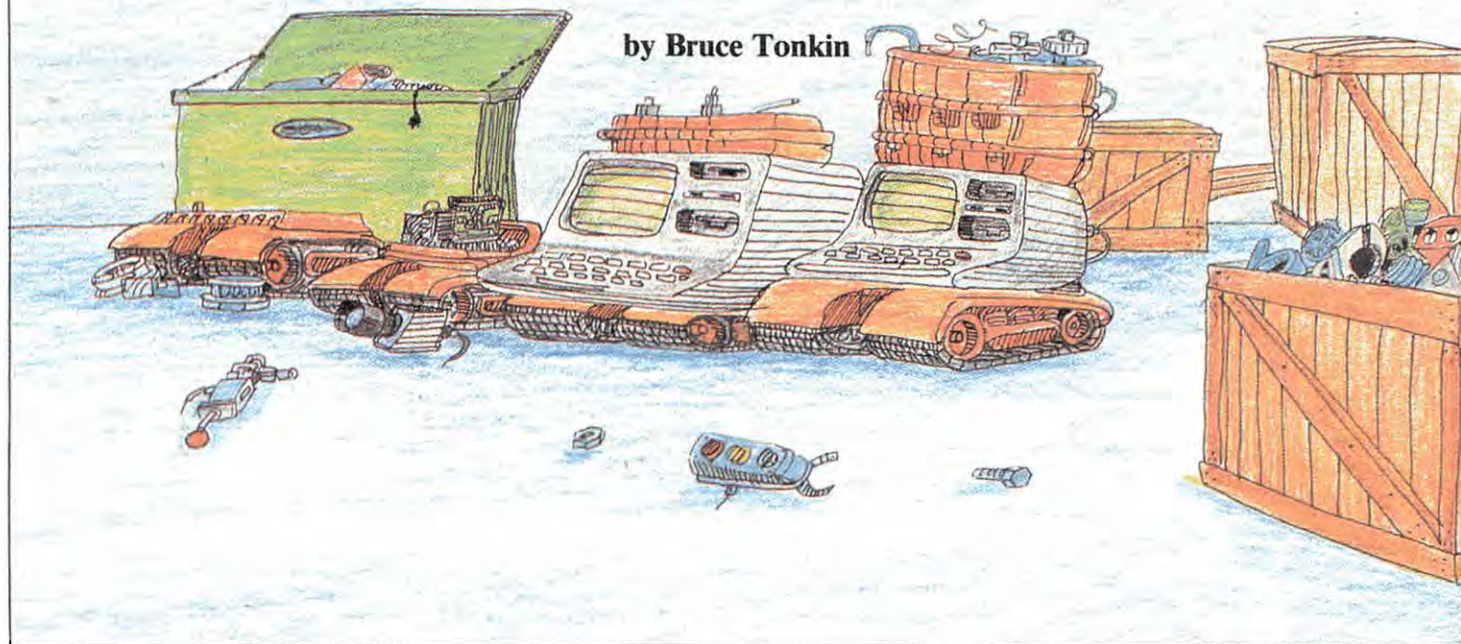


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The Creator

by Bruce Tonkin



I'd also like to finally make a little money from the Creator. My royalties have so far come to \$0.00. I managed this through a combination of improper marketing, a poor choice of associates, and not enough cash to market it myself.

The Creator is a program that writes data-base programs in Microsoft Basic for the Model I. With slight modifications, it will do so for a number of other Radio Shack and non-Radio Shack computers. It will run unchanged on the Model III. As far as I know, the DOS you use doesn't matter. The Creator is especially good at mailing lists, inventory programs, accounts payable and receivable, and general data-base applications.

A number of dedicated data-base programs exist for the TRS-80. These programs are good, but misguided; since they are usually written in Assembly language, anything they create and modify is not transportable, nor is the application they generate. Modifications are generally impossible.

But programs the Creator generates can be transported to nearly any machine running Microsoft Basic or a reasonable facsimile thereof. The generator itself can also be modified, if you have the time and patience.

Since neither the Creator nor the pro-

grams it writes calls any Assembly-language routines or depends on the operating system for anything, the programs are also highly portable. The operating system only matters to the extent that it affects Basic: Since Basic tends to disguise any differences that exist, you're assured that your software investment is protected.

A Short History

I write and develop application and utility software for a living. I've written programs for all the popular microcomputers, and I believe they're generally of high quality. The Creator was one of the better ones.

So why wasn't it commercially successful?

First, a short history is in order.

I got the idea for the Creator toward the end of 1978. I was working as a systems engineer for a company (which I will call Noname) selling computers to Radio Shack.

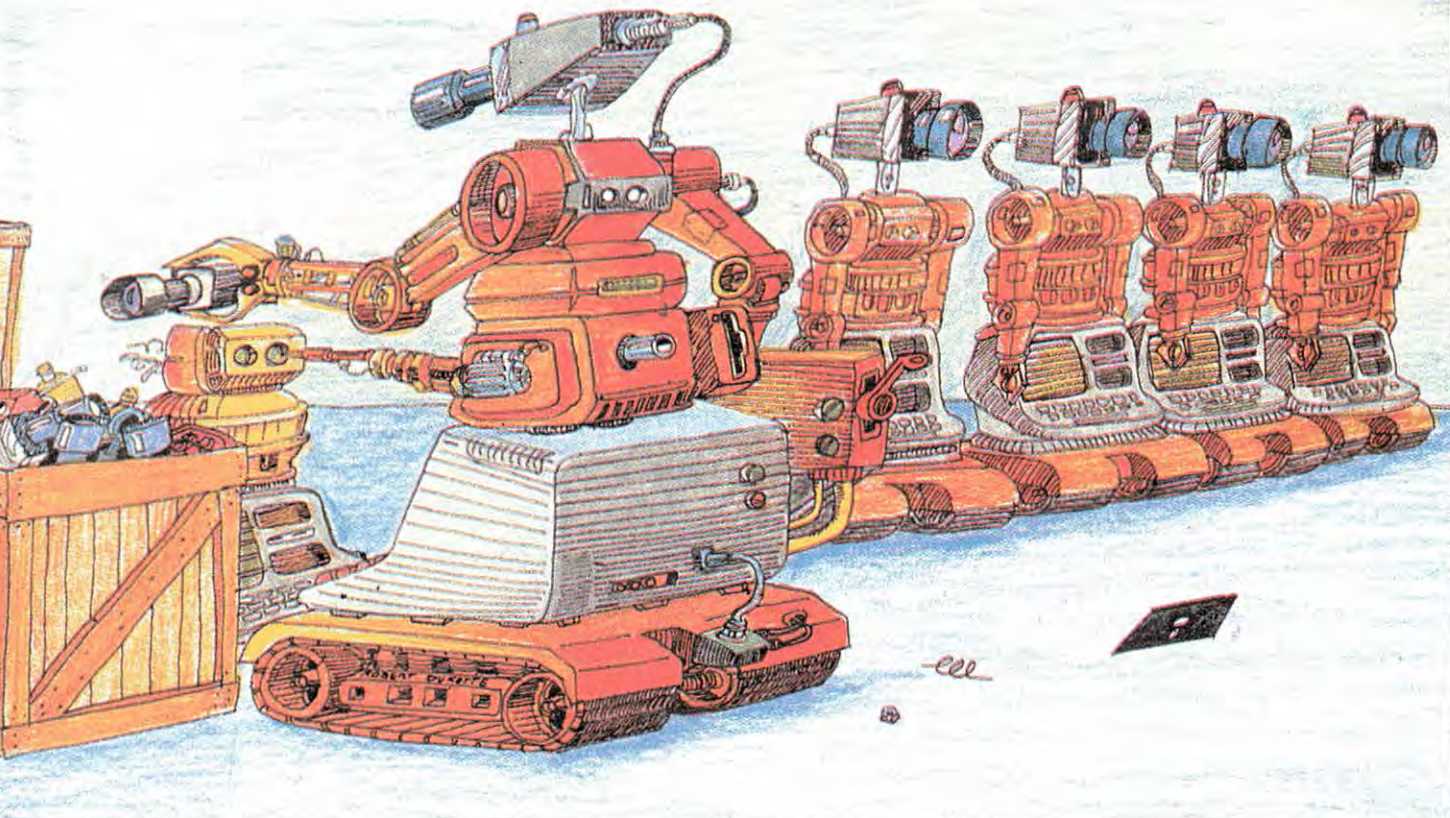
Noname did not want to sell any software other than languages, unless the software came from out-of-house. They feared the amount of support that marketing a piece of software would require. When they decided to end all field software support for all their products in favor of a plan to do all support from the home office, I decided to

strike out on my own. In about a week I found two possible backers and was out of a job.

In a spirit of boundless optimism, I began the project about an hour after I left Noname. In about two weeks (some 200 hours of work), I had a version of the Creator running well enough to demonstrate. I took a listing to my lawyer and submitted it for a copyright. No money was coming in and my wife was becoming worried. I continued working on the program for several more months, ironing out the bugs and adding features.

Meanwhile, I showed the program to the potential backers, and they agreed to supply money in return for a financial interest in the company that would market the program. The major backer took 50 percent and the minor one 25 percent. Also, the company was to have exclusive marketing rights. In return, ownership of the program and all modifications remained mine, and I was to receive royalties from each sale.

I got a TRS-80 Model I toward the end of February. I began getting money and the company incorporated in March. We almost immediately sold a number of programs for \$295. As a matter of fact, the first 22 individual demonstrations produced 21 sales. The future was looking better. But as it



turned out, this was to be the high point. After a year, my health was poor, my wife was threatening to take herself and the kids back to her mother, and my finances were a disaster.

Down the Tubes

I made some bad choices. I had associates who knew nothing about software, little or nothing about computers, and no time or willingness to learn. I even had one associate who believed I spent my time loafing around and doing nothing.

I chose dealers and distributors who paid the company (my associates) royalties. I never saw any of it.

And I did too much business by handshake. To quote L.B. Mayer, "An oral agreement isn't worth the paper it's printed on."

My situation may not be typical. Many software authors have gotten a good income from distributors and have been treated well. By and large, distributors are not crooks. But if you're going to try to market your software, you should protect yourself.

First, you should see a good lawyer and follow his recommendations. Friendship and business should never be confused: One should have nothing to do with the other.

Be aware that distributors want close

Program Listing 1

```

1 PRINT "COPYRIGHT 1980 BY BRUCE TONKIN ALL RIGHTS RESERVED"
2 PRINT "SERIAL NUMBER"
3 FOR I=1 TO 2000:NEXT I
10 REM THE CREATOR
20 REM
30 REM
40 REM
50 REM VERSION 1.1 DATED 2-28-80
60 REM BASIC DATA BASE PROGRAM:WRITTEN AND ADAPTED FOR TRS 80
  BY BRUCE TONKIN
70 CLEAR3000:CLS
80 PRINT"THIS IS THE CREATOR, TRS-80 V1.1. IT WILL ALLOW YOU"
90 PRINT"TO GENERATE A PROGRAM WHICH WILL CREATE AND ACCESS A DA
  TA FILE"
100 PRINT"FOR LATER USE. PLEASE INPUT THE PROPOSED PROGRAM NAME.
  "
110 PRINT"YOU ARE LIMITED TO 8 ALPHABETIC CHARACTERS."
120 PRINT"PROGRAM NAME=";:LINEINPUTPN$
130 FORI=1TOLLEN(PN$):A$=MID$(PN$,I,1):IFA$>"Z"ORAS<"A"THENPRINT
  ALPHA CHARACTERS ONLY!":GOTO120
140 NEXTI
150 IF LEN(PN$)>8THENPRINT"TOO LONG":GOTO120
160 PRINT"WHEN THE PROPOSED PROGRAM IS RUN, WHICH DRIVE WILL CON
  TAIN THE"
170 PRINT"DATA FILE(0-3)?"
180 AN$=INKEY$:IFAN$=""THEN180 ELSEIF(AN$>"3"ORAN$<"0")THEN170

190 PRINTAN$
200 PRINT"WHICH DRIVE DO YOU WANT THE PROGRAM WRITTEN ON? (0-3)
  "
210 DN$=INKEY$:IFDN$=""THEN210 ELSEIF(DN$>"3"ORDN$<"0")THEN200

220 PRINTDN$:DN$=" "+DN$
230 DF$=PN$+"/DAT:"+AN$:PN$=PN$+"/BAS":PQ$=PN$+DN$:OPEN"O",1,PQ$

240 PRINT#1,"1 REM*****PROGRAM NAME:";PN$;*****"
250 PRINT#1,"2 REM*****DATA FILE NAME:";DF$;*****"
260 PRINT#1,"3 REM*****DATA FILE IS ON DRIVE";AN$;*****"
270 INPUT"WHAT IS THE MAXIMUM DATA FILE SIZE, IN # OF RECORDS";M
  S
280 INPUT"WHAT IS THE RECORD LENGTH(1-255)";RR:IFRR<1ORRR>255THE
  N280 ELSERR=256/RR

```

Listing 1 continues

and continuing support. They don't want to buy your program, they want to rent your program and buy you. If you can't provide the support, don't go to a distributor.

(Incidentally, that's why this program isn't going through a distributor now: I can't support it because I no longer have a machine that will run the program. Nor do I really want one.)

Distributors want to pay royalties of 5 to 25 percent, depending on the program and its selling price. I feel that's unfair. Distributors insist it is not, and some of them aren't very rich, so maybe it isn't. If you feel as I do, don't go to a distributor. Otherwise, you're just inviting mental anguish, especially when customers complain that your software is overpriced.

Expect a lag of 10 to 90 or more days after a program is sold before you get any royalties. Distributors have to deal with returned merchandise and slow payments from dealers—they can't pay you what they don't have. In the meantime, existence can be somewhat painful.

Not all distributors are entirely scrupulous. Anyone can make his books look good to a nonprofessional. If you're not an accountant or can't afford to hire one, you'll just have to take a good guess. You'll need to spend some time to choose only honest dealers and distributors. Picking honest men is not easy for some people. I guessed wrong a lot of the time.

One other thing. Distributors and dealers have been known to go bankrupt. When they do, you lose your money. I can offer no suggestions for you there.

The Flip Side

Is there any reason to go to a distributor? Yes. Distributors can and do succeed in doing the following:

- They evaluate your package. If it's weak, they'll tell you. If the software is salvageable, they'll offer suggestions for improvement. This can be the most valuable service they can perform.
- They advertise and promote your package far beyond what you could do, unless you're wealthy and a good advertising copywriter.
- They screen dealers and handle the bad apples for you.
- They provide at least some of the support. A good distributor and dealer team can save an awful lot of your time. Without this, you'd better like talking on the telephone. (You won't believe the questions you'll get, either!)
- They provide the niceties, such as packaging and printing. Believe me, this

Listing 1 continued

```

290 IFMS*256/R%>85760THENPRINT"NOT ENOUGH ROOM ON A SINGLE DISK
FOR THIS.":GOTO270
300 PRINT#1,"4 REM*****MAXIMUM FILE SIZE IS";MS;" RECORDS*****
"
310 PRINT#1,"5 REM*****RECORD LENGTH IS";RR;"PACKED";R%;"PER SE
CTOR*****"
320 QS=CHR$(34)
330 PRINT"PLEASE TYPE IN A TITLE FOR YOUR GENERATED PROGRAM.":LI
NE INPUT TIS
340 LN=LN+10:PRINT#1,LN;"REM CHANGE DISKS--REINITIALIZE HERE"
350 LN=LN+10:PRINT#1,LN;"CLEAR 3000"
360 LN=LN+10:PRINT#1,LN;"OPEN";QS;"R";QS;"",1,"";QS;DF$;QS
370 LN=LN+10:PRINT#1,LN;"ONERRORGOTO25001"
380 LN=LN+10:PRINT#1,LN;"DIMF$(22),G$(22)"
390 PRINT#1,"25000 REM*****BEGIN ERROR ROUTINE*****"
400 PRINT#1,"25010 PRINT";QS;"ERROR ENCOUNTERED IN LINE";QS;"";ER
L"
410 PRINT#1,"25020 PRINT";QS;"ERROR #=";QS;"";ERR/2+1:CLOSE:RUN"
420 PRINT#1,"25001 IFERL<10000ANDERL>10000THENPRINT";QS;"PROBABLE
ERROR IN EDIT SPECIFICATIONS.":QS
430 PRINT#1,"32000 REM*****INITIALIZE THE HASHED FILE*****"
440 PRINT#1,"32010 PRINT";QS;"THIS WILL ERASE ALL PREVIOUS ENTRI
ES,IF ANY!";QS
450 PRINT#1,"32020 PRINT";QS;"TO CONTINUE INITIALIZATION, HIT TH
E C KEY";QS
460 PRINT#1,"32035 PRINT";QS;"THIS WILL TAKE A LITTLE WHILE.":QS
470 PRINT#1,"32030 AN$=INKEY$:IF AN$="" ;QS;QS;"THEN32030ELSEIFAN$
<>" ;QS;"C";QS;"THENRUN"
480 PRINT#1,"32040 FIELD #1,255 AS AZ$,1 AS DZ$:LSET AZ$=STRING$
(255,255):LSET DZ$=CHR$(255)"
490 PRINT#1,"32050 FOR I=1 TO";INT(.99+MS/R%);":PUT1,I:NEXT:RUN"
500 DIMF$(22)
510 CLS:PRINT"YOU MAY NOW CHOSE AN EXIT CODE OR MESSAGE WHICH WI
LL ALLOW THE"
520 PRINT"OPERATOR OF YOUR PROGRAM TO EXIT DATA ENTRY OR UPDATE
WITHOUT"
530 PRINT"SAVING HIS LATEST CHANGES TO DISK, AND ENABLE A RETURN
TO THE"
540 PRINT"PROGRAM MENU. DO YOU WISH SUCH AN EXIT MESSAGE (Y/N)?"
550 OO$=INKEY$:IF OO$="" THEN 550 ELSE IF OO$<>"Y"ANDOO$<>"N"TH
EN510
560 IF OO$="Y" THEN PRINT"WHAT IS YOUR EXIT MESSAGE OR CODE?":L
INE INPUT OT$
570 CLS:PRINT"NOW WE MUST DESCRIBE THE POSITIONS OF THE FIELDS I
N THE FILE."
580 PRINT"THE NUMERIC FIELDS CAN BE PACKED. WHOLE NUMBERS FROM -
32767 TO"
590 PRINT"32767 CAN BE STORED AS PACKED INTEGERS IN TWO SPACES."
600 PRINT"NUMBERS NEEDING 6 DIGITS OF ACCURACY CAN BE PACKED INT
O 4."
610 PRINT"NUMBERS NEEDING UP TO 16 DIGITS OF ACCURACY WILL TAKE
8 SPACES."
620 PRINT"PACKED 6-DIGIT-ACCURACY NUMBERS ARE PACKED SINGLE PRE
CISION."
630 PRINT"PACKED 16-DIGIT-ACCURACY NUMBERS ARE PACKED DOUBLE PRE
CISION."
640 PRINT"PLEASE TAKE CARE TO ALLOCATE THE CORRECT NUMBER OF SPA
CES."
650 PRINT"FROM LEFT TO RIGHT IN YOUR RECORD, TELL ME HOW MUCH SP
ACE"
660 PRINT"TO ALLOCATE TO EACH FIELD. YOU HAVE 255 SPACES IN EACH
RECORD."
670 PRINT"AND UP TO 22 FIELDS. TYPE IN 999 WHEN YOU ARE DONE."
680 A=1
690 PRINT"FIELD #";A;" USES: ";:INPUT F$(A)
700 EX=EX+VAL(F$(A)):IFEX>RRANDF$(A)<>"999"THENPRINT"EXCEEDS";RR
;"TOTAL SPACES:TRY AGAIN.":EX=EX-VAL(F$(A)):GOTO690
710 IFF$(A)="999"ORA=22THEN780
720 PRINT"IS THIS FIELD SIZE OK?(Y/N)";
730 EX$=INKEY$:IFEX$=""THEN730 ELSEIFEX$="N"THENEX=EX-VAL(F$(A)
):GOTO690 :ELSEIFEX$<>"Y"THEN720
740 IFRR-EX=0THENPRINT:A=A+1:GOTO780
750 PRINT" ";EX$:PRINT"THEN YOU HAVE";RR-EX;" SPACES LEFT."
760 A=A+1:GOTO690
770 LN=LN+10:PRINT#1,LN;"REM*****SET UP FIELDS IN DATA FILE****
**"
780 A=A-1:LN=LN+10:SL=LN:PRINT#1,LN;"FIELD 1,";:OF$="FIELD 1,"
790 FORI=1TOA-1:V=VAL(F$(I)):V$=MID$(STR$(V),2):I$=MID$(STR$(I),
2)
800 PRINT#1,V$;"AS F$( ";I$; " );";
810 OF$=OF$+V$+"AS F$( "+I$+" );";
820 NEXTI
830 PRINT#1,MID$(STR$(VAL(F$(A))),2);"AS F$( ";MID$(STR$(A),2);")

```

Listing 1 continues

```

840 LN=LN+10:PRINT#1,LN;"FORI=1TO22:G$(I)=";Q$;Q$;"NEXT:FC=0:UF
=0:G$=";Q$;Q$;"CLS"
850 LN=LN+10:PRINT#1,LN;"PRINTTAB(19);";Q$;"PRODUCED BY THE CREA
TOR";Q$
860 LN=LN+10:PRINT#1,LN;"PRINT";Q$;STRING$((60-LEN(TI$))/2),32)
;TI$;Q$
870 LN=LN+10:PRINT#1,LN;"PRINT"
880 LN=LN+10:PRINT#1,LN;"PRINT";Q$;"ENTER DATA.....
.....DEPRESS E";Q$
890 LN=LN+10:PRINT#1,LN;"PRINT";Q$;"LOOK UP A RECORD.....
.....DEPRESS L";Q$
900 LN=LN+10:PRINT#1,LN;"PRINT";Q$;"SCAN ALL RECORDS ON FILE....
.....DEPRESS S";Q$
910 LN=LN+10:PRINT#1,LN;"PRINT";Q$;"UPDATE A RECORD.....
.....DEPRESS U";Q$
920 LN=LN+10:PRINT#1,LN;"PRINT";Q$;"DELETE A RECORD.....
.....DEPRESS D";Q$
930 LN=LN+10:PRINT#1,LN;"PRINT";Q$;"INITIALIZE THE FILE.....
.....DEPRESS I";Q$
940 LN=LN+10:PRINT#1,LN;"PRINT";Q$;"EXIT THE PROGRAM.....
.....DEPRESS X";Q$
950 LN=LN+10:PRINT #1,LN;"PRINT";Q$;"PLEASE DEPRESS THE LETTER O
F YOUR CHOICE: NO ENTER KEY IS NEEDED";Q$
960 IF OOS="Y" THEN LN=LN+10:PRINT#1,LN;"PRINT";Q$;"TO RETURN TO
THE MENU FROM UPDATE OR ENTRY WITHOUT SAVING YOUR MATERIAL TO
THE DISK, ENTER ";OT$;" FOR A FIELD ENTRY.";Q$
970 LN=LN+10:PRINT#1,LN;"ANS=INKEY$:IF AN$=";Q$;Q$;"THEN";LN
980 LN=LN+10:PRINT#1,LN;"IFAN$<>";Q$;"E";Q$;"ANDAN$<>";Q$;"L";Q$
;"ANDAN$<>";Q$;"U";Q$;"ANDAN$<>";Q$;"D";Q$;"ANDAN$<>";Q$;"I";Q$
;"ANDAN$<>";Q$;"X";Q$;"ANDAN$<>";Q$;"S";Q$;"THEN";SL
990 LN=LN+10:PRINT#1,LN;"IFAN$=";Q$;"E";Q$;"THEN1000"
1000 LN=LN+10:PRINT#1,LN;"IFAN$=";Q$;"L";Q$;"THEN10000"
1010 LN=LN+10:PRINT #1,LN;"IFAN$=";Q$;"S";Q$;"THEN35000"
1020 LN=LN+10:PRINT#1,LN;"IFAN$=";Q$;"U";Q$;"THEN11000"
1030 LN=LN+10:PRINT#1,LN;"IFAN$=";Q$;"D";Q$;"THEN12000"
1040 LN=LN+10:PRINT#1,LN;"IFAN$=";Q$;"I";Q$;"THEN32000"
1050 LN=LN+10:PRINT#1,LN;"CLOSE:NEW"
1060 DIM D$(22)
1070 PRINT#1,"10000 REM*****BEGIN THE FILE LOOK-UP ROUTINE*****
**"
1080 PRINT#1,"11000 REM*****BEGIN THE FILE UPDATE ROUTINE*****
**"
1090 PRINT#1,"12000 REM*****BEGIN THE RECORD DELETE ROUTINE*****
**"
1100 INPUT"WHICH FIELD IS THE KEY FIELD? INPUT THE FIELD NUMBER:
";KF
1110 OF$=OF$+F$(A)+"AS F$( "+MID$(STR$(A),2)+" )"
1120 IF R%>1 THEN R=INSTR(OF$,"");OF$=LEFT$(OF$,R)+MID$(STR$(RR
),2)+"*P% AS TX$,"+MID$(OF$,R+1)
1130 PRINT#1,"35000 FOR K=0 TO";MS-1;"RP=K:OS=1:GOSUB27040"
1140 PRINT#1,"35010 IF F$(";KF;")>CHR$(249) THEN35990"
1150 PRINT#1,"35050 GOSUB28000:REM UNPACK RECORD FOR DISPLAY"
1160 PRINT#1,"35960 GOSUB29000:REM DISPLAY THE RECORD"
1170 PRINT#1,"35970 FOR J=1 TO 2000:NEXTJ:REM WAIT A LITTLE BIT
BEFORE NEXT RECORD"
1180 PRINT#1,"35990 NEXTK:GOTO";SL
1190 LN=1000:PRINT#1,LN;"CLS:REM*****BEGIN ENTRY*****"
1200 GOSUB1210 ;GOTO1450
1210 PRINT"NOW WE MUST DESCRIBE THE INPUT PROMPTS THE OPERATOR W
ILL SEE,"
1220 PRINT"THE EDITS TO BE PERFORMED, AND THE DATA TYPE FOR EACH
FIELD."
1230 PRINT"TO DO THIS, WE WILL ASK A SERIES OF QUESTIONS ABOUT E
ACH FIELD."
1240 PRINT"TO THE QUESTION";Q$;"KIND OF DATA";Q$;"THE POSSIBLE A
NSWERS ARE:"
1250 PRINT"N.....NUMERIC DATA, NOT PACKED-STORED AS C
HARACTER."
1260 PRINT"PI.....PACKED INTEGER DATA, STORED AS 2 CHA
RACTERS."
1270 PRINT"PS.....PACKED SINGLE-PRECISION NUMBER, 4 CH
ARACTERS."
1280 PRINT"PD.....PACKED DOUBLE-PRECISION NUMBER, 8 CH
ARACTERS."
1290 PRINT"C.....CHARACTER DATA-ANY CHARACTER IS OK"
1300 PRINT"YOU MAY TYPE THE WORD HELP TO REPEAT THESE INSTRUCTIO
NS LATER."
1310 PRINT"HIT ANY KEY TO CONTINUE."
1320 P$=INKEY$:IF P$="" THEN1320
1330 CLS:PRINT"TO THE PROMPT QUESTION, TYPE IN THE OPERATOR'S QU
ESTION."
1340 PRINT"TO THE BAD INPUT IF QUESTION, INPUT AS MANY EDITS AS
YOU WANT "
1350 PRINT"OF THE FORM: <999 =3 >456.5 <=9"
1360 PRINT"<";Q$;"A";Q$;" NOTE THE QUOTES AROUND ALPHABETIC ED
ITS."

```

Listing 1 continues

Control Cash & Inventory at Check-out



NEW SYSTEM MAKES TRS-80 III A TOTAL CASH REGISTER & POINT-OF-SALE COMPUTER

Which performs all the normal functions of a computer and is specially programmed to....

- COMPUTE Sales Taxes, Discounts, Special Sales and Promotions
- TRACKS Sales by Type, such as Visa, Mastercard, Check, Charge, etc. and by Employee/Operator for up to 30 people
- SELF-PROMPTING to Cashiers
- Produces Audit Trails and ACCOUNTING DATA for entire operation
- CONTROLS up to 20,000 INVENTORY LINE ITEMS on our Hard Disk Drive
- CONTROLS up to 1,500 INVENTORY LINE ITEMS on your Floppy Drive
- Complete, Ready-to-Run SOFTWARE comes with Cash Control Drawer Unit
- AUDIBLE SIGNAL produced when any key is depressed by any operator
- DRAWER operates automatically or by manual override anytime
- Generates RECEIPTS on Printer
- Available to display in English, French, Spanish, or German Languages
- Operates on 110AC or 220AC...just plug it in
- NO INTERFERENCE with or modification of regular TRS-80 Mod III...plugs right into computer

FREE Specifications and Data Package or order complete Operating manual for \$15 from

ICR/FutureSoft
Box 1446 - Orange Park, Florida 32073
(904) 269-1918 for technical assistance
and Dealer Information

Integrated Cash Register Systems from as low as \$449.

ICR-FutureSoft

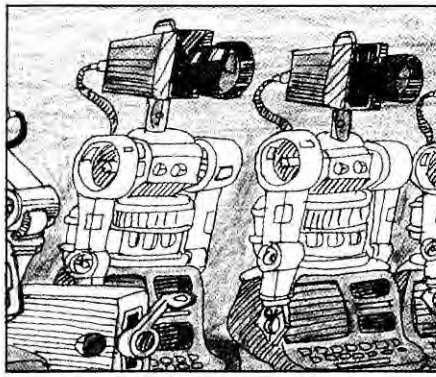
Software of Tomorrow... Today 211

can be a real pain if you have to do it yourself, even if your family helps. Unpaid labor has been known to strike over working conditions.

What Customers Expect

There is no essential difference between buying software and buying a pair of shoes. Any salesman will tell you the customer is looking for fit, style, and price. Which one is most important depends on the customer. Your software must "fit" the customer's needs. Style applies to both packaging and program appearance. Price depends on the program's function.

A word about pricing. Generally, if you go through a distributor, a program must either be a game or sell for over \$50. Otherwise, it's not worth his time. In my opinion, most of the \$50 programs should sell for about \$10, and most of the \$100-\$150 programs should sell for about \$20. The difference is just about the dealer's and distributor's



markup.

Of course, if a program is to be sold at all, it must be advertised. Advertising and demonstrations can cost half or more of a package's selling price. I can only afford to sell this program for \$10 because this article is essentially free advertising.

Customers have grown to expect fancy packaging and well-printed (not nec-

essarily good, but good-looking) manuals. I think this is unreasonable: It prevents many packages from ever reaching the marketplace. Most customers will never read the documentation, anyway. The lesson here: Make your software so easy to run that little or no documentation is required.

I would advise software purchasers to buy generic, but buy with care. Organize or join a club. Pool your funds, and have the club buy one package for evaluation. If the software is worthwhile, then have the interested members each buy a copy.

Never pirate software. It's not fair to the writer. If you want to see something even better than the piece of code in your hot little hands, encourage the author with some rightfully earned profit.

On the other hand, stay away from over-priced software. Sooner or later, the price will come down, even if not all the way to \$10.

Expectations and Enhancements

Here is what I expected the program to do:

1. Write bug-free Basic programs. Ideally, no bug could ever be generated, no matter what the provocation; program size limitations and program speed trade-offs resulted in a modification of this. Generally, I achieved this objective.

2. The programs could access records in a data file by a key. This access had to be quick (preferably less than one second), operator transparent, require no sort, and make no assumptions about the operating system or the processor chip used. I wanted to be completely flexible, and not be committed to just Radio Shack gear. This meant I could not use a sort, since it would have to be written in Basic (and at the TRS-80's operating speed, be painfully slow).

A sort presented several other problems. Any sort would not be operator-transparent. Also, any access or write based on a sort (even B-TREE) would be either slow to read or slow to write a record. This was unacceptable. Finally, if a sorted index file were used, then disk failure would cause terrible problems for the user.

Therefore, I reasoned, why should any sort be used? The sort, after all, would only be needed when and if the

records had to be printed in sorted order. Access, in Basic, is by record number: thus, what I needed was a way to convert the key to a record number.

I wondered (and I still do) why everyone else seemed to have settled on sorting and binary search. There is, after all, a big difference between retrieving records and printing reports.

I investigated several methods, but settled on hashing. Hashing, as I used it, consisted of taking a key composed of one or more alphanumeric characters and converting it to a number in the range of 1 to the maximum number of records permitted on a single disk. The hashing algorithm had to be reasonably random. I tested it to make sure it was: the generator I used was capable of generating numbers more random than Microsoft's RND function. I used a simple Chi-squared test to be sure.

The record access had to be reasonably quick. A peculiarity of Microsoft Basic and a floppy-disk-based computer is that it is much quicker to read even 10 long records placed consecutively than it is to read just two records placed widely apart. (That, by the way, is why a binary search technique is necessarily inferior to hashing for speedy access.) For that reason, I

wrote the Creator so that the generated programs would search consecutive locations in the data file after generating the hashed record number; any access past the end of the file would wrap around to the beginning. Hashing has another benefit, particularly important to anyone using a disk drive: head movement is generally less than with any other approach. Therefore, disk drives should last longer before needing repair or adjustment. The result is that a program generated by the Creator can read any record within about a half-second after the disk drive is turned on.

3. Records needed to be capable of being updated on any field. This was easy. I just fixed it so that an update on the key field deleted the old record and wrote a new one at the new hashed position. Otherwise, the updated record would be written at the same position.

4. Records had to be any length, up to the maximum length of a record permitted within Basic. This was 255 bytes, at the time.

5. I wanted at least 20 fields allowed per record.

6. The data file had to be as bullet-proof as possible. Bad sectors, power

Continues on p. 85

```

1370 PRINT"NOT NUMERIC
1380 PRINT"NOT ALPHA
1390 PRINT:PRINT"TO THE QUESTION ERROR MESSAGE TYPE THE MESSAGE
TO BE DISPLAYED"
1400 PRINT"IF THAT ERROR IS MADE BY THE OPERATOR."
1410 PRINT"YOU MAY SIGNAL COMPLETION OF EDITS FOR ANY FIELD BY M
AKING NO"
1420 PRINT"ENTRY AND HITTING THE ENTER KEY. HIT ANY KEY TO CONTI
NUE."
1430 P$=INKEY$:IFP$=""THEN1430
1440 RETURN
1450 FOR I=1TOA:I$=MID$(STR$(I),2)
1460 PRINT"FIELD #";I;" LENGTH=";L=VAL(F$(I)):PRINTL
1470 P$="":PRINT"PROMPT:";:LINE INPUTP$:IFP$="HELP"THENGOSUB1210
:GOTO1470
1480 K$="":INPUT"KIND OF DATA";K$:IFK$="HELP"THENGOSUB1210:GOTO
1480
1490 IFK$<>"N"ANDK$<>"PI"ANDK$<>"PS"ANDK$<>"PD"ANDK$<>"C"THENPRI
NT"INVALID KIND OF DATA. N, PI, PS, PD, OR C PLEASE.":GOTO1480
1500 IF(K$="PI"ANDL<>2)OR(K$="PS"ANDL<>4)OR(K$="PD"ANDL<>8)THENP
RINT"INCORRECT FIELD LENGTH FOR DATA TYPE.":GOTO1480
1510 LN=LN+10:PRINT#1,LN;"PRINT";Q$;P$;Q$;BL=LN
1520 IF K$<>"C"THENPRINT#1,BL+1;"IFUF<>0"ANDG$="";Q$;Q$;"THENG$=G$
(";I$;)"
1530 LN=LN+10:PRINT#1,LN;"LINE INPUTG$(";I$;)" ;:D$(I)=LN:IFOO$=
"N" THEN PRINT#1," " ELSEPRINT#1," :IFG$="";I;"=";Q$;OT$;Q$;"THEN
";SL
1540 IF K$="PI"THENPRINT#1,LN+1;"IFUF<>0"THENG1=INSTR(G$(";I$;)"
";Q$;"MORE";Q$;)" :IFGL>0THENG=CINT(VAL(G$(";I$;)" )+VAL(G$)) :G$(
";I$;)"=MID$(STR$(G$),2+SGN(G$)/2)
1550 IF K$="PI"THENPRINT#1,LN+2;"IFUF<>0"THENG1=INSTR(G$(";I$;)"
";Q$;"LESS";Q$;)" :IFGL>0THENG=CINT(-VAL(G$(";I$;)" )+VAL(G$)) :G$(
";I$;)"=MID$(STR$(G$),2+SGN(G$)/2)
1560 IFK$="PS"THENPRINT#1,LN+1;"IFUF<>0"THENG1=INSTR(G$(";I$;)"
";Q$;"MORE";Q$;)" :IFGL>0THENG=CSNG(VAL(G$(";I$;)" )+VAL(G$)) :G$(
";I$;)"=MID$(STR$(G$),2+SGN(G$)/2)
1570 IFK$="PS"THENPRINT#1,LN+2;"IFUF<>0"THENG1=INSTR(G$(";I$;)"
";Q$;"LESS";Q$;)" :IFGL>0THENG=CSNG(-VAL(G$(";I$;)" )+VAL(G$)) :G$(
";I$;)"=MID$(STR$(G$),2+SGN(G$)/2)
1580 IFK$="PD"THENPRINT#1,LN+1;"IFUF<>0"THENG1=INSTR(G$(";I$;)"
";Q$;"MORE";Q$;)" :IFGL>0THENG=CDBL(VAL(G$(";I$;)" )+VAL(G$)) :G$(
";I$;)"=MID$(STR$(G$),2+SGN(G$)/2)
1590 IFK$="PD"THENPRINT#1,LN+2;"IFUF<>0"THENG1=INSTR(G$(";I$;)"
";Q$;"LESS";Q$;)" :IFGL>0THENG=CDBL(-VAL(G$(";I$;)" )+VAL(G$)) :G$(
";I$;)"=MID$(STR$(G$),2+SGN(G$)/2)
1600 IFK$="PI"THENLN=LN+10:PRINT#1,LN;"IFABS(VAL(G$(";I$;)" ))>32
767"THENPRINT";Q$;"NUMBER OUT OF RANGE. MUST BE FROM -32767 TO 32
767.":Q$;":GOTO";BL
1610 IFK$="PI"THENLN=LN+10:PRINT#1,LN;"IFINT(VAL(G$(";I$;)" ))<>V
AL(G$(";I$;)" )THENPRINT";Q$;"MUST BE WHOLE NUMBER.":Q$;":GOTO";B
L
1620 BI$="":PRINT"BAD INPUT IF:";:LINEINPUTBI$:IFBI$=""THEN1760

1630 IF BI$="HELP"THENGOSUB1210:GOTO1620
1640 PRINT"ERROR MESSAGE:";:LINEINPUTEM$:IFEM$="HELP"THENGOSUB12
10:GOTO1640
1650 IFINSTR(BI$,"NOT NUMERIC")>0THEN1660 ELSEIFINSTR(BI$,"NOT A
LPHA")>0THEN1670 ELSEIFINSTR(BI$,"NO ENTRY")>0THEN1680 ELSEIFINS
TR(BI$,"CONTAINS")>0THEN1690 ELSEIFINSTR(BI$,"LENGTH")>0THEN1720
ELSE1730
1660 LN=LN+10:PRINT#1,LN;"CD$=G$(";I$;)" :E=0:GOSUB30000:IFE=1THE
NPRINT";Q$;EM$;Q$;":GOTO";BL:GOTO1620
1670 LN=LN+10:PRINT#1,LN;"CD$=G$(";I$;)" :E=0:GOSUB31000:IFE=1THE
NPRINT";Q$;EM$;Q$;":GOTO";BL:GOTO1620
1680 LN=LN+10:PRINT#1,LN;"IFLEN(G$(";I$;)" )=0"THENPRINT";Q$;EM$;Q
$;":GOTO";BL:GOTO1620
1690 FH=INSTR(BI$,Q$):IFFH<1THENPRINT"YOU FORGOT QUOTES.":FH=0:G
OTO1620
1700 IF FH>1THENFH$=MID$(BI$,FH+1,1):LN=LN+10:PRINT#1,LN;"IFINST
R(G$(";I$;)" ,";Q$;FH$;Q$;)">0THENPRINT";Q$;EM$;Q$;":GOTO";BL:FH=
0:GOTO1620
1710 PRINT"SYNTAX ERROR. THE WORD CONTAINS SHOULD NOT BE SET OFF
BY QUOTES":GOTO1620
1720 FH=INSTR(BI$,"LENGTH"):LN=LN+10:PRINT#1,LN;"IFLEN(G$(";I$;)"
))>MID$(BI$,FH+6);"THENPRINT";Q$;EM$;Q$;":GOTO";BL:FH=0:GOTO162
0
1730 IFINSTR(BI$,">")<1ANDINSTR(BI$,"<")<1ANDINSTR(BI$,"=")<1THE
NPRINT"SYNTAX ERROR. REPEAT COMMAND, PLEASE.":GOTO1620
1740 C=INSTR(BI$,Q$):IFC>0THENLN=LN+10:PRINT#1,LN;"IFG$(";I$;)"
";BI$;"THENPRINT";Q$;EM$;Q$;":GOTO";BL:GOTO1620
1750 LN=LN+10:PRINT#1,LN;"IFVAL(G$(";I$;)" );BI$;"THENPRINT";Q$;
EM$;Q$;":GOTO";BL:GOTO1620
1760 LN=LN+10:IFK$="PI"THENPRINT#1,LN;"G$(";I$;)"=MKI$(VAL(G$(";
I$;)" ))
1770 IFK$="PI"THENPRINT#1,11900+I;"IFUF<>";I$;"THENG$(";I$;)"=MK
I$(VAL(G$(";I$;)" ))
1780 IFK$="PI"THENPRINT#1,RL+28000;"G$(";I$;)"=STR$(CVI(F$(I$;I$;
"))"

```

Listing 1 continues

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Listing 1 continued

```

1790 IFK$="PS"THENPRINT#1,LN;"G$(";I$;")=MK$S(VAL(G$(";I$;")))
1800 IFK$="PS"THENPRINT#1,11900+I;"IFUF<>";I$;"THENG$(";I$;")=MK
SS(VAL(G$(";I$;")))
1810 IFK$="PS"THENPRINT#1,RL+28000;"G$(";I$;")=STR$(CVS(F$(";I$;
")))"
1820 IFK$="PD"THENPRINT#1,LN;"G$(";I$;")=MK$S(VAL(G$(";I$;")))
1830 IFK$="PD"THENPRINT#1,11900+I;"IFUF<>";I$;"THENG$(";I$;")=MK
D$(VAL(G$(";I$;")))
1840 IFK$="PD"THENPRINT#1,RL+28000;"G$(";I$;")=STR$(CVD(F$(";I$;
")))"
1850 IFK$="N"ORK$="C"THENPRINT#1,RL+28000;"G$(";I$;")=F$(";I$;")
"
1860 RL=RL+10:LN=LN+10:PRINT#1,LN;"RETURN":NEXTI
1870 PRINT#1,"10200 GOSUB28000"
1880 PRINT#1,"11200 GOSUB28000"
1890 PRINT#1,"12200 GOSUB28000"
1900 PRINT#1,"1005 FC=FC+1"
1910 PRINT#1,"1006 ONFCGOSUB";
1920 FORI=1TOA-1:PRINT#1,MID$(STR$(D%(I)-10),2);",":NEXT:PRINT#
1,D%(A)-10
1930 PRINT#1,"1007 IFFC<";A;"THEN1005ELSE";LN+10
1940 PRINT#1,"10010 CLS:GOSUB 27000 'TRY TO FI
ND THE RECORD"
1950 PRINT#1,"10199 REM*****UNPACK THE FIELDS IN THE FILE FOR D
ISPLAY*****"
1960 PRINT#1,"11010 CLS:GOSUB27000 'TRY TO FI
ND THE RECORD"
1970 PRINT#1,"11199 REM*****UNPACK THE FIELDS IN THE FILE FOR D
ISPLAY*****"
1980 PRINT#1,"12010 CLS:GOSUB27000 'TRY TO FI
ND THE RECORD"
1990 PRINT#1,"12199 REM*****UNPACK THE FIELDS IN THE FILE FOR D
ISPLAY*****"
2000 PRINT#1,"10799 REM*****DISPLAY RECORD IF MATCH ON KEY*****
*"
2010 PRINT#1,"10800 GOSUB29000"
2020 PRINT#1,"11799 REM*****DISPLAY RECORD IF MATCH ON KEY*****
*"
2030 PRINT#1,"11800 GOSUB29000"
2040 PRINT#1,"12799 REM*****DISPLAY RECORD IS MATCH ON KEY*****
*"
2050 PRINT#1,"12800 GOSUB29000"
2060 PRINT#1,"28998 RETURN"
2070 PRINT#1,"28999 REM*****DISPLAY FOUND RECORD*****"
2080 PRINT#1,"27999 REM*****UNPACK FIELDS IN RECORD*****"
2090 PRINT#1,"29000 CLS:IF OS=0 THENPRINT";Q$;"IS THIS IT? (PLEA
SE PRESS Y IF CORRECT)";Q$
2100 PRINT#1,"29010 FORI=1TO";A
2110 DIMH$(22)
2120 PRINT"WHEN THE DATA IS DISPLAYED, WHAT TITLE WILL EXPLAIN T
HE DATA IN"
2130 FORI=1TOA
2140 PRINT"FIELD NUMBER:";I;:LINEINPUH$(I)
2150 PRINT#1,22000+I;"DATA ";H$(I)
2160 NEXT
2170 PRINT#1,"29020 READR$:PRINTR$";Q$;";";Q$;";G$(I)";
2180 PRINT#1,"";"TAB(50)";";";Q$;"FIELD #";Q$;";I"
2190 PRINT#1,"29030 NEXT:RESTORE"
2195 PRINT#1,"29035 IF OS=1 THEN RETURN"
2200 PRINT#1,"12900 REM*****DELETE CODE WRITTEN IN ALL FIELDS**
*****"
2210 PRINT#1,"12905 R%=(RP-1)/";R$;"+1:P%=(RP-1)-(R%-1)*";R%
2220 PRINT#1,"12910 FIELD 1,";RR;"*P% AS DX$";RR;" AS DL$:LSET
DL$=STRING$(255,250):PUT 1,R%:GOTO";SL
2230 PRINT#1,"29050 AN$=INKEY$:IFAN$="";Q$;Q$;"THEN29050"
2240 PRINT#1,"29055 IFAN$<>";Q$;"Y";Q$;"THENGOSUB27040:GOSUB2800
0:GOTO29000"
2250 PRINT#1,"10860 GOTO";SL
2260 PRINT#1,"11810 PRINT";Q$;"WHAT FIELD NUMBER DO YOU WANT TO
UPDATE?";Q$
2270 PRINT#1,"11820 INPUTUF"
2280 PRINT#1,"11840 IFUF>";A;"ORUF<1THENPRINT";Q$;"INVALID FIELD
";Q$;":GOTO11810"
2300 PRINT#1,"11860 ONUFGOSUB";
2310 FORTZ=1TOA-1:PRINT#1,MID$(STR$(D%(TZ)-10),2);",":NEXT:PRIN
T#1,D%(A)-10
2320 PRINT#1,"11865 R%=(RP-1)/";R$;"+1:P%=RP-1-(R%-1)*";R%
2330 PRINT#1,"11870 IFUF<>";KF;"THEN11900ELSEZZ$=G$(";KF;"):FIEL
D1,";RR;"*P% AS DX$";RR;"AS DL$:LSET DL$=STRING$(255,250):PUT 1
,R%:GOSUB26000"
2340 PRINT#1,"11900 REM*****BEGIN OUTPUT*****"
2350 PRINT#1,"11995 ";OF$
2360 PRINT#1,"11998 REM*****INSERT CHANGED FIELDS INTO RECORD A
ND SEND*****"
2370 PRINT#1,"11999 FORI=1TO";A;":LSET F$(I)=G$(I):NEXT:PUT 1,R%
:GOTO";SL

```

Listing 1 continues

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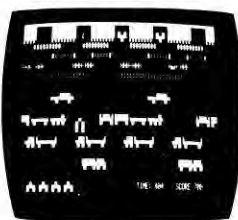
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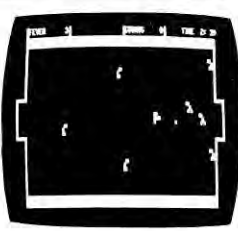
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Listing 1 continued

```
2380 PRINT#1,"27000 REM*****LOOK FOR RECORD SUBROUTINE*****"
2390 PRINT#1,"27010 GOSUB";D%(KF)-10;" :KF$=G$(" :KF;" ) "
2400 PRINT#1,"27020 OS=0"
2410 PRINT#1,"27030 ZZ$=KF$:GOSUB26000 'GO TO HASHING ROUTI
NE, GET POS."
2420 PRINT#1,"27040 RP=RP+1:IFRP>";MS;" THENRP=1 'NOT FOUND? BEG
IN AGAIN @ #1"
2430 PRINT#1,"27045 R%=(RP-1)/";R%;" +1:P%=(RP-1)-(R%-1)*";R%
2440 PRINT#1,"27046 " :OF$
2445 PRINT#1,"35005 " :OF$
2450 PRINT#1,"27047 IF OS=1 THEN GET 1,R%:RETURN"
2460 PRINT#1,"27050 GET 1,R%:IFLEFT$(F$(" :KF;" ),LEN(ZZ$))=ZZ$THE
NRETURN"
2470 PRINT#1,"27055 FIELD 1,";RR;"*P% AS DX$,";RR;" AS ZY$:GET 1
,R%:IFYZ$=STRINGS(" ;RR;" ,255) THENPRINT";Q$;"RECORD NOT FOUND.";Q
$;" :RUN"
2490 PRINT#1,"27057";OF$
2500 PRINT#1,"27060 GOTO27040 'NO MATCH: TRY NEXT RECORD"
2510 PRINT#1,"29999 REM*****NUMERIC FIELD EDIT CHECK SUBROUTINE
*****"
2514 PRINT#1,"30002 CD=INSTR(CD$,";Q$;"-" ;Q$;" ) :IFCD>0 AND INSTR
(CD+1,CD$,";Q$;"-" ;Q$;" )>0 THEN E=1:RETURN"
2515 PRINT#1,"30000 CD=INSTR(CD$,CHR$(32)) :IFCD>1THENCDS$=LEFT$(C
D$,CD-1)+MID$(CD$,CD+1):GOTO30000:ELSE IF CD=1THENCDS$=MID$(CD$,2
):GOTO30000"
2520 PRINT#1,"30005 FORZZ=1TOLEN(CD$) "
2530 PRINT#1,"30010 IFMIDS(CD$,ZZ,1)<" ;Q$;"0";Q$;"ORMIDS(CD$,ZZ
,1)>" ;Q$;"9";Q$;" THENIFMIDS(CD$,ZZ,1)<>" ;Q$;"." ;Q$;"ANDMIDS(CD$,Z
Z,1)<>" ;Q$;"-" ;Q$;" THENE=1:RETURN"
2540 PRINT#1,"30020 NEXTZZ"
2550 PRINT#1,"30030 RETURN"
2560 PRINT#1,"30999 REM*****ALPHA FIELD EDIT CHECK SUBROUTINE**
****"
2570 PRINT#1,"31000 FOR ZZ=1TOLEN(CD$) "
2580 PRINT#1,"31010 IF (MIDS(CD$,ZZ,1)<" ;Q$;"A";Q$;"ORMIDS(CD$,ZZ
,1)>" ;Q$;"Z";Q$;" )ANDMIDS(CD$,ZZ,1)<>CHR$(32) THENE=1:RETURN"
2590 PRINT#1,"31020 NEXTZZ"
2600 PRINT#1,"31030 RETURN"
2610 LN=LN+10:PRINT#1,LN;"ZZ$=G$(" ;MID$(STR$(KF),2) ;" ) :GOSUB2600
0"
2620 PRINT#1,"25999 REM*****HASHING ALGORITHM SUBROUTINE*****"
2630 PRINT#1,"26000 FORZZ=1TOLEN(ZZ$) "
2640 PRINT#1,"26010 X#=X#+ZZ*ASC(MID$(ZZ$,ZZ,1)) "
2650 PRINT#1,"26020 NEXTZZ"
2660 PRINT#1,"26030 X#=X#*X#*X#*X#*X#:X$=STR$(X#):RP=VAL(MID$(X$,5
,4)) :X#=0"
2670 PRINT#1,"26040 RP=" ;MS;"*RP/9999:RETURN"
2680 LN=LN+10:PRINT#1,LN;" REM*****LOOK FOR RECORD SPACE*****"
2690 LN=LN+10:PRINT#1,LN;"GOSUB";LN+10;" :GOTO";LN+60
2700 LN=LN+10:PRINT#1,LN;"RP=RP+1:IFRP>";MS;" THENRP=1"
2710 LN=LN+10:PRINT#1,LN;"R%=(RP-1)/";R%;" +1:P%=(RP-1)-(R%-1)*";
R%
2720 PRINT#1,LN+5;"FIELD 1,";RR;"*P% AS DX$,";RR;"AS ZY$"
2730 PRINT#1,"11890 GOSUB";LN-10
2740 LN=LN+10:PRINT#1,LN;"GET 1,R%:IFYZ<CHR$(250) THEN";LN-20
2750 LN=LN+10:PRINT#1,LN;OF$
2760 LN=LN+10:PRINT#1,LN;"RETURN"
2770 LN=LN+10:PRINT#1,LN;"FORK=1TO";A
2780 LN=LN+10:PRINT#1,LN;"LSET F$(K)=G$(K):NEXT:PUT 1,R%"
2790 CLS:PRINT"NOW WE ARE ALMOST DONE. WE NEED TO ASK IF THE OPE
RATOR IS DONE."
2800 PRINT"NOTE: DONE REFERS TO DATA ENTRY OPERATIONS ONLY!"
2810 PRINT"YOU MAY CHOOSE THE MESSAGE YOU WISH. THE OPERATOR'S R
EPLY WILL"
2820 PRINT"BE LIMITED TO A SINGLE KEY DEPRESSION. I'D SUGGEST A
MESSAGE"
2830 PRINT"OF THE FORM ARE YOU DONE(Y/N)?"
2840 PRINT"TYPE IN YOUR MESSAGE BELOW."
2850 LINEINPUTTM$
2860 PRINT"IF THE OPERATOR IS NOT DONE, WHAT SHOULD THE REPLY BE
?"
2870 NDS$=INKEY$:IFNDS$=""THEN2870 ELSEPRINTNDS$
2880 PRINT"IF THE OPERATOR IS DONE, WHAT SHOULD THE REPLY BE?"
2890 ID$=INKEY$:IF ID$=""THEN2890 ELSEPRINTID$
2900 LN=LN+10:PRINT#1,LN;"PRINT";Q$;TM$;Q$
2910 LN=LN+10:PRINT#1,LN;"TM$=INKEY$:IFTM$="" ;Q$;Q$;"THEN";LN;"EL
SEPRINTTM$";BL=LN-10
2920 LN=LN+10:PRINT#1,LN;" REM*****IF DONE, END: IF NOT, RETURN
TO MENU, ELSE REPEAT**"
2930 LN=LN+10:PRINT#1,LN;"IFTM$<>" ;Q$;ID$;Q$;"AND TM$<>" ;Q$;NDS$
;Q$;"THENPRINT";Q$;"PLEASE ANSWER " ;Q$;" ;" ;Q$;ID$;Q$;" ;" ;Q$;" OR
";Q$;" ;" ;Q$;NDS$;Q$;" :GOTO";BL
2940 LN=LN+10:PRINT#1,LN;"IFTM$=" ;Q$;ID$;Q$;" THEN";SL
2950 LN=LN+10:PRINT#1,LN;"FORI=1TO22:G$(I)=" ;Q$;Q$;" :NEXT:FC=0:U
F=0:CLS:GOTO1000"
2960 CLOSE:END
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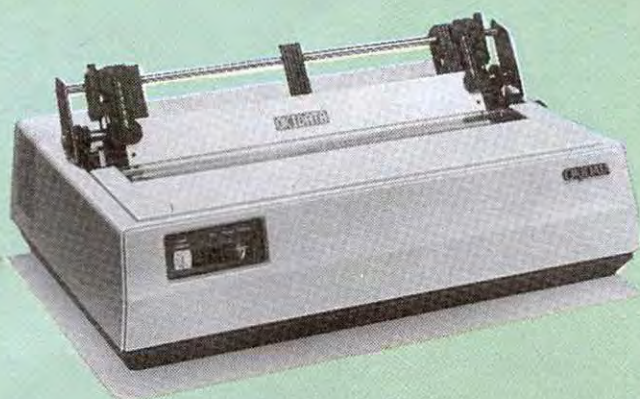
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failures, and operating system bugs had to do minimal damage to records. This condition meant I had to pre-allocate all the space in a file. Doing this verifies that the disk (at least at the start) is error-free and has sufficient space to hold the proposed file. Furthermore, once all the space is pre-allocated, if any sector is damaged, only that sector is lost. Only a directory read error might damage the whole file; that was something I couldn't guard against. However, copying the directory from a back-up disk to the damaged disk would suffice to completely recover the data, provided the data disk and its backup were identical in the directory.

Pre-allocation assures that the two disks can be made to have identical directories. The trade-off, here, is that initializing the data file becomes a necessity, and adds to the time necessary to set up the generated program to run. After my Model I had crashed 15 times or so, I was convinced I had made a wise choice. About 70 percent of the first 100 or so crashes were hardware-related, and I was able to successfully recover all data more than 90 percent of the time.

7. Anyone using my program generator needed complete freedom to check for data-input errors, print error-messages of his choice, display computed data based on fields in the record, update fields based on the result of a computation, and state record length, field length, field type, and number of fields.

8. Record space utilization had to be efficient.

Fortunately, Microsoft Basic on the TRS-80 lets you pack any numeric data. Other Basics, such as CBasic or Applesoft, do not allow such space savings. CBasic, in fact, requires record and field delimiters or substring operations to extract field data. This capricious requirement is extraordinarily wasteful of disk space: in fact, CBasic records can be as much as 8 times as long as Microsoft packed data, and normally are about twice as large. Anyone who has bought CBasic for a computer that permits only a limited amount of disk storage (less than several megabytes) has, in my opinion, made a serious error. Even for a computer with essentially unlimited disk space, larger records mean longer access times. For many other

reasons, CBasic is much the inferior of Microsoft, and (again in my opinion) Tandy's decision to put this extraordinarily good version of Microsoft Basic on the TRS-80 was one of the best decisions they ever made.

Incidentally, I find it almost incredible how many microcomputer manufacturers produce and proudly sell machines as "business solutions" when simple things like packing data, multiple-precision arithmetic, line input, substring matching and print formatting are impossible without all kinds of gyrations. If those nameless manufacturers of 6502-based toys had paid Microsoft to put a good Basic on their machines, I seriously doubt the cost would have amounted to as much as a dollar a machine. Yet nobody but Radio Shack, of all companies, saw fit to make this honest effort. Instead, the 6502-based computer manufacturers spent a lot of money on half-truthful celebrity advertising, graphics, and games. Then, promoting their machines for business applications, they sold a ton of these game machines. Ah, well.

9. The program generated needed to handle an indefinite number of records on an indefinite number of disks.

Yet another reason to go to hashing: no key file space is needed, no tables to store in memory and take up program space, no worry about the time needed to do a binary search. The programs generated can handle millions or billions of records, given a sufficient number of floppy disks and a patient operator.

10. The program had to be easy to run, even for someone not knowing much about Basic. I tested the program on my associates, both of whom were well-qualified on this score.

11. The program had to run in a single-drive 32K system, to maximize the number of possible customers.

Unfortunately, this meant I could not continue improving my program past a certain point. Once memory became too short, I had to quit the improvements and leave at least a little space to fix later bugs. The Creator will still run in a 32K machine, but it could have been a better program, with more error-checking and more capabilities.

12. The generated program had to be as modular as possible, and permit

Continues on p. 86

WILDCAT

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easy customization later.

This meant that the program would not necessarily be generated with the line numbers in order, since the logical order in which the modules would be generated by the Creator would not match the order the modules would be placed in the program. Under TRSDOS, NEWDOS, or CP/M, this does not cause any problem, because the actual line numbers used will be placed by the Basic interpreter in their correct order. Since anyone with a TRS-80 has easy, cheap access to at least TRSDOS, and since any alternative operating system permits transfer from TRSDOS to itself, I believed there would be no problem in writing the program lines out of order.

Anyone running an altered version of Microsoft Basic should check to see if their Basic meets this requirement before trying to run the Creator under their version of Basic.

Design Limitations/ Possible Enhancements

I could have made a number of modifications to the Creator. Customers, associates, dealers, and friends asked me, in nice and not so nice ways. One dealer threatened to pirate my software with his modifications if I refused to do them myself. I refused, anyway. As far as I know, he didn't pirate the software.

Here are the changes you might make, and the reasons I did not:

1. *Add a sort for the report program generator.* I didn't do this for several reasons. First, any Basic sort program would be too slow. Second, any assembler sort would be nontransportable. Third, sort programs (then and now) are cheap. Why should I waste my time reinventing the wheel for a small return in a crowded field?

Nonetheless, I did write a simple sort program for the Model II and the CP/M market. I came to regret it, too. Customers complained it was too slow and found numerous ways to make it even slower or fail to run at all. No sort in the world will sort a data file correctly when asked to sort the wrong field.

2. *Add user customization to the screen display.* I refused to do this because of memory problems. Fancy screen displays, in my opinion, are puffery for serious business applica-

Program Listing 2

```

10 CLS:PRINT"COPYRIGHT 1980 BY BRUCE W. TONKIN; ALL RIGHTS RESER
VED"
20 PRINT"SERIAL NUMBER=SAME AS CREATOR"
30 PRINT"THIS IS THE REPORT WRITING PROGRAM. CHOOSE ONE OF THE F
OLLOWING:"
40 PRINT"RUN A PREVIOUSLY WRITTEN PROGRAM.....DEPRES
S R"
50 PRINT"WRITE A NEW REPORT.....DEPRES
S W"
60 PRINT"EXIT THE PROGRAM.....DEPRES
S X"
70 PRINT:PRINT"PLEASE ENTER THE LETTER CORRESPONDING TO YOUR CHO
ICE";
80 A$=INKEYS:IF A$="" THEN 80 ELSE IF A$="R"THEN90 ELSEIF A$=
"W"THEN110 ELSEIF A$="X"THEN1870 ELSEPRINT"YOU MUST CHOOSE EITHE
R R, R, OR X. PLEASE TRY AGAIN.":GOTO30
90 PRINT A$
100 PRINT"WHAT IS THE NAME OF YOUR PROGRAM?";:LINEINPUTPN$:RUN P
N$
110 CLEAR 3000
120 PRINT A$
130 PRINT"WHAT IS TO BE THE NAME OF YOUR PROGRAM?";:LINEINPUTPN$

140 IF INSTR(PN$,"/")<1ANDINSTR(PN$,"/BAS")<1THENPN$=PN$+"/BAS"
150 OPEN"O",1,PN$:Q$=CHR$(34)
160 PRINT"WHAT IS TO BE THE TITLE OF YOUR REPORT? TYPE IT ON THE
NEXT LINE"
170 LINEINPUTT$
180 PRINT"WHAT FILE ARE YOU GOING TO READ FOR YOUR REPORT? TYPE
ITS"
190 PRINT"COMPLETE NAME. DO NOT OMIT THE FILE EXTENSION IF THERE
IS ONE."
200 LINE INPUTF$
210 PRINT"IS THE REPORT TO GO TO THE SCREEN OR THE PRINTER (S/P)
"
220 INPUT PR$:IF INSTR("SP",PR$)<1 THEN 210
230 IF PR$="S" THEN PR$="PRINT":CL$="CLS":GOTO250
240 PR$="LPRINT":CL$="LPRINTCHR$(12)"
250 PRINT#1,"10 CLEAR 5000"
260 PRINT#1,"30 T$=";Q$;T$;Q$;" 'REPORT TITLE"
270 PRINT#1,"40 OPEN";Q$;"R";Q$;"1,",";Q$;F$;Q$;" 'OPEN REP
ORT FILE"
280 PRINT"WHAT IS THE RECORD LENGTH OF EACH RECORD (1-255)";:INP
UT RL:IF RL>255 OR RL<1 THEN PRINT"INVALID.":GOTO 280
290 NR%=256/RL
300 PRINT"NOW YOU MUST DESCRIBE THE FIELDS IN EACH RECORD OF YOU
R FILE."
310 PRINT"YOU MUST GIVE THE FIELDS IN ORDER, FROM LEFT TO RIGHT.
TELL ME"
320 PRINT"HOW MUCH SPACE TO ALLOCATE TO EACH FIELD."
330 PRINT"WHEN YOU ARE DONE, TYPE IN 999 AS THE AMOUNT OF SPACE.
"
340 A=1:DIM F$(50),D$(50)
350 XZ=0
360 PRINT"FIELD NUMBER";A;:INPUT F$(A)
370 IF F$(A)=999 THEN410 ELSEIFF$(A)>RL THEN PRINT"INVALID. MUS
T BE NOT GREATER THAN RECORD LENGTH.":GOTO360
380 XZ=XZ+F$(A):IF XZ>RLTHENXZ=XZ-F$(A):PRINT"TOTAL EXCEEDS RECO
RD LENGTH":GOTO360
390 IFXZ=RLTHENA=A+1:GOTO410
400 A=A+1:GOTO360
410 XF$="FIELD 1,("+STR$(RL)+"(CT-1)) AS DUS,"
420 PRINT#1,"50 DIM F$(;A-1;);P(;"A-1;);P$(;"A-1;);C#(50),P#
(;"A-1;);C(50),C$(50),H$(50)":A=A-1
430 FOR I=1 TO A-1:XF$=XF$+MID$(STR$(F$(I)),2)+"AS F$(+"STR$(I)+
");":NEXT
440 XF$=XF$+STR$(F$(A))+ "AS F$(+"STR$(A)+")"
450 PRINT#1,"45 REM *****NOW WE DIMENSION THE MATRICES USED ****
"
460 PRINT#1,"55 REM *****HERE WE SET UP THE FIELDS IN THE FILE *
*****"
470 PRINT #1,"56 CT=0:RL=";RL
480 PRINT"WHAT ARE YOUR COLUMN HEADINGS TO BE? PLEASE SET UP A L
EGEND FOR"
490 PRINT"EACH COLUMN YOU WILL USE IN YOUR REPORT. TYPE IN 999 T
O END."
500 DIM C$(25)
510 B=1
520 PRINT#1,"65 REM *****FOLLOWING ARE THE COLUMN HEADINGS ****
"
530 PRINT"COLUMN NUMBER";B;:LINE INPUT C$(B):IF C$(B)="999"THENC
$(B)="" :B=B-1:GOTO550
540 B=B+1:GOTO530
550 LN=70
560 FOR I=1 TO B
570 I$=MID$(STR$(I),2):PRINT#1,LN;"H$(+"I$+)"=";Q$;C$(I);Q$;LN=L
N+10:NEXT
580 DIMT(50)

```

Continues on p. 89

Listing 2 continues

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Of course, you may be able to "force-fit" an application into some existing canned program you have, but to really get results, you need a separate application program to run on your computer.

Until now, that meant you were forced to pay money for application software off the shelf, or if you could afford it, have it custom written for you, or, if you are qualified, do it yourself...spending endless hours figuring it out and writing it. Now, your computer can write individual application programs for you. These programs are each separate, unique software programs that run in standard Basic on your computer.

A company named FutureSoft has developed this exciting and long awaited remarkable working tool for you. There are two versions called *Quikpro+Plus* and standard *Quikpro*. Both of them create unique separate Basic programs for you...to do exactly, precisely, what you want to do. And listen to this...you create a new program in minutes instead of hours.

You can quickly generate a new program when you want it. You can generate thousands of different unique programs, each one standing alone as a complete program that runs in Basic. Best of all, you do not have to be a programmer to do it. The *Quikpro* software becomes your personal programmer, waiting to do your work for you any time of day or night you choose to use it.

The custom programs you generate from this software provide for: Data Entry, Additions, Changes, Record Locating & Searches, great variety of Computations, and Report Printing (if you have a printer). It lets you decide what data to manipulate and how to manipulate it. It lets you decide the formats you want to appear on your screen and/or to print out in a report. It lets you use differing formats on the same data base. It lets you make calculations from data within records without altering the data base. It lets you report results with or without including the base data from which results were calculated.

All this is included in the ability/power of the program you create. You do it by simply answering questions that appear on your screen. Instantly, the *Quikpro* software instructs the computer to perform complex and



error free instructional sequences. You get the immediate benefits of professionally written software for your application.

The resulting custom program is truly a separate Basic program. You can list it, you can modify it, you can actually see what makes it tick. You can even ask it to print out its own operating instruction manual so others can run it for you. Finally, you can really tap the speed and power of your computer the way you really want. You can create new programs for every use you have in Business, Science, Education, and Hobby areas. And you can start now.

The software is available immediately from the creators. It comes in two versions. If you want to generate separate Basic programs with all the data handling plus Calculations and Report Printing features, you want *Quikpro+Plus*. Specify to run on TRS80 Model I and Model III at only \$149; to run on TRS80 Model II at \$189.

If you do not need Calculation ability or Report Printing in the separate Basic programs you will create from this program generating software, then standard *Quikpro* will do the job for you. Standard *Quikpro* to run on TRS80 Model I or Model III is \$89; to run on TRS80 Model II is \$129. (Later on you can always trade up to the Plus Versions for only the cost difference between the two).

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590 PRINT"WE NEED TO SET THE TABS FOR YOUR";B;"COLUMNS. INDICATE
THE SET:"
600 FORI=1TOB
610 PRINT"TAB SETTING FOR COLUMN NUMBER";I;";":INPUT T(I)
620 IF T(I)>255 OR T(I)<1 THEN PRINT"NOT A VALID TAB SETTING.":G
OTO610
630 NEXT
640 PRINT#1,"30050 DATA ";
650 FOR I=1 TO B-1
660 PRINT#1,T(I);";";
670 NEXT
680 PRINT#1,T(B)
690 LN=LN+10:PRINT#1,LN;"PG=1 'INITIALIZE PAGE COUNTER"
700 PRINT#1,LN+5;"REM*****NOW FOLLOWS THE RECORD RETRIEVAL SECTI
ON*****"
710 PRINT"DO YOU WANT THE PAGES NUMBERED (Y/N)?";
720 PG$=INKEY$:IFPG$=" "THEN720 ELSE IF(PG$<>"Y"ANDPG$<>"N")THEN
PRINT"INVALID ANSWER.":GOTO710
730 LN=LN+10:PRINT#1,LN;"FORI=1TO10000"
740 LN=LN+10:KZ=LN
750 LN=LN+10:PRINT#1,LN;"IFF$(1)<CHR$(1)THEN20000"
760 IFF$="Y"THENPRINT"HOW MANY LINES PER PAGE";:INPUTL
770 L=L-1
780 PRINT"THE DATA TO BE PRINTED IN THE VARIOUS COLUMNS OF THE R
EPORT"
790 PRINT"COMES FROM THE FIELDS IN THE RECORD. NOW WE MUST FIND
OUT WHAT"
800 PRINT"KIND OF DATA IS IN EACH FIELD. YOU MUST TELL ME IF IT
IS"
810 PRINT"CHARACTER (C), NUMERIC UNPACKED (N), PACKED INTEGER (P
I),"
820 PRINT"PACKED SINGLE PRECISION(PS), OR PACKED DOUBLE PRECISIO
N(PD). "
830 PRINT"YOU MUST DESCRIBE EACH FIELD IN THE RECORD. IF THERE I
S A FIELD"
840 PRINT"IN THE RECORD YOU ARE NOT USING, DESCRIBE IT AS CHARAC
TER(C). "
850 FOR I=1 TO A
860 PRINT"FIELD NUMBER";I;":LENGTH IS";F$(I);":DATA TYPE IS";:IN
PUTD$(I)
870 IFD$(I)<>"C"ANDD$(I)<>"N"ANDD$(I)<>"PI"ANDD$(I)<>"PS"ANDD$(I
)<>"PD"THENPRINT"C,N,PI,PS,OR PD ARE THE ONLY VALID DATA TYPES.":
GOTO860
880 IF D$(I)="PI"ANDF$(I)<>2THENPRINT"WRONG LENGTH FOR PACKED IN
TEGER.":GOTO860
890 IF D$(I)="PS"ANDF$(I)<>4THENPRINT"WRONG LENGTH FOR PACKED SI
NGLE PRECISION.":GOTO860
900 IF D$(I)="PD"ANDF$(I)<>8THENPRINT"WRONG LENGTH FOR PACKED DOU
BLE PRECISION.":GOTO860
910 NEXT
920 FORI=1TOA:PRINT"FIELD NUMBER:";I;"LENGTH=";F$(I);":TYPE:";D$(
I):NEXT
930 PRINT"ARE THESE FIELD DEFINITIONS CORRECT? DEPRESS N FOR NO.
"
940 JX$=INKEY$:IFJX$=" "THEN940 ELSEIFJX$<>"N"THEN980
950 PRINT"WHICH FIELD IS NOT CORRECT? TELL ME THE NUMBER.":INPUT
I
960 PRINT"WHAT IS THE DATA TYPE?";:INPUT D$(I):IFD$(I)<>"N"ANDD$(
I)<>"C"ANDD$(I)<>"PI"ANDD$(I)<>"PS"ANDD$(I)<>"PD"THENPRINT"INVA
LID TYPE.":GOTO960
970 IF(D$(I)="PI"ANDF$(I)<>2)OR(D$(I)="PS"ANDF$(I)<>4)OR(D$(I)="
PD"ANDF$(I)<>8) THENPRINT"WRONG LENGTH FOR DATA TYPE.":GOTO960
980 PRINT:FOR I=1 TO A
990 LN=LN+10:IFD$(I)="C"ORD$(I)="N"THENPRINT#1,LN;"P$(";I;")=F$(
";I;)"
1000 IFD$(I)="PI"THENPRINT#1,LN;"P(";I;")=CVI(F$(";I;"))"
1010 IF D$(I)="PS" THENPRINT#1,LN;"P(";I;")=CVS(F$(";I;"))"
1020 IF D$(I)="PD" THENPRINT#1,LN;"P#(";I;")=CVD(F$(";I;"))"
1030 NEXT
1040 PRINT"NOW WE MUST DESCRIBE WHAT IS TO GO INTO THE COLUMNS O
F THE"
1050 PRINT"REPORT. YOU MUST WRITE SENTENCES OF THE FOLLOWING FOR
M:"
1060 PRINT"COLUMN(5)=FIELD(2)+FIELD(5) "
1070 PRINT"COLUMN(1)=(FIELD(2)-FIELD(6))/FIELD(7)
1080 PRINT"IF COLUMN(3)=";Q$;"JOHNSON";Q$;"THEN COLUMN(3)=473.6
4"
1090 PRINT"V1=COLUMN(1)/COLUMN(2):V2=100*V1:COLUMN(3)=V2
1100 PRINT"IF FIELD(3)=<0 THEN SKIP"
1110 PRINT"IF FIELD(4)<100 OR FIELD(7)=";Q$;"LAWYER";Q$;"THEN S
KIP"
1120 PRINT:PRINT"WHERE THE V ARE WORK VARIABLES AND THE COLONS C
AN BE USED TO"
1130 PRINT"SEPARATE ANY ADDITIONAL COMMANDS YOU MAY WANT TO EXEC
UTE ON THE"
1140 PRINT"SAME LINE. THE COMPUTER READS THE COMMANDS FROM LEFT
TO RIGHT."

```

Listing 2 continues

A Word About Documentation

Frankly, the original documentation for the TRS-80 Model I and II versions of the Creator and Reporter was not very good. All the information you'll probably need was there—somewhere. Finding it was a little tricky. I don't think I write that poorly. But I made several errors when writing the manual. Here's where I went wrong.

First, I wrote the entire manual on a typewriter. After you've typed 60 or 80 pages, you'll find that it's too late and too frustrating to revise and add material. Proofreading is more trouble than it should be. Making copies is a chore.

I suggest that you write your manual with a word processor. Any is better than none at all—it is not possible to do worse than with a typewriter and paper.

Second, I wrote the manual myself. Nothing wrong there, except that I wrote the programs. It's difficult for a programmer to anticipate the questions and errors a user might make. If you must write the manual yourself, have some interested and intelligent nonprogrammer read your copy and make suggestions. Then give the manual to several idiots and ask them to run your program. Watch how they go wrong and take notes, but do not help them. When you've recovered from the shock, rewrite your manual and try the whole procedure again. Repeat, using different idiots, until even they get everything right.

Third, one of the associates absolutely insisted that the manual be retyped to make a camera-ready copy. If you use a word processor, do not (under any circumstances) permit this step. When my Apple manual was retyped, it ended up with over 100 typographical errors (the associate didn't believe in proofreading), some of which were disastrous. The first 100 copies had to be discarded, and this was the single act that led to the demise of the corporation.

Beg, borrow, or steal a good letter-quality printer. Dump your manual to it. Any error will be yours.

Fourth, be careful to organize your manual well. Include plenty of indexes, and a table of contents. The contents should be organized logically, so that anyone running the program will not be skipping from one section to another. Put anything technical in appendices.

Fifth, include lots of examples, including at least one complete run-through of your program.

Finally, be prepared to have users ignore the manual, and reviewers criticize it for shortcomings. My experience has been that only about 20 percent of the

Continued from p. 86

tions. Furthermore, after investigating the matter, I decided that the questions I would have to ask, and the possible input errors I would need to check, would require enough memory to demand a 48K machine. Not only that, but such routines would make the Creator and the generated programs less transportable.

3. Add routines to mask input, character by character, for undesirable responses. Again, Basic was too slow and assembler too nontransportable. Even worse, such routines seem to provoke garbage collection on the part of the Microsoft interpreter; the worst time to have something like garbage collection is during data input. I thought this modification would be a terrible one, and still do.

4. Add more features: more error checking, more help messages, flexible levels of help messages, etc. The problem here was simple. I wanted to do this, but memory limitations did not permit it.

5. Separate the "get the user response" section from the "generate code" section. I thought about this and rejected it for the TRS-80 market. The modification was attractive and would have freed more memory for each module, but it would have made the Creator more complex to operate and would have demanded a more sophisticated operator than I saw at the time. I still think this was the right decision; I can remember getting some unbelievable calls for support from people who didn't know how to format disks, enter Basic, or load programs. Adding another program module meant another module to destroy or misunderstand.

I made this modification for the CP/M market. The file containing the operator responses looks like a Basic program to the Microsoft interpreter, and can be loaded and modified without rerunning the program generator. The "generate program specifications" module is separate from the "generate a program from specifications" module. Indeed, the latter consists of three separate programs, in the CP/M version. Operators haven't had much trouble with this, so perhaps I was wrong to leave it out of the TRS-80 version.

Continues on p. 91

"I BOUGHT IT" "My biggest loss of programming time using Snappware's EXTENDED BASIC is spent inserting my diskette."

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```

1150 PRINT"*=MULTIPLICATION, /=DIVISION, [=EXPONENTIATION, -=SUB
TRACTION,"
1160 PRINT"AND + IS EITHER ADDITION OR CONCATENATION."
1170 PRINT"DEPRESS ANY KEY TO CONTINUE."
1180 AN$=INKEY$:IFAN$="" THEN1180
1190 CLS:PRINT"YOU MUST REMEMBER TO ENCLOSE CHARACTER DATA WITH
QUOTES."
1200 PRINT"YOU MUST ALSO REMEMBER TO PUT A $ SIGN AFTER A COLUMN
"
1210 PRINT"WHICH WILL PRINT STRING DATA. PLEASE REVIEW YOUR MANU
AL."
1220 PRINT"BECAUSE THIS IS VERY IMPORTANT! FOLLOW THE EXAMPLES G
IVEN."
1230 PRINT"COLUMNS WHICH CONTAIN DOUBLE PRECISION NUMBERS SHOULD
BE"
1240 PRINT"INDICATED BY APPENDING A # SIGN, AS IN THE EXAMPLES."
1250 PRINT"YOU CAN STORE RUNNING TOTALS WITH STATEMENTS LIKE:"
1260 PRINT"V3=V3+FIELD(6)"
1270 PRINT:PRINT"YOU MAY TYPE AS MANY MANIPULATIONS AS YOU WANT
FOR ANY COLUMN"
1280 PRINT"IN ANY ORDER. TYPE IN 999 <ENTER> WHEN YOU ARE COMPLE
TED."
1290 M$=STRING$(50,32)
1300 LINEINPUTSX$:IFSX$="999" THEN1470
1310 C=INSTR(SX$,"FIELD"):IFC>1 THENSX$=LEFT$(SX$,C-1)+"P"+MID$(S
X$,C+5):GOTO1310
1320 IFC=1 THENPRINT"FIELDS CANNOT BE REDEFINED. PLEASE REVIEW DO
CUMENTATION.":GOTO1300
1330 D=INSTR(SX$,"COLUMN"):D1=INSTR(SX$,"=")
1340 C=INSTR(SX$,"OLUMN"):IFC>1 THENSX$=LEFT$(SX$,C-1)+MID$(SX$,C
+5):GOTO1340
1350 IFC=1 THENPRINT"SYNTAX ERROR.":GOTO1300
1360 PRINT"IS THIS OK? IF NOT, DEPRESS N TO DELETE THE INSTRUCTI
ON."
1370 JX$=INKEY$:IFJX$="" THEN1370 ELSEIFJX$="N" THEN1300 ELSEPRINT
"OK, READY FOR NEXT COMMAND (999 TO EXIT)"
1380 IF LEFT$(SX$,1)="V" OR LEFT$(SX$,2)="IF" THEN LN=LN+10:PRIN
T #1, LN;SX$:GOTO 1300
1390 IFD<ORD1<D THENPRINT"WAIT A MINUTE. . .INVALID COLUMN DEFIN
ITION: RE-INPUT.":GOTO1300
1400 LN=LN+10:PRINT#1, LN;SX$
1410 D=INSTR(SX$,""):D1=INSTR(SX$,""):D$=MID$(SX$,D+1,D1-1)
1420 D=INSTR(D$,""):IFD=1 THEND$=MID$(D$,2):GOTO1420
1430 IFD>1 THEND$=LEFT$(D$,D-1):GOTO1420
1440 D=VAL(D$)
1450 IF INSTR(SX$,"$")>0 AND(INSTR(SX$,"$")<INSTR(SX$,"=")) THEN
MID$(M$,D,1)="S":GOTO1460
1451 IF INSTR(SX$,"#")>0 AND(INSTR(SX$,"#")<INSTR(SX$,"=")) THEN
MID$(M$,D,1)="M":GOTO1460
1452 MID$(M$,D,1)="D"
1460 GOTO1300
1470 LN=LN+10:PRINT#1, LN;"M$=";Q$;M$;Q$
1480 IF PR$="PRINT" THEN LN=LN+10:PRINT#1, LN;"IFL=0 THENCLS:PRINT
TAB(30);T$:";GOTO 1500
1490 LN=LN+10:PRINT#1, LN;"IFL=0 THEN";PR$;"CHR$(12);TAB(30);T$:";
1500 IF PG$="Y" THENPRINT#1, PR$;" TAB(65);";Q$;"PAGE NUMBER";Q$;"
;PG" ELSE PRINT#1," "
1510 LN=LN+10:PRINT#1, LN;"IF L=0 THEN ";PR$;";GOSUB30000"
1520 PRINT#1,"30000 FOR J=1 TO";B
1530 PRINT#1,"30010 READ T:;PR$;" TAB(T);H$(J);"
1540 PRINT#1,"30020 NEXT:RESTORE"
1550 PRINT#1,"30030 ";PR$;";RETURN"
1560 LN=LN+10:PRINT#1, LN;"FOR J=1 TO";B
1570 LN=LN+10:PRINT#1, LN;"IF MID$(M$,J,1)=";Q$;"S";Q$;" THEN READ
T:;PR$;" TAB(T);C$(J);"
1580 LN=LN+10:PRINT#1, LN;"IF MID$(M$,J,1)=";Q$;"D";Q$;" THEN READ
T:;PR$;" TAB(T);C(J);"
1590 LN=LN+10:PRINT#1, LN;"IF MID$(M$,J,1)=";Q$;"M";Q$;" THEN READ
T:;PR$;" TAB(T);C#(J);"
1600 LN=LN+10:PRINT#1, LN;"NEXT:;PR$;";RESTORE"
1610 LN=LN+10:PRINT#1, LN;"L=L+1:IFL>";L;" THENPG=PG+1:L=0"
1620 LN=LN+10:PRINT#1, LN;"NEXT"
1630 PRINT#1, KZ;"FIELD 1, (";RL;"*(CT-1)) AS DU$;";RL;" AS ZU$:GE
T 1,1+(I-1)/;NR$;"):IF ZU$=STRING$(;RL;"",255) OR ZU$=STRING$(
;RL;"",250) THEN;LN
1640 PRINT #1,KZ+1;"IF ZU$=STRING$(;RL;"",0) THEN 20000"
1650 PRINT#1,KZ+5;XF$
1660 PRINT#1,KZ-5;"CT=CT+1:IF CT=";NR$+1;" THEN CT=1"
1670 PRINT#1,KZ+7;"GET1,1+(I-1)/;NR$
1680 CLS:PRINT"HAVE YOU SAVED ANY TOTALS YOU WANT PRINTED AT THE
END? (Y/N)"
1690 YN$=INKEY$:IF YN$="" THEN1690 ELSEIF(YN$<>"Y"ANDYN$<>"N") THE
NPRINT"Y OR N ONLY, PLEASE.":FORI=1TO300:NEXT:GOTO1680
1700 PRINT#1,"30040 REM*****THESE ARE THE TAB SETTINGS*****"
1710 PRINT#1,"29990 REM*****BEGIN PRINTING COLUMN HEADINGS*****"
1720 IF YN$="N" THENPRINT#1,"20000 CLOSE:END":GOTO1870
1730 PRINT"THEN YOU MUST TELL ME WHICH VARIABLES YOU WANT PRINTE
D IN WHICH"

```

Listing 2 continues

program's users will read the manual, and only about 10 percent of that 20 percent will read it thoroughly. The remaining 90 percent will get frustrated and either throw the program out (and ask for a refund), work through the problem somehow, or give up and read the manual. We gave refunds to about 5 percent of our buyers.

Unfortunately, writing a program that doesn't need a manual makes the program attractive to pirates. Pirates don't like to copy documentation: It's expensive to do it right.

Why I Gave Up on Tandy

You'll notice that I could have made several improvements to the Creator that would have increased its usability, not to mention its salability. I never got around to it because I stopped writing software for the TRS-80 almost two years ago, when my company dissolved and I sold my Model I in favor of the CP/M-based Altos 8000-2.

I do not wish to take a step backward and return to the Radio Shack market. Here are some reasons why.

I thought then that TRSDOS would never be a standard operating system, that the "big" manufacturers would surely and soon enter the microcomputer marketplace, and that CP/M would offer much more future potential. Further, the little TRS-80 was unhealthy from the first day I had it. Mean time to disk-drive failure was about five days; mean time to repair was two. The local dealer was helpful—he even lent me replacement drives—but the annoyance and downtime was aggravating.

The Model II was annoying, as well. The TRSDOS on that machine was as buggy as the TRSDOS on the little one, and the machine didn't like to run on hot days at all. I had CP/M for that machine, bought from Pickles and Trout, but I had no faith in the hardware. (By the way, Pickles and Trout's CP/M is good, and I recommend it.)

Even worse, the Model II TRSDOS kept being modified. The modifications were the sort that changed the disk format, space available, and other low-level things. They meant that the program written for one DOS release was incompatible and unreadable under another. After several such modifications, any user would have to go through several transfer programs to successfully upload a program. I felt that such DOS modifications were an indication that TRSDOS was going to be unusable.

The Model II TRSDOS also had some features I didn't like at all. A one-

6. Allow automatic overflow of records from drive to drive. I didn't want this modification at all. It would not be transportable. Another more important reason is that it would demand that you place each disk on a special drive and/or that the program detect how many drives/disks were in place. This would be nontransportable and an easy place for errors. To this day, I have no doubt whatsoever about the correctness of my decision here.

7. Since "everyone" was running (choose one or more: NEWDOS, NEWDOS80, LDOS, ULTRADOS), add enhancements for a version for that operating system. This turned out to be both an easy and a hard decision. I felt, then, that TRSDOS was terrible, but I wanted to stay transportable. I was only one man, and my associates wanted a version for the Apple (shudder) and the PET (two shudders) and other machines—even other languages. I didn't see how I could possibly support all those different versions, make enhancements, provide customer support, check ad copy, eat and sleep at one time. I was, after all, working about 14 to 16 hours a day, seven days a week. Nor could the company afford to hire any help for me.

8. Make the generated program faster. Actually, this was a continuing project. I have little doubt that the program would be even more streamlined today if I had continued with the TRS-80. Still, I feel I could have done little to the program to appreciably speed its operation beyond its present abilities. One thing now possible is the Microsoft compiler for TRSDOS programs. Both the Creator and the generated programs could be compiled; the only changes in the generated program, I believe, would be the replacement of the New command with an END, and inserting spaces where required.

9. Reduce the memory requirements in the generated program. This was a battle. I could have made the generated program smaller than it was, but at the cost of increased size in the Creator and decreased modularity and modifiability in the generated program. I struck a compromise I felt was fair.

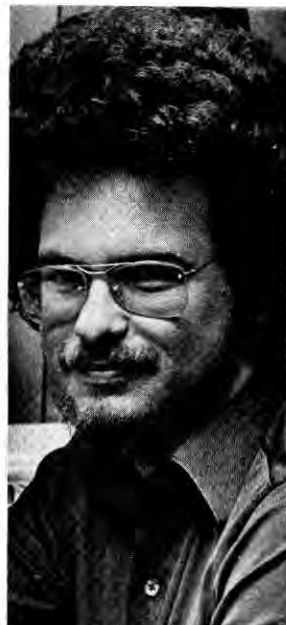
10. Allow more fields in the gener-

Continues on p. 92

"I BOUGHT IT"

"My biggest loss of programming time using Snappware's EXTENDED BUILT IN FUNCTIONS is spent inserting my diskette."

SCOTT ADAMS - PRES. OF ADVENTURE INTL.



Snappware's EXTENDED BUILT IN FUNCTIONS is a collection of much needed additions to the TRSDOS* BASIC interpreter which greatly extends its convenience and utility. The following features become part of your BASIC language and provide the enhancements without requiring any additional memory. The most important component of EXTENDED BUILT IN FUNCTIONS is an in-memory sort routine, guaranteed to be the fastest general purpose in-memory sort on the market. Along with this you also receive other EXTENDED BUILT IN FUNCTIONS. Here is a sampling:

- SRT**—Sorts one or more arrays into a specified sequence
- FMT**—Arranges data into a string variable as with PRINT USING
- PDAT/UDATS**—Permits user to do arithmetic on dates.
- PKS/UPKS**—Compresses strings to save disk space.
- ETIMS**—Shows the difference between two times.
- CLEAR**—Specifies the number of file blocks to be allocated when you specify high memory and string space.
- DELETE**—Allows you to dynamically remove portions of a BASIC program.

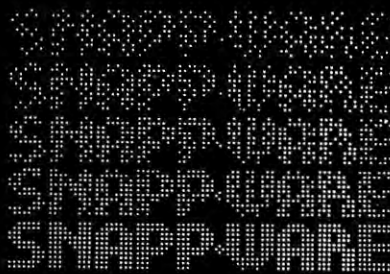
In addition to these, there are functions unique to Model II and to Model III. The exclusives to Model II are long error messages and PEEK/POKE. The exclusives to Model III are:

- SWAP**—Supports exchange of variables with a single statement.
- HEXS**—Converts numbers to hexadecimal strings.
- RESTORE**—Allows you to set READ pointer to location of choice.

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Listing 2 continued

```
1740 PRINT"COLUMNS. I WILL GIVE YOU TWO DUMMY VARIABLES CALLED"  
1750 PRINT"T$ AND B$. T$ IS THE WORD TOTALS, AND B$ IS BLANKS."  
1760 PRINT"IF YOU WANT TO PRINT THE WORD TOTALS IN ANY COLUMN, T  
ELL ME TO"  
1770 PRINT"PRINT T$; IF YOU WANT TO SKIP A COLUMN, TELL ME TO PR  
INT B$."  
1780 LN=20000:PRINT#1,LN;PR$  
1790 LN=LN+10:PRINT#1,LN;"T$=";Q$;"TOTALS";Q$;"B$=CHR$(32)"  
1800 FOR I=1 TO B  
1810 PRINT"VARIABLE TO PRINT IN COLUMN NUMBER";I;"":LINE INPUT  
SX$  
1820 LN=LN+10:PRINT#1,LN;"READ T:";PR$;" TAB(T)";SX$;" "  
1830 NEXT  
1840 LN=LN+10:PRINT#1,LN;CL$  
1850 LN=LN+10:PRINT#1,LN;"CLOSE:END"  
1860 PRINT#1,"19990 REM*****PRINTING TOTALS SECTION*****"  
1870 CLOSE:END
```

disk system required the operating system on all disks at all times, meaning I would have to ignore Tandy's copyright or sell every purchaser another copy of TRSDOS with each purchase of my software. Since every purchaser of a Model II got TRSDOS with his machine, this meant I had to sell him something he already had!

I called Tandy, leaving my name and phone number. I told them I intended to sell copies of the software with TRSDOS on the disk, and might require the purchasers to verify that they already had purchased TRSDOS; if this was illegal, please have someone at Tandy or Radio Shack contact me and tell me what I must do. I never heard from them. TRSDOS turned out to be unnecessary, after all. Anyway, I thought their approach was dumb and probably illegal.

The Model II had no PEEK and POKE commands. Factory software support was, I felt, miserable. On the other hand, the CP/M machine was never down. We even shipped it to the

NCC and back one year as baggage, and accidentally dropped it on the marble floor in Chicago's Northwestern station just before a demonstration. In fact, that machine went almost three years before anything at all went wrong with it (a bad transistor in the power supply), and downtime then was one day. I have had very good luck with my Altos 8000-2.

The CP/M Microsoft Basic 5.2 was better than the TRS-80 Basic, as well. Program chaining with saved variables, 40-character variable names, While... Wend loops, and a good compiler were available. The CP/M machine also had more disk space, and (at my actual incomplete count) 69 languages or versions of languages available. This meant a lot of flexibility. All this cost less than the Model II!

The CP/M operating system had no discernable bugs, ran fast, and was well supported. I was not tied to one company for languages and utilities. An assembler/editor came with the system. About 16 megabytes of public-domain

Continued from p. 91

ated program. This modification was, and is, fairly easy to make. You will note that the generated program contains an On...GOSUB construction. The present limitation of 22 to 24 fields is solely dependent on Basic's maximum line length. By weeding out spaces in the generated code, this could be increased to 47. By generating a GOSUB to a program section containing a number of consecutive On...GOTO lines, any number of fields can be accommodated. This is necessary, because an On...GOTO will fall through when an over or underflow occurs, whereas an On...GOSUB over- or underflow returns an

error. The CP/M version, for that reason, permits up to 500 fields, limited only by memory.

11. Make it easy to use the report program with sort programs. I never thought such use was difficult. The CP/M version will allow the specification of a sort index for a report at runtime, but the TRS-80 version can be so modified with a simple bit of code: to the generated report program, add one line opening an index file as a sequential input file, file number 2. This index file should contain the record numbers to read, in sorted order. Then alter the beginning of the record read loop from "GET 1,I" to "IF EOF(2) THEN 20000:ELSE INPUT #2,K:GET 1,K". That's it! ■

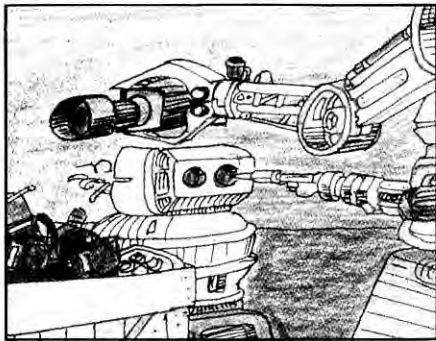
software was available, for about \$8 a disk. This software included languages (like Pilot, Stoic, Algol, and Basic-E), communications programs, applications software, games, and so on. I knew I'd have a long wait before I saw any of that stuff from Tandy.

The decision I made was easy, and I have yet to regret it. I said goodbye to the Model I (and the Model II) and kept the Altos.

The Ill-Fated Apple/PET Versions

After about a year of my associate's cajolery and threats, I succeeded in getting someone to help me do an Apple version. I needed help, since I didn't have any knowledge of the Apple. I even got one.

I hated the Apple, hated Apple's DOS, doubly hated Applesoft (not even an Else statement!), disliked the compromises necessary with the Apple version, and gave the machine to one of my associates at the first opportunity, about three months later. Even today, I



never want to see another Apple again. I will have to admit that the Apple never broke, though.

I never wrote a version for the PET. I got as far as reading the PET DOS manual, decided the machine was unsuitable for anything to do with business applications (especially my program), and told my associates NO. In fact, I told them I'd leave if they ever brought it up again.

What I really wanted to do was a CP/M version with the (then new) Microsoft Basic compiler and Microsoft Basic 5.2.

Have fun with the programs. Write me if you have questions about my experiences, comments about my decision, or just want to share some experiences. I will do my best to reply, but I have a family to support so please understand: I may be too busy. I will read your letters with interest, though. I may even read the ones I'll probably get from Tandy, Apple, and Commodore. ■

(Continues)

"I BOUGHT IT" "My biggest loss of programming time using Snappware's AUTOMAP and AUTOFILE is spent inserting my diskette."

SCOTT ADAMS - PRES. OF ADVENTURE INTL.



When working with direct files or creating a formatted screen, Autofile and Automap are indispensable aids.

Autofile is designed to automate for the BASIC programmer the task of moving data elements to and from a direct file. Previously, this was a time consuming chore because the FIELDed variables may not be directly referenced by user logic. The FIELD statement was eliminated, thereby relieving you of the guessing game as to where the FIELDed variable is. In addition, the LSET and the CVx functions are performed automatically. The software, when installed, becomes part of your BASIC interpreter providing the enhancements without additional memory.

Automap is designed to automate for the BASIC programmer the task of presenting information on the video display and accepting information from the keyboard operator. The software consists of two main components: the OFF-LINE COMPONENT used to describe to the system the screen formats and the ON-LINE COMPONENT from within your BASIC program to initialize a screen, send data to the video display and receive data from the keyboard operator. This facility when installed, becomes part of your BASIC interpreter.

Both products complement one another and, if used in conjunction, can save a significant amount of programming time.

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Sketchy Documentation

Though this is not intended to be a complete set of instructions to all of the features of the Creator, the following should let you successfully run the program. The Creator and the Reportor (the report program generator) come as disk-based programs, called CREATOR/BAS and REPORTOR/BAS. The disk also includes two demonstration programs, which are not provided here for reasons of space.

The Creator and Reportor come on a nonbootable disk. For \$10, I cannot afford to provide a DOS or a loader. If you have a single-drive system and your DOS requires that the disk in drive 0 have an operating system, find a friend with a two-drive system and copy the Creator disk to a disk with a system on it.

How to Load The Programs

Enter Basic. The default number of files is all right. To run the Creator, just type RUN"CREATOR/BAS:x", where x is the drive number on which the Creator disk is loaded.

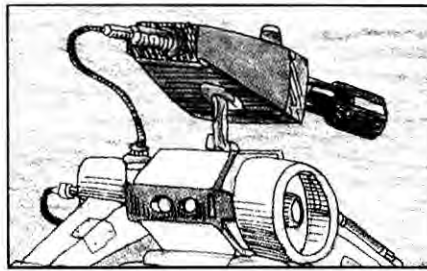
Questions Asked by the Creator

The questions asked, in order, are:

1. What's the name of the program being generated? Use up to eight alphabetic characters.
2. Which drive will contain the data file when the generated program is run? Enter a number, depending on the number of drives in your system.
3. Which drive do you want this program written on?
4. What is the maximum number of records desired in the file? Enter a number of reasonable value.
5. What is the record length?

Questions four and five generate a check to see if the file will fit on a standard Model I disk; you might want to modify the check in Creator if your DOS permits more file space on a single disk. The Creator will generate a program that will block and deblock records within a sector (but will not span sectors); you will need to modify the Creator and Reportor if your Basic allows the specification of different-size records. Record length may be anything up to 255 bytes.

6. What will be the title of your program? Enter up to 250 characters.



Please do not enter anything with quotation marks.

7. Do you want to use an exit code or message? This question will allow you to specify a character or group of characters that will allow you to exit data entry/update/retrieval and return to the menu. You'll never need to depress the break key to exit your program.

8. If seven is answered Y: What is your exit code or message? Do not use quotation marks.

9. Now comes a repetitive series of questions for each field you will be using. First you are asked for the field size: packed fields can be eight, four, or two bytes, and character or unpacked numeric fields can be from 1 to 255 bytes in length. You are then asked if the size you choose was correct. The Creator will tell you how many spaces you have left and proceed to the next field until no space remains in the record.

10. What field is the key field? Input the field number of the field by which data will be retrieved. This field must not be a packed field.

11. Now comes another series of repetitive questions. Each field is covered, in order.

You must first tell the Creator the operator prompt that will request input for each field. This prompt must not contain quotation marks, but can contain anything else.

You are then asked to tell the Creator what kind of data is being stored in each field. Your options are:

- PI (Packed integer: whole numbers from -32767 to 32767).
- PS (Packed single precision: floating-point numbers with six significant digits).
- PD (Packed double precision: 16-digit, floating-point numbers).
- C Character data.

- N Unpacked numeric data. Treated exactly as character data.

You will then be asked for edits and error messages. The edits you may choose will determine the kinds of acceptable responses the generated program will accept.

When requesting edits, the program will display the message:

BAD INPUT IF:

Here are the permissible edits:

- NOT NUMERIC (Operator input contains nonnumeric characters).
- NOT ALPHA (Operator input contains digits).
- CONTAINS"XX" (Forbidden character string contained in input).
- NO ENTRY (Operator attempts to skip a field input). Note: The key field must use this edit.
- LENGTH>xx (Supply a maximum length for entry to this field).
- LENGTH<xx (Supply a minimum length for an entry to this field).
- LENGTH = xx (Supply a forbidden length).
- LENGTH< = xx LENGTH> = xx LENGTH<>xx
- <"abc" (Supply a character string. If the operator inputs a string alphabetically less than the string you supplied, the input will be flagged as erroneous).
- >"abc" <="abc" >="abc" = "abc" < >"abc"
- <xx.yy (Supply a number. If the number input is less than the number you choose, the input will be flagged as erroneous).
- >xx.yy <= xx.yy >= xx.yy = xx.yy < >xx.yy

Compound edits are permitted; every edit past the first one must refer to the field as G\$(X), where X is the field number. Compound edits can be quite complex to implement; a little experimentation will serve to show you what techniques will work. For example:

>xx.yy OR VAL(G\$(4))<VAL(G\$(3))

is a compound edit that will not permit the entry of a number to field 4 that is either >xx.yy or less than the numeric value of field 3. You don't need to

choose any edit (except, as noted, for the key field). Further, you can use as many edits as you want. You will, for each edit, be asked for an error message. The message you choose will be displayed if the edit is violated. Error messages are not mandatory. If an error message is used, it cannot contain quotes.

12. When you're done entering prompts, edits, and error messages for each field, you'll be asked for field titles. When the record is retrieved and displayed, these titles will appear next to each field's data.

13. You will then be asked for a termination message. This message will be something of the form:

ARE YOU DONE ENTERING DATA (Y/N)

14. You will be asked for two permissible single-key depressions. In this case, the first one, applied if the operator is done, would be Y; the second, if the operator is not done entering data, would be N. When the generated program is being run, (in this case) a response of Y will return the operator to the menu and a response of N will continue with data entry.

When this last question has been completed, your program is done. You can load it or run it; it's ready to go. *Don't forget: you must initialize your data file before entering any data!* The initialization option will appear in the menu of your generated program. The load may take a little while. Your program will be saved on the disk you indicated earlier as a text (ASCII) file, and the lines are out of order. If you want to arrange for speedier program loads in the future, just load and resave your program in the normal way. Future loads will be quite rapid.

Updating Your Records

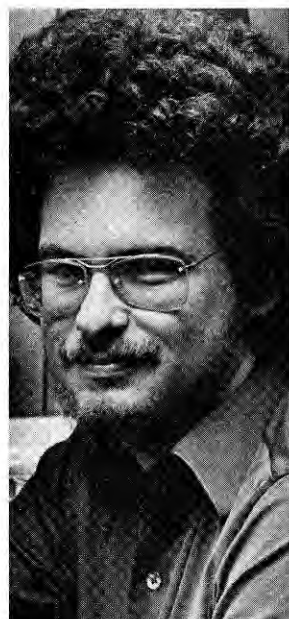
You can update records in any of several ways. You can update a field by choosing the update option in your generated program's menu, and then entering the record's key and the field number to update. You can then directly enter the updated value for the relevant field. If the field is a packed field, you can update the field computationally. This is done by entering a numeric value followed by the operator you choose. Permissible operators are +, -, MORE, and LESS.

Continues on p. 96

"I BOUGHT IT"

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SCOTT ADAMS - PRES. OF ADVENTURE INTL.



The Snappware College Educated Garbage Collector (SNAPP-VI) is an intelligent processing function which greatly improves performance of typical BASIC applications. And here's why.

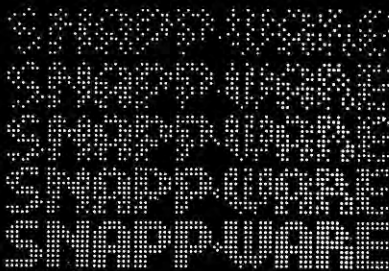
Microsoft uses a 'variable length string' in the BASIC interpreter. Each time the string is assigned a new value, it is relocated in a string pool. Periodically the string pool must be reorganized and condensed into a single contiguous area. Performing this string space reclamation is time consuming and inefficient because this approach evaluates and collects each string individually. The time required is roughly proportional to the square of the number of active strings in the resident program. During reclamation the system seems to 'lock-up' and does not respond to the operator until the process is completed.

This time consuming approach requires a better solution. Snappware has developed a solution which takes advantage of the auxiliary memory available. SNAPP-VI requires only four bytes per active string as a work area. When free storage space is available, our system temporarily borrows, uses and returns the space to the free storage pool when completed. If storage is not available, our system will temporarily transfer out to disk enough of the BASIC program to make room for our work area and return the 'paged out' information to its correct location when completed. Benchmarked times show, in some situations, SNAPP-VI performs one hundred times as fast as the Microsoft approach.

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For example, updating a field containing the value 34.56 by entering 1.23 + will produce an updated field value of 35.78. This is especially handy for inventory, accounts-receivable, and accounts-payable applications. When your record has been updated, you can choose to update one or more additional fields, or you can choose to return to the menu. You can update the key field, if you wish.

The Reportor

Suppose you've generated your data file. The next thing you might want to do is print a list of the information contained in the file. You might want to perform computations, obtain totals, or skip certain records. The Reportor will let you do it.

You can generate your report so that the report is printed to the screen, or so that the information is sent to your printer. The CP/M version will let you choose either or both options at the time the report program is being run.

You can load and run the Reportor by entering Basic and entering the command:RUN"REPORTOR/BAS:x", where x is the drive number on which the Reportor can be found.

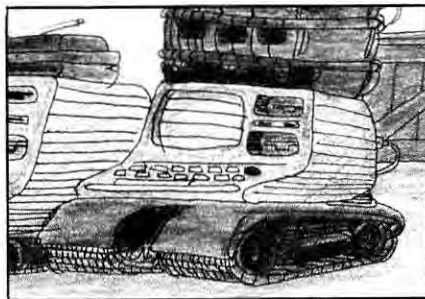
Here are the questions asked by the Reportor:

1. Do you want to write a new program, run a program, or exit? Choose the appropriate option.
2. What is the name of the proposed program? Up to eight uppercase letters can be used. Do not choose a name identical to the name of another program on the same disk, or the old program will be overwritten.
3. What will be the title of the report? This is the title that will be printed on the top of each page of the report. Do not include quotation marks, please.
4. Do you want the report printed on the screen or the printer?
5. What is the name of the data file to read? Please include the full file name, including the password (if any). If you make a mistake here, you can correct the generated program in line 40, later.
6. What is the record length of each record in the data file? Answer this as you did when running the Creator.
7. Now follows a series of repetitive questions asking about the field

lengths for each field in the data file. You need not answer with the same numbers as earlier; however, the total of the field lengths must be the same as the record length.

8. Now you are asked to enter the column headings for each of the columns you'll be using in your report. You can have more columns than fields, since one or more columns can be derived or computed. You can also have fewer columns than fields. Your column headings can include spaces, but should not include quotation marks.

9. What are the tab settings for each column of the proposed report? Enter numbers from 1-255. You can get some pretty fancy printing results by requesting that one column's tab be less than or equal to a previous col-



umn; Basic will print that column at the correct tab position, but one line down. Ordinarily, I use this approach when printing mailing labels. You can also use tab settings greater than the width of the paper to achieve similar results.

10. Here, the Reportor will want to know if you want the pages numbered, and the number of lines per page. You can have as many lines per page as you want. For mailing labels, I suppress the printing of the headings and title (after the first time) by telling the Reportor that I don't want the pages numbered, and I want 1,000,000 lines per page. This should be sufficient: 1,000,000 lines, at 300 lines per minute, takes 3,333.33 minutes (about 3.5 weeks). If not, tell the Reportor you want 10,000,000 lines per page. You either have an extremely fast printer or an awful lot of patience.

11. Now you will see a screen full of information, telling you about the ways you can manipulate the data.

You'll need to remember only a few things:

- COLUMN(K) is the Kth column of

your report.

- FIELD(K) is the Kth field of your record.
- Any packed fields are automatically unpacked.
- If any field or column is either double precision or a character string, you must explicitly state that fact. For example, COLUMN\$(K) is the Kth report column, and it contains character data. COLUMN#(K) is the Kth report column, and it contains double precision data. FIELD\$(K) is the Kth field of the record, and that field contains string data.

12. You are then asked to state the data type for each field, just as with the Creator. The permissible data types are C, N, PI, PS, and PD. C and N are treated identically.

13. Using the information from (11), you then state what you want printed in each column. You can state your requirements in any order you like. Any operation permitted in Basic is allowed. (If you have unpacked numeric data, be sure to convert the data to numbers using the VAL function before using that data in calculations.)

Here are some examples of permissible operations, so you get the idea:

```
COLUMN(4)=FIELD(5)
COLUMN(5)=VAL(FIELD$(7))/FIELD#(6)
COLUMN#(9)=(FIELD(4)-FIELD(2))/
INT(COLUMN(5))
IF COLUMN(3)=0 THEN SKIP
COLUMN$(1)="THIS IS THE NAME"
+FIELD$(4)
IF COLUMN(7)>1000 THEN COLUMN$(10)
="INVALID BALANCE"
IF COLUMN(6)<>0 THEN COLUMN(9)=
COLUMN(4)/COLUMN(6) ELSE COL-
UMN(9)=0
COLUMN(3)=FIELD(1)*FIELD(1)+
FIELD(2)*FIELD(2)-2*FIELD(1)*FIELD(2)
COLUMN$(7)=MID$(STR$(FIELD(6)
+COLUMN(3)),2)
```

14. If you need to use totals or intermediate results, use any variable beginning with the letter V. For example:

```
VX=VX+FIELD(7) VX=VX+1 VX=VX
+VY+SQR(VZ)
```

15. You can signal completion of this define-columns stage by entering the command 999 instead of defining a column.

16. You will then be asked if you have any totals you wish printed at the end of your report. If you do,

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then you will be asked for the variable to print. You can print any temporary variable you have defined, or you can print T\$ (which prints the word 'TOTALS') or B\$(which prints a blank). You can also print character strings or computations such as $V1/(V2+V3)$, if you wish. You can print additional information after the last report column by telling the Reportor to print the added items followed by commas. For example, suppose column nine is the last report column, and you want to print V9 there. You could print some more information by telling the Reportor to print V9, V8, "HELLO THERE "; V7\$, "REPORT ENDS" in column number nine. When you are done with this section or, if totals were not desired, you have completed question 15, your report program has been written. You can run it immediately, or you may wish to load and resave it so that subsequent loads occur more rapidly.

About Support for These Programs

I'm sorry to tell you that I cannot support or enhance these programs in any way. If there is sufficient demand, and reason to believe it might be worth my while, I might be convinced to change my mind. I think

this is unlikely.

What You Can and Cannot Do

Given a 48K machine, you might wish to add some of the enhancements I mentioned. However, if you do, do not assume you can sell the enhanced version without my permission. You can make any enhancements you wish for your own use, however. I hereby publicly place my hashing algorithm and file-access methods unconditionally in the public domain. You can use them, incorporate them in your future programs, sell them, or do whatever you like with them.

For Information

Send your check or money order for \$10 (\$20 for Model II) to: Bruce W. Tonkin, 34069 Hainesville Road, Round Lake, IL 60073. Add \$1 for mailing in the continental U.S. (or sufficient funds if not in the continental U.S.), or write and tell me when and where you want to pick the programs up. Please don't come to my house: I don't like that, and I probably won't have anything to give you, anyway. Remember I don't have a machine: Several friends have agreed to make the copies or arrange for the copies to be made. I will try to fill all orders within two weeks of receipt. If I'm deluged with responses, I'll fill all orders as I receive them. You'll be

notified if your order cannot be filled within 30 days.

All disks for the Model I or III will be standard single-density minifloppies. All disks for the Model II (if there are any requests for that version) will be 8-inch. I don't know what format TRSDOS is using now, so I'll probably need to find out. It would help if you would tell me which version of TRSDOS you are running: If there are any difficulties in transferring from my 2-year-old copy to the present one, I may just have to return your money. If that happens, you can blame the whole thing on Tandy.

If you want the CP/M version, send \$99 or write for information. Shipping anywhere within the continental U.S. is included. Add funds for postage elsewhere: shipping weight will be three pounds. Please state the disk format required. Anything other than standard 8-inch, single-density or Altos 8-inch, double-density disks might take some extra time to obtain.

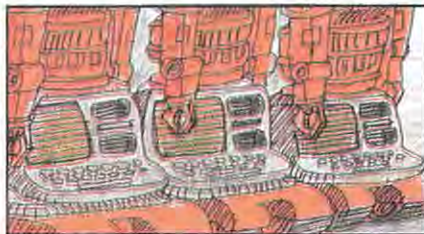
If you want the complete rewritten documentation for the TRS-80 versions of these programs, send an additional \$10 plus postage (shipping weight is one pound); I will have to arrange to have the manuals reprinted. If there is insufficient demand, I will return your money and not fill your order. The documentation will probably be shipped separately. ■

Model II and CP/M Versions

For those users running the Model II, a similar version of the Creator and Reportor is available. Since I no longer have a Model II, nor do I know anyone who might be willing to make copies, I will have to check around to see where I might make some copies.

The Model II version, for those patient enough to wait for it, has increased capabilities. Computational update allows * and /, the maximum number of fields is 47, computed data can be displayed with the record, a number of additional utility programs are provided, etc. The Model II version can be purchased for \$20, plus mailing. It is also being placed in the public domain, for anyone's noncommercial use.

There was an Apple version of the Creator. It was sold, about a year ago,



and I have no more interest in it. For those with Apples, you can try to modify the TRS-80 code shown. Good luck; you'll need it!

The present version of the Creator for CP/M and Microsoft Basic 5.2, has been sold under a variety of names. To my knowledge, there are 12 program generators for Microsoft Basic for micros on the market today. Four out of these 12 were my work. The selling price has been as high as

\$795. I am, herewith, reducing the price to \$99 for the Creator (now called Progen), and the Reportor (now called Reppen) to readers of this article. Complete documentation will be provided with full support.

Frankly, I don't think that you'll need any support. The CP/M version has more capabilities than any other program generator being sold. To give you an idea of the expansion, let me note that the code published with this article takes about 30K. The CP/M version includes some 240K of code.

So, if you have CP/M, write me. I will send a brochure detailing the capabilities of the CP/M version and listing some of the other software I have for sale. (Plug, plug). Complete source code for this version is for sale, as well. ■

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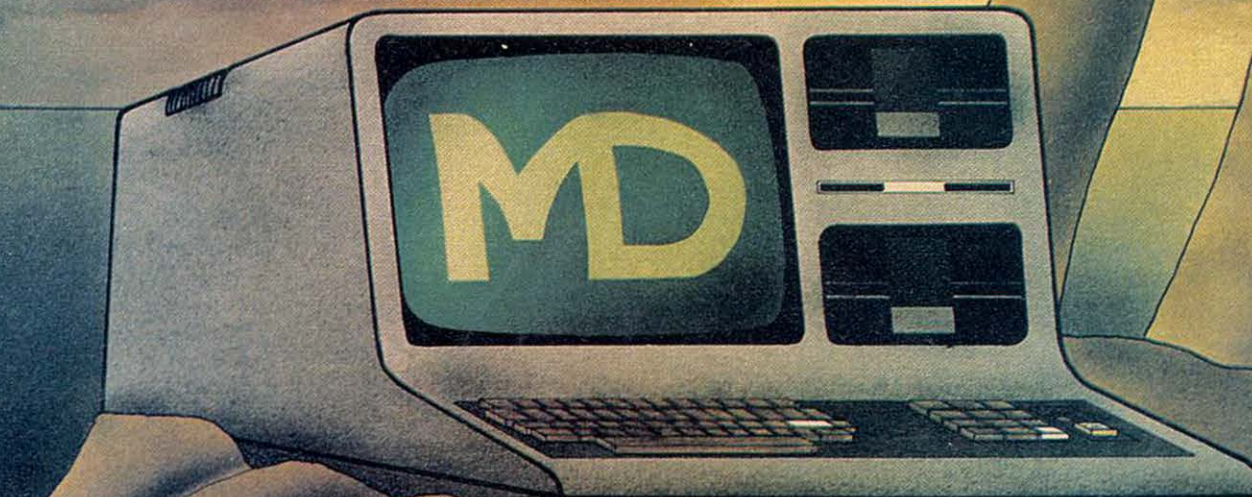
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Users Manual

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Forthwrite

by Wynne Keller

The second generation of word processors is upon us. One newcomer, Forthwrite, deserves to be ranked with the best of them.

★★★★

Forthwrite
Miller Microcomputer Services
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Natick, MA 01760
\$175

Several new word processors have been introduced in the past year. Many reviewers use the term "second generation" to describe these programs. The first generation included the original Electric Pencil and Scripsit. The second generation has arrived with far greater capabilities than the first. Forthwrite is in this new generation, which also includes Lazy Writer, SuperScripsit, and Newsprint. All cost over \$100 and are intended for the serious writer or business user.

Forthwrite is written in the Forth language and requires the MMSForth disk system to operate (\$130 for the TRS-80, \$250 for the IBM PC). Forth is a sophisticated, highly flexible language known for its speed. MMSForth has been on the market for several years and is a respected implementation of Forth. Forthwrite is available for the TRS-80 Model I and III and the IBM.

Editing Module

On the assumption that many Forthwrite users are former Scripsit users, some Scripsit commands have been retained, so learning Forthwrite is easy. The same letter abbreviations are used to set margins, turn justify on and off, center the text, and so on. These are entered in a command line within the text, and unlike Scripsit, can be in lowercase.

The editing commands are more logical than Scripsit's, and they are easy to remember. In the TRS-80 version, the clear key is the control key, and all commands function by pressing control and one or two other keys. For example, control I toggles in and out of the insert mode, control D is for delete, and control P for paragraph. Many commands offer additional choices; the delete command, for instance, deletes one letter when first pressed with the option of further deletion of blanks, words, sentences, paragraphs, blocks, or pages, or to the end of text. These additional choices are displayed on the bottom line of the screen, so you don't have to remember all the keys, just the control D.

Those who already own MMSForth will recognize many Forthwrite commands from the Forth editor. Arrow keys provide complete cursor control

and can be supplemented with commands for special cursor moves. Nine help screens can be accessed for assistance.

You can reset a number of editing features, such as the cursor's blink rate and speed of movement, the number of type-ahead characters (which allow commands or text to be typed while the computer is busy with other tasks), and the number of lines to be jumped with the shift up and down arrows. Forthwrite provides a screen of dots on which to type; it can be up to 255 characters wide. This helps you visualize layouts. If you don't like the dots, you can substitute another character.

Text blocks in Forthwrite are marked as in Scripsit, but there are many added features. For example, headers and footers can run more than one line. Forthwrite also has many convenient block features; it can get a block rather than just copy it (with Get, you don't need to delete the block from the former position when you are done). You can also save a block to disk, move it to another document, or include it in another document at printout time. The ability to include blocks allows considerable flexibility. You can create a file that calls in other blocks or other documents so material can be reused in multiple documents. Several sample files on the Forthwrite disk illustrate this process.

Column features are very sophisticated. Forthwrite has two types of tabs: visual tabs and printer's ems (measured in tenths of an inch). Visual tabs are displayed on a bar at the bottom of the

screen, as in Scripsit. A printer's ems tab appears at printout time, but its position isn't shown on the screen while you're typing. Either system is easy to use, but the ems are more flexible and give true proportional appearance on the letter-quality Spinwriter-type printers and the new class of under-\$700 dot-matrix proportional printers.

Forthwrite's left-margin and paragraph-indent features produce professional-looking documents. By adjusting these settings, single-word left columns can have an adjacent right column of several lines, indented automatically; you don't have to be concerned about where each line in the second column will end. In many word processors, this type of layout requires resetting the left margin frequently. With Forthwrite, you only adjust the setting once, before starting the columns.

The directory is alphabetized for easy, sequential loading of documents with shift, control, and down arrow and for automatic printing of a range of documents. The directory is always available and file names can be capitalized, lowercased, or a mixture. When asking for your file, you do not have to match the uppercase/lowercase display of the directory file name. Type the letters in any form, and they are adjusted to match the directory configuration. If you forget to save the file before leaving the program, a reminder appears on the screen.

Complete find, replace, and wipeout functions are available. These are indifferent to uppercase/lowercase mismatches and have a wildcard capability so you can ignore nonmatching characters or control codes associated with the search word. The replace function can distinguish whether it is replacing a capitalized letter or a lowercase letter, so it can globally replace a single word, capitalizing the first letter if the word begins a sentence. Find, replace, and wipeout can be done on a global basis, with or without a verification before each change.

Hyphenation is often unnecessary with right-justified proportional print, because words are evenly spaced on the line. However, long words may need hyphenation. Forthwrite provides a soft hyphen that is placed while typing with control J. During the printout, if the word falls on the right margin, it is hyphenated. If the word occurs within the line, the hyphen does not appear. A hard hyphen, which is always printed, is also available.

One advantage of the soft hyphen is that rehyphenation isn't needed if you

change the document's margins. In Forthwrite, you can't see which words fall on the right margin until a printout is made, because paragraph indents do not occur on the screen, and true proportional print cannot be duplicated with the computer character set. So, you should either hyphenate long words with soft hyphens as you type or obtain a printout and choose those lines that you want hyphenated. Typical proportional print documents require about two hyphens per page.

While editing a document, you might receive the error message "This command illegal when in the white space." Forthwrite calls all the areas of the screen where typing has not occurred white space, since the background characters are white dots. As you type, each letter replaces a dot. However, if you decide to use the down arrow to drop the cursor onto the white dots and add a word to the end of a previous line, the cursor must occupy the space adjacent to the last letter. If the cursor is on a white dot, you can't type until it is moved or the text line is opened with control O. This is disconcerting at first, but it's not difficult once you are accustomed to it.

Unfortunately, you can't determine

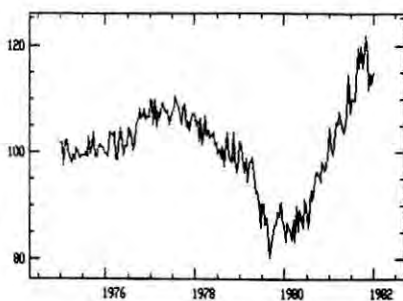
the line number of the cursor. This is a handicap when trying to decide if a letter, for example, would fit on a single page. Cursor line numbering becomes meaningless if a document uses included blocks, but it would be useful for simple documents. Information on the number of characters in a document is provided, as well as the amount of memory available.

Printouts

Forthwrite has several printout modes. While typing and editing a document, a screenprint is always available. This duplicates the screen and does not format the document.

Quickprint is a formatted printout of the document, and it is slightly faster than a regular printout because menu choices are not required. It retains the document in memory while the printer program overwrites the editor program. After a Quickprint, the document is still available in memory.

A third printing method is a technical copy of the document as it appears on the disk. This method does not format the document. It includes all printing and formatting commands and is especially useful when learning to use Forthwrite.



From the review in INFOWORLD (7/12/82, p. 41)

"SUMMARY: All in all, AUTO PLOT is a superlative program in its advertised form. It is extremely easy to use and well documented and provides Model I or III owners with capabilities they only dreamt of before . . .

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InfoWorld Software Report Card

Autoplot 2.2

	Poor	Fair	Good	Excellent
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Ease of Use	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
Error Handling	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>

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Another interesting option is to "print" the file on disk rather than paper. In this mode, the file is formatted as it would appear on paper, and it can be scanned for proper appearance. The idea is to save paper, noise, time, and to permit proofing even when no printer is available. I encountered two problems. One is that a document that fits in memory as a document might not fit when formatted. You might have to artificially break up the document to use this option. The other problem is that this feature cannot work if you use proportional type, since these characters can't be accurately displayed on the screen. However, if the document is to be printed in standard pitch, the feature displays margins and page breaks as they will appear on paper.

The fifth and most-used choice is a formatted printout of the document. This has a number of options. First, you should select a printer driver. Special drivers are available for the NEC Spinwriter, Epson MX-80, Daisy Wheel II, NEC 8023, and the C. Itoh Prowriter, in addition to a standard serial and parallel driver that works with any printer but does not provide special features. Other options include multiple-copy printing, the page number to begin printing, and the page number for headers and footers to start printing. You can change the print buffer size, the baud rate (for serial printers), and the number of characters per interrupt, or you can request pauses for inserting text from the keyboard or changing print wheels. Not all these options are

available from the printer program; some are part of a customization routine, and many are commands within the document.

One of the nice features of the system is its ability to embed special commands that only affect the printout if the proper printer is available. Otherwise, the program ignores the commands and prints the text normally. Special items such as condensed print, wide print, red-ribbon mode, emphasized mode, subscript, superscript, legal strike out, and underlining are all supported if your printer can do them and you have a printer driver. Because Forthwrite source code is provided you can adjust the existing printer-driver code tables for other printers.

Forthwrite supports true propor-

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tional print with right-justification and tabbing on capable printers. A complete test program is included for adjusting your type. The preset width of type characters can be changed. True proportional print means the individual characters are proportional. The j, for example, occupies less space than the w. The spaces between words are adjusted in fractions of a space, resulting in a pleasing text.

Special Features

Forthwrite can read MMSForth's Datahandler data-base program files, and you can include their fields as text blocks in documents. Format features include right-justification within a field and dollars and cents decimal point alignment, with dollar sign and commas. Names entered into the Datahandler in last-name-first, first-name-last order can be reversed for Forthwrite printouts.

You can dictate a document and then use the Xscribe function to trigger the cassette port to turn the tape recorder on and off while typing. This is not as elegant as foot-activated transcription machines, but it is useful and is a nice "extra."

I have had MMSForth for more than

a year, and it is totally incompatible with most other Model I and III programs, since it is not just a different DOS but a different language. Yet, since it is a fine system and is pleasant to use, I am tempted to say it is not out of step with the world, the world is out of step with it.

Gradually, many specialized application programs are becoming available for the MMSForth system, and these programs are made to be compatible with each other wherever the compatibility would be useful, as it is between the Datahandler and Forthwrite. The problem is that this is a slow process, and some needed programs are not available.

The obvious omission here is a spelling checker. Spelling programs are becoming popular, but with Forthwrite, you can't use any spelling checker currently on the market.

Forthwrite provides a transfer module to take any standard TRSDOS (or IBM PC) file and move it to Forthwrite. This is intended for moving files from your old word processor to the new one. A program is under development to effect a transfer in the other direction—onto a DOS; when it becomes available, the compatibility problem will be solved. Using a foreign DOS

spelling checker will still cause some problems, but it can be used.

Curiously, Forthwrite provides extraordinary compatibility between the Models I, III, and the IBM Personal Computer. If you own all versions of the program, you can freely exchange files, on the same disk, among all three computers. By using Forthwrite, a modem, and the Forthcom communications program, you can send a perfectly formatted letter at 1,200 baud to any of the three machines. You can also send Forthwrite files to any brand of computer with Forthcom. However, they have to be edited, after they are received, to make them compatible with the format commands used by the receiving computer. If you want to do word processing on your microcomputer at home and transmit the results to a mini or mainframe computer at work, you should enjoy this feature.

The Forthwrite program provides sophisticated printer control, fast operation, powerful include functions, Datahandler compatibility, on-screen help, modular source code that can be altered by the end user, and much more. It can rightfully take its place among the top-quality word processors for the TRS-80 and the IBM PC. ■

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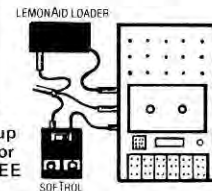
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Selling Your Software

by Neil J. Salkind

So you've decided to put your program on the market. Should you sell it through a publishing house? Neil tells you how to begin.

You've just finished writing the greatest program in the world! You want to let thousands of other micro users in on the fun, but how?

You can share the code with your local user group, publish it in *80 Micro*, or, as many amateur programmers are doing, try to sell it commercially.

The market for software is booming. As the personal computer permeates everyday life, the market is wide open for innovative and well-written software.

Your First Decision

So you've decided to sell your software. Do you want to market your software directly or work with an established software company?

If you decide to market your software directly, you probably will advertise in magazines and newsletters, purchase mailing lists from direct-mail brokers, mail flyers, and even visit user groups. Don't underestimate the time and money you must spend—typical headaches include increasing postage costs, poorly targeted mailing lists, and documentation that's never quite complete.

The advantage to handling all sales and marketing yourself is that you keep every penny sales earn.

There are also distinct advantages to working with a commercial publisher. First, they have established technical support and marketing systems. Next, they have the people and the skills to adapt your program to new systems (other than the one the software was developed on) so that the entire market can be tapped. Finally, they are virtually impossible to compete with financially. They have salespeople, lots of money for advertising, and a network of retailers already in place.

Let's assume you decide to sell your work through a software house. How do you go about that?

Choosing a Publisher

Finish your program; be sure that it operates without problems, and fully document its operation. (If your program is accepted by a publisher, be prepared for some final editing. What you think is the best way of saying something might indeed be best for you, but

not for the thousands of potential users.)

What are publishers looking for? In general, the things you want from your own software. It should be user friendly, able to handle errors, show good programming practice, and be unique. Few publishers are looking for another program that can balance your checkbook.

Review the advertisements in popular magazines and see what kinds of software different companies publish, and which company's advertisements appeal to you. Some companies deal only with business software, while others may focus almost entirely on arcade games. You want to target your efforts where they will produce the highest likelihood of success.

Remember also that not all software firms deal with outside authors. Many commercial publishers conduct all writing and documentation using their own staff and are not interested in purchasing out-of-house materials.

After you have found a company that looks right, give them a call and ask to speak to someone in acquisitions, new submissions, or marketing. Depending upon the company, different departments handle such calls, so be patient in your search to locate the right person. Tell what you have done, and see if they are interested in learning more. Many firms use a submissions packet consisting of all the materials you need to submit your work for consideration. Others might simply want a listing of the program. Under no circumstances

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Caterpillar



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Defend Planet from
6 Different Types of Alien Attacks

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should you ever send your materials, either in disk, cassette, or printed form to a publisher without first making an inquiry and then fully protecting yourself (which we'll get to in a moment) against misuse of your materials.

If you are hesitant to call and want to write a letter instead, be sure to include as much as you can about the program's development, any limitations there might be (for example, memory needed) the system it was developed on, as well as a full description of what it does.

Do not be discouraged by disinterested companies. Try other firms until you've at least one invitation to submit your materials for consideration. If your work is good, someone will surely be interested.

Finally, although it's a good idea to send inquiries to more than one company at the same time, be careful not to send off the actual materials to too many publishers at once. Go first with the one you feel can best serve your needs, and then work your way down if your program is not accepted.

Protecting Yourself

Sometimes people *do* make the mistake of sending their programs to a company without first making in-

quiries. The next thing they know, their software is being passed around and they've lost any chance at the market. When you deal with any company, you must protect yourself by using a nondisclosure form and by copyrighting your materials.

A nondisclosure statement simply says that the company will not disclose or reveal the contents of your work to anyone else while discussions with you are underway or thereafter if they don't choose to publish. In other words, they cannot discuss your work outside of their own company. Any company that does not suggest you complete such a form should not be considered.

The next step you should take is to copyright your work, a much easier and more inexpensive procedure than most people think (see "How to Copyright," page 154).

In 1978, with the increase in the number of programs being written, the Copyright Law (P.L. 96-517) was amended to include computer programs.

It is important to understand that the Copyright Office only acts as an office of record. They will not verify whether your program works. For them, a computer program is defined as "a set of statements or instructions to be used di-

rectly or indirectly in a computer to bring about a certain result." In other words, they assume what you send them is what you claim it to be. The copyrighting of the material in no way validates that claim.

When you are ready to copyright your work, you should enter as a comment in your printout the word "Copyright," your name, and the year. You should also have it incorporated into your program itself if there is any kind of visual output. (Next time you play Pac-Man, glance at the bottom of the screen.) Send to the Copyright Office (Library of Congress, Washington, DC) for one copy of form TX. Complete this form, and send it along with \$10 plus a listing of your program to the Copyright Office. Your certificate will arrive within a few weeks. The people who work in the copyright office are very helpful—feel free to call them if you have questions.

When you send a listing of the program, be sure that it is in a high-level language rather than machine language since the examiners will want to read at least part of it. Since some programs run very long, send only the first and last 25 pages of the listing if it is more than 50 pages.

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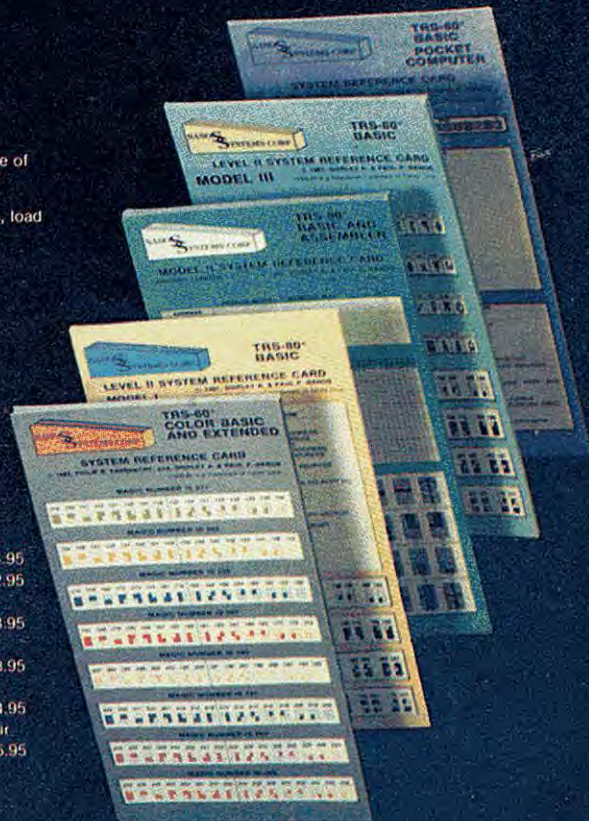
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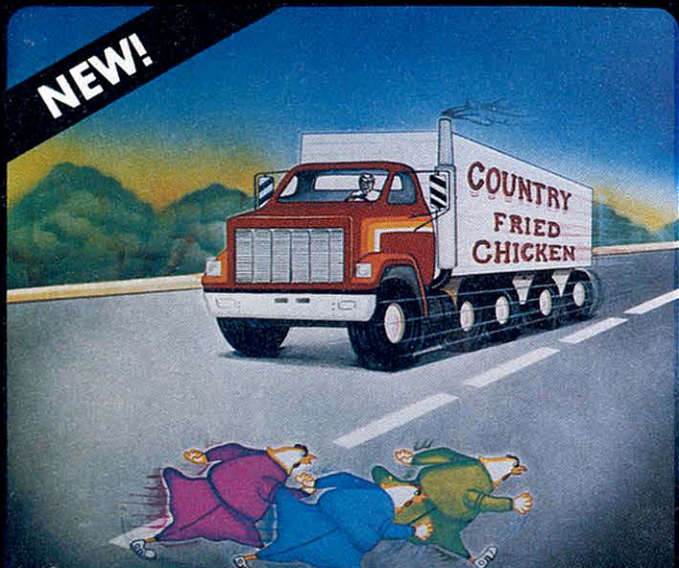
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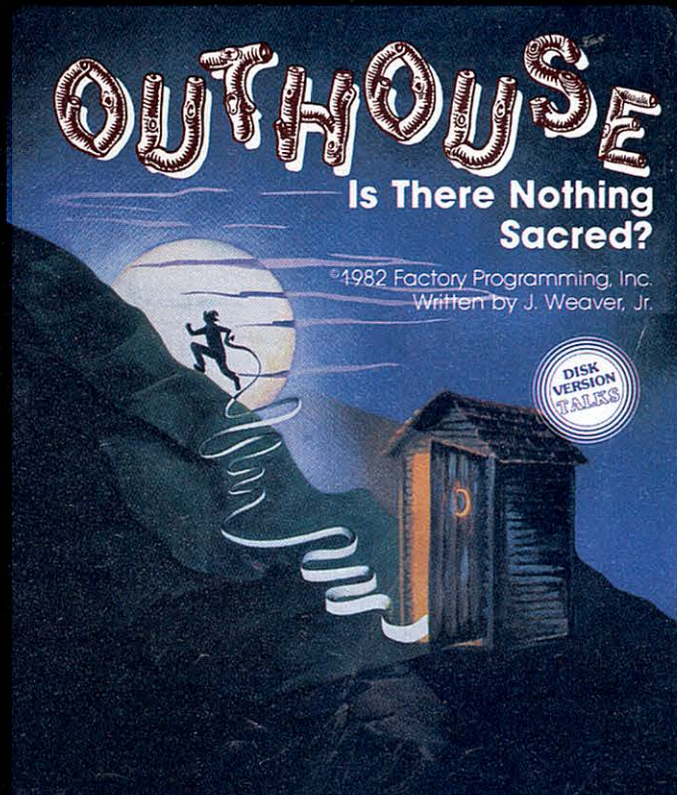
Don't Chicken Out!

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Written by J. Weaver, Jr.

OUTHOUSE

Is There Nothing Sacred?

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What You Should Expect from a Publisher

A publisher should provide good design and coding assistance, documentation (if yours is not perfect, which it rarely is), telephone support for users (especially if the program is very complex), on-going maintenance (enhancement and revisions for different operating systems), sales and marketing systems already in force (not just advertising), and finally, a royalty rate that you find acceptable.

Royalties are always a sticky situation and vary widely from publisher to publisher. In general, publishers pay around 30 percent of their net sales. What this means is that they might subtract production costs (disks, printing and binding costs for the documentation, and so on) from the sales cost. In numbers, the net cost is 80-85 percent of the retail costs, and this figure is what your royalty would be based on. For example, if the retail price of the program is \$20, the net (85 percent of \$20) is \$17, and your 30-percent royalty is \$5.10.

The dealer, of course, also gets a discount of around 40 percent. In the end, the publishing company itself has perhaps 20-25 percent as their profit. You

can see they need to sell a good number of any software package to recoup design and production costs.

The larger the predicted sales are, the more likely it is that your royalty will be higher. In the same sense, the more the publisher has to invest in bringing your software on line, the less your royalty will be.

Finally, programmers who have an established reputation can demand a higher royalty. I have not heard of any software designer getting an advance for his or her work (much like the book publishing industry does on a regular basis), but I certainly wouldn't be surprised if this is a common practice in the future.

What the Publisher Does with Your Software

When you send your materials to the publisher, and after the nondisclosure form is signed, the company will begin evaluation. This can be done in several ways. One way is to have their own staff do the evaluation. Some companies, however, send it to outside evaluators who test the program on their own machines and can get a feel for the everyday value of your idea.

This evaluation process can take up to three months in some cases, and only a few weeks in others. It depends upon the backlog of programs to be reviewed and the publisher's procedure for reviewing. Don't call the publisher every few days asking if a decision has been made yet. They want the evaluations back as quickly as you do, so you will both have to wait.

Virtually all software that comes to a commercial firm needs some additional work, and the amount of time that it will take to get the bugs out, rewrite the existing documentation, and produce the final version are all factors that enter into the publisher's final decision whether to offer you a contract.

Although it might seem to you that the market is saturated (because most computer magazines are full of advertisements), this is simply not the case. The potential for sales of new programs with new uses, or even new programs that do a better job than others, is expanding every day. Get to work writing and stick with it until you're successful! ■

Neil J. Salkind, a developmental psychologist, lives at 1235 Tennessee St., Lawrence, KS 66044.



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For the serious businessman who has as little as 100 name mailing list or 200,000 names, THERE IS ONLY ONE SYSTEM FOR YOU!

FEATURES OF THE NEW POSTMAN MASS MAILING SYSTEM

The Postman system (version 2) is an almost COMPLETE rewrite, rethink, redesign of the original POSTMAN. The many features of the new POSTMAN system are quickly outlined below:

MULTI-DRIVE - True multi-drive operation is possible. POSTMAN will search all drives for address files and connect them together into one large file for the duration of that session. Once POSTMAN has found the data files on the disks, the operator "sees" just ONE CONTIGUOUS sorted list of addresses. The operator does not need to tell POSTMAN when to "switch" drives or manually "swap" sections of the data file in and out of the computer's memory. This is the foremost among the list of features because of its relative uniqueness among mail list handlers written for the TRS-80.

LARGE LIST SUPPORT - The multi-drive operation allows the user to access data files on ALL configured drives CONCURRENTLY (at the SAME time) for truly large mailing lists. Files need not be sectioned into smaller "byte size" chunks to fit into memory.

HARD DISK SUPPORT - (HARD DISK POSTMAN only) The FULL utilization of the space and speed of the new hard disk drives is possible with POSTMAN. For example, a 7.5 megabyte drive can be configured to hold almost 60,000 labels. Multiple hard drives can be accessed CONCURRENTLY allowing 200,000++ entry mailing lists.

FORM LETTER CAPABILITY - With the purchase of the separate POSTRITE program, the user is provided with an easy to use form letter generator which will merge a generalized letter produced from a word processing system (i.e. LAZY WRITER, etc.), with the name and address information from the POSTMAN MASS MAILER data base. POSTWRITER allows the user to insert any field from a POSTMAN label entry anywhere in the letter.

MENU OPERATION - As you would in a restaurant, choose your dinner from a list (or MENU). POSTMAN will allow you to direct its actions by selecting from various menus that it will display. A complete discussion of each menu is presented in the manual.

INSERT - New names can be quickly added to your list at any time. The new addresses are placed into the file in their proper sorted order eliminating the need for a separate sort operation after entering a stack of new names. POSTMAN will allow the operator to enter a "batch" of labels without returning to the control menu between each label insertion, thus speeding entry and reducing the aggravation of extra menu control keystrokes.

DELETE - Names can be removed at any time when they are no longer needed.

EDIT - Information in any name entry can be quickly changed at will with "word processor" ease. A "transparent" cursor simply is moved to the label displayed on the computer screen and corrections are just typed over the existing label. If you happen to change a field which is also used as a sort key, POSTMAN will automatically move the changed label to its correct position in the list to maintain the sorted arrangement of the labels.

OVERLAY - When identical changes are needed on many addresses, the OVERLAY feature can make them with one keystroke. The needed changes which are common to many labels are entered into the "overlay mask". When you wish to apply these common changes to any label, one command will do it.

SORT - Arrange your list in any alphabetic or numeric order. The ordering may use one or more fields to control the sort. A machine language heap sort assures fast execution. The sort need only be performed once, the sorted list will stay sorted through all subsequent insertions, deletions, and changes to existing labels. NO NEED to leave the POSTMAN program to use a separate program to sort your data. Your data is sorted quickly and after sort completion, POSTMAN is ready for your next command!

SPECIAL STREET ADDRESS SORT - For the user with many addresses on the same street, POSTMAN will sort your entries by the house NUMBER after grouping those on the same street together. Local city lists can be quickly sorted to aid post office dispatching.

PURGE - Unwanted duplicate addresses can be removed from your list automatically or under operator control.

SEARCH - Any address in your list can be quickly found with fast search and positioning commands. Three different types of searches are provided. A "fast" search which uses a hashing technique, a "selective sequential" search for labels with common fields, and "quick" positioning using the first or major sort field to get you into the general "ball park" of a label or sequence of labels.

LABEL PRINTING - One, a few or all addresses in your list can be printed on standard or non-standard label stock. Up to 6 labels across can be printed with a format YOU can easily control. TWO user definable "ATTN" lines are provided for any use. Labels can be printed from many of POSTMAN's menus, search, edit, or during label insertion.

EFFICIENCY - POSTMAN is written in the machine's native language to gain the full advantage of the microcomputer's speed. Extensive use of program segmentation reduces the amount of use RAM needed to hold the program, allowing a greater number labels to be kept in core, resulting in faster operation. Little used routines need only be brought into memory when they are needed and once through with their task, release their space back to POSTMAN.

REPORT LISTINGS - A special program to produce columnar listings of address data from your label data base is provided. You can easily specify the information to be printed.

DATA DISK MERGING - Labels can be quickly transferred from one disk to another with the PSTMERGE program callable from the main POSTMAN SYSTEM menu. Source and destination drives need not be separate drives, prompts to exchange diskettes if the same drive is used, are provided.

DATA DISK PREPARATION UTILITY - Provided with POSTMAN is the DPREP program which allows the user to prepare a floppy/hard disk for use with POSTMAN. This easy to use utility can be told to prepare any portion of the available space on a disk.

DATA INTEGRITY - All data transfers to the disk files are made using special write commands which instructs the operating system to check the validity of EACH write to the disk.

DATA GUARD - Is a special programming technique only offered by Soft Sector Marketing, Inc. If by chance your machine resets while writing information to the disk, you only lose the information that you were writing. Your files are always protected from the danger of losing all the work that you have put in that day. NO OTHER PROGRAM ON THE MARKET OFFERS THIS PROTECTION. If you reset with ANYBODY'S MAILING PACKAGE DURING WRITING you would destroy your ENTIRE data disk. We can't stop your machine from failing but we can protect your data.

Description of Label Record Fields:

Length	Name	Description	Length	Name	Description
10	Code	User defined printable field	15	City	City, township, village
15	Last Name	Last name of addressee	5	State	State, province, territory
15	First Name	First name of addressee	9	Zip	Zip code, zone, route
26	Company	Name of company	2	Data 1	User definable field
26	Address	Street address	5	Data 2	User definable field

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The Great Beyond

by Terry Kepner

★★★★

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TRS-80 programmers rejoice! Excalibur Software has just increased the power of Basic 1,000 percent. Beyond-Basic is a machine-language program that replaces standard Microsoft Basic and adds 60 new Basic commands, functions, and operators for cassette-based computers and 82 new Basic commands, functions, and operators for disk-based users.

Beyond-Basic is available in three configurations: short, medium, and long, for cassettes or disks. Each of the larger versions contains all the commands, operators, and functions of the next smaller version. The smaller versions are included in packages two and three so you can use them when you need the extra memory they free, and don't need all the power of the larger versions for the particular program you're writing.

Beyond-Basic's manual is thick, over 200 pages. The same manual is used for all three versions and is divided into three sections. The introduction claims that this is done so you can upgrade from one version to another without needing another manual. I suspect that Excalibur is using only one manual as a subtle form of advertising: Once you see the features you didn't get, you'll want to buy the next version.

Increase the power of Microsoft Basic 100 fold with Excalibur Soft- ware's new Beyond-Basic.

There are certain features common to all three versions, cassette and disk. I'll cover these first.

Beyond-Basic uses its own keyboard driver to supply lowercase support for Model Is with the uppercase/lowercase modification. It also gives you control over the character used as the cursor and if it blinks. Repeating keys, the time delay before repeat takes effect, and the speed of the repeat are also under your control.

Pressing the shift and right-arrow keys tabs the cursor over eight columns, as in standard Basic, but pressing the left-arrow key jumps the cursor back over all the spaces in the tab. Pressing the shift and up-arrow keys has been modified to let you input any ASCII code from 1-255. After pressing this key, the keyboard waits for you to type up to three decimal numbers that represent the ASCII character code you want. Numbers greater than 128 are stored and displayed in the line as graphics characters, numbers less than 32 are stored as the graphics character formed by adding 128 to the number.

If, while typing in a line, you discover a mistake made earlier, press the shift and right-arrow keys and the line is transferred to Beyond-Basic's XED mode, where you can use the editing commands to correct the line before typing further.

Another useful feature covers the immediate keys. These are keys that you can type as the first character of a command line and have them treated as full commands; i.e., pressing the period key followed by the enter key lists the current program line. Other immediate keys are: the up-arrow key lists the previous line; the down-arrow key lists the next program line; shift and up-arrow lists the first line of the program; shift and down-arrow lists the last line of the program; comma puts you into standard edit mode for the current line; shift and comma puts you in Beyond-Basic's Extended Editor (XED); semi-colon runs the current program; slash continues program execution after a break; colon resumes auto line numbering starting at the current line number plus the last increment; and the @ sign lists the statement about to be executed if the program has been stopped by an error or by the break key.

All the Beyond-Basic versions also support shorthand notation for certain commands:

```
A AUTO
D DELETE
E EDIT
G GOTO
L LIST
L LOAD (if followed by quotes)
R RUN
S SAVE
```

The medium version also includes F (Find) and X (XED for extended editor) as shorthand, while the disk versions accept K (Kill) and N (Name).

For those fortunate (or unfortunate) enough to remember Level I Basic, the abbreviations of Basic commands (P.A. for PRINT@) allowed were real time

savers. Well, Beyond-Basic lets you abbreviate commands by their first letter followed by a period.

There's no memory advantage to using these abbreviations, but they do make it much easier when typing in program lines.

For those of us interested in program readability and structured programming, Beyond-Basic automatically indents For...Next loops by indenting two spaces per nesting level after the line number for each line affected. This indentation technique is also used with the Beyond-Basic commands WHILE...WEND and LIF...ENDIF. Lines beginning with the Basic command REM are also indented.

Other improvements include accepting hexadecimal and octal numbers in input, data, and VAL statements; accepting numbers between -32768 and +65535 as integers; letting you put quotes in strings without having to use CHR\$(34); fixing the Tab function to operate properly with LPRINT (LPRINTTAB(130) puts the print head at column position 130 instead of column 64 as with standard Basic); and instead of putting you in edit mode when a syntax error is discovered, you're left in command mode of Basic, preserving your program's variables and values.

Features Taken From Standard Disk Basic

Many features of standard Disk Basic have been duplicated by Beyond-Basic, most of which are available in all versions. These are: CMD"R" and CMD"T" (turning internal clock on and off for Model I disk, turning clock display on and off for Model III disk); DEF USRn and USRn (10 USR functions); INSTR (search a string for a substring); LSET and RSET (left and right-justification of strings, disk only); DEFFN and FN (define user functions, not in the short version); MID\$ = (take a substring and store it in another string); and Load and Save (which operate exactly as CLOAD and CSAVE, tape system only).

The Short Version

The functions supplied with the short version of Beyond-Basic include translating integer expressions into hexadecimal numbers and back; converting strings of hex digits to integers; converting hexadecimal numbers to strings of ASCII codes; converting strings of uppercase letters to lowercase and vice versa; calling machine-language routines; converting degrees to radians; converting between signed and unsigned in-

tegers (65535 to the appropriate normal integer); evaluating numbers buried in strings (VAL finds the number only if it starts the string); PEEKing a string from memory; formatting a number similar to the Print Using command, only this returns a string in a variable; PEEKing of 16-bit numbers; generating a string of spaces with a single command; a routine that performs similarly to INKEY\$, except it waits for a key to be pressed; another routine that operates the same as INKEY\$ except the buffer isn't emptied when it's read; letting you find the address of a line number; and positioning the line-printer print head.

There are several new operators that make it easier to use Beyond-Basic: DIV performs integer division faster than Basic's "/"; EQV performs a binary AND operation on two integers; IMP results in NOT (A AND NOT B); MAX returns the larger value of two numbers; MIN finds the smaller of two numbers; MOD finds the remainder of integer division; and XOR, which returns a true condition if either one, but not both, of its arguments is true.

The Medium Version

The medium version includes all the

commands, functions, and operators of the short version, with the addition of three commands, two statements, and two functions, including:

- Find scans your program for any string of up to 20 characters, including Basic and Beyond-Basic tokens.

- Size gives you program statistics on free memory size; current program size; number of program lines; number of file buffers; number of bytes used by any currently defined variables; number of bytes cleared for strings; and the total size of the program, variables, and string RAM.

- XED, the Extended Basic Editor, performs similarly to the normal Edit except it displays the entire line you're editing (using a nondestructive cursor, like a word processor); control characters are displayed as graphics; the line number can also be edited (letting you duplicate a line by just giving it a new number); graphics can be entered using the G command and pressing Q, W, A, S, Z, and X; and you can store any ASCII character (1-255) in the line being edited.

- Plot statements give the Model I and III many graphics commands of the Color Computer (plot a filled box; a

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line; a box outline; shapes by using up, down, left, right, erase, and invert; plot width, rotation, scaling, clearing, and intersections; plot using variables or arrays; and plot by superimposing screens on top of each other and displaying them or displaying only where they intersect, or don't intersect).

- ERN\$ corrects a deficiency of the on-error trapping routines by providing string messages to the error-trap routine instead of just numbers.

- SYS is tied to the plot statements, and fills in the SYS(15-18) locations with the proper information.

Long Version

The long version contains everything in the medium version, plus these commands and statements:

- COMP automatically compresses your program by removing unneeded spaces and, optionally, remarks.

- LREF is a line-number cross-reference.

- RENUM is a program renumbering routine.

- VLIST lists all the currently defined variables in your program, as well as their values.

- VREF is a variable name cross-reference, which lists all the variable names

in your program.

- MAT, matrix manipulations, lets you fill, copy, reshape, add, subtract, multiply, print, read, and delete entire arrays with one statement.

- Sort, sorts arrays into ascending or descending order; either the entire array or just a portion of it can be sorted at any time. Up to 64 arrays can be simultaneously sorted.

Disk Systems Only

There are several commands, statements, and functions that are restricted to disk systems. Most are related to disk I/O, and include:

- INCHR\$ reads a character from a disk file.

- Name displays default file name.

- OPEN"C" opens a file buffer to pass information from one program to another.

- OPEN"S" opens a sequential file, for output or input, without erasing the current file on the disk.

- SLOAD lets you break a large program into segments.

- SYS loads a machine-language program into memory, but doesn't execute it.

The disk versions of Beyond-Basic also include a special utility called

CONFIG/CMD, which lets you change the operation of Basic to your custom needs, such as disabling the lowercase driver (Model I only), causing all output that would normally be sent to the printer to generate a "Feature Not Available" error if you don't have a printer available, setting up a default memory size, or setting up to use the standard Basic Editor instead of XED.

There's one command I haven't mentioned yet, and that's "\$". By typing "\$" directly in front of a Basic command, you specify that the command's output be sent to the printer; i.e., \$DIR will force the directory to be printed out instead of printed on the video. Also, you'll notice that many Basic commands were modified for use by Beyond-Basic. This hasn't affected their normal performance. Thus, while CVD is used by Beyond-Basic to convert degrees to radians, it still functions as convert to double precision when properly used with a field statement and string variable. So you haven't lost any of the normal Basic commands or abilities; instead, they've been enhanced to include new abilities.

As you can see, Beyond-Basic is a very powerful program, but it does have a few flaws: It's guaranteed to work only with TRSDOS (or Percom's DBL-DOS). Not all your DOS's capabilities (if it's not TRSDOS) will work properly.

There's no summary of commands, nor a command-syntax card. If you want to find a command, you must use the manual's index. This also makes it difficult to learn the commands, as you have no handy method to remind you of commands you may have forgotten after reading the manual the first time.

If you write a program using Beyond-Basic, you must always have this system in memory to use the program. (That is, the only people who could use your program would have to have Beyond-Basic before they could use your program.) If you're writing only for your own needs or for someone who has Beyond-Basic, then this point isn't relevant.

I think Beyond-Basic is a useful tool for the programmer writing a program for a specific use. It has many features that ease the difficulty of writing and debugging a program, and many more features that make the program a sleeker, more efficient unit. If you currently use TRSDOS Basic for your programming, I suggest you get Beyond-Basic. If you aren't using TRSDOS, you should still give Beyond-Basic your consideration in view of its many power features. ■

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The Art of Documentation

by G. Michael Vose

Documentation doesn't have to be hard to write. Here's a step-by-step explanation of how to write clear, concise manuals for your code.

Documentation, the written instruction that accompanies most software, is often called the armpit of our industry. Manuals are criticized for being too long, too short, too skinny, too fat, too simple, too complicated—everything except too good.

The fact is, they are often poorly written, incomplete, not indexed, and full of jargon. Many shining examples prove that manuals can be well-written and useful—Radio Shack's Model III Operation and Basic Language Reference Manual or Disk System Owner's Manual, for example—but such a manual requires hard work, and some fundamental knowledge of how to write.

If you have inclinations as a software entrepreneur, you'd better learn some basics of writing high-quality manuals. Good old common sense, and the writing and organizational techniques described in the following paragraphs, can help you develop manuals that can turn out "too good."

Different Styles

There are two main categories of documentation. They are different in style and orientation. The first category is program documentation, the step-by-step explanation of what each program

line does, a table of all variables used in the program, and a flowchart of the program's logic. Program documentation always includes a listing of the program's code. If the listing contains abundant remarks and explanations in the code, the listing is called self-documenting code.

The second category includes the user documentation, the instruction manuals that explain to the end user how to load and run the program.

Both categories (and there is some overlap of the information each requires) need to be organized to accommodate the following goals:

- Make it easy to find information.
- Avoid errors and ambiguous references.
- Don't forget anything.
- Write in a positive, first-person style.

With these general goals in mind, let's take a look at the kinds of information that good documentation should include.

Program Documentation

Program documentation is less important to the people who use the program than it is to you, because most people won't be concerned with how the program works. Those who are will

want to talk to you personally. Ultimately your program documentation needs to be thorough only because you may need it to help you make upgrades and modifications or to repair a bug that surfaces six months after the program is on the market.

Program documentation should include the following materials:

- A listing of the program;
- A variable map listing all the variables used and what they mean;
- A flowchart of the program's logic;
- A description of the hardware the program will run on (listing any exceptions);
- Operating systems the program is written under; and
- Notes on any special restrictions such as memory size, protection of memory for machine-language subroutines, and so on.

It is good technique to make liberal use of remarks when coding your programs. You can remove remarks from the final working version of the program, but they are invaluable during the coding process. A listing of the code with remarks intact is an indispensable part of your program documentation.

Flowcharts often change substantially from a rough diagram of the embryonic program to the chart that describes what the final product actually does. Therefore, you will probably have to draw a flowchart before you start and after you finish writing the program. Don't eliminate this step in the documentation process. This flowchart can save many hours six months later if

you decide to modify the program. A flowchart can help you avoid unworkable additions to the program keeping the logic flow straight in your mind as you try to accommodate a new feature into the existing code.

If you produce detailed program documentation first, preparing user documentation will be easier. Detailed program documentation will give you a clear, well-organized idea of how to present the essential material to the reader.

User Documentation

The first task in writing user documentation is to determine for whom you will be writing. If your program is a utility, you can presume your audience knows quite a bit about computers. You can safely incorporate some jargon into your text and can possibly hedge on things like loading instructions, unless they are out of the ordinary. But if your audience is school children or secretaries, you had better plan to write down every detail on how to use the program, from loading to listing to running, with as little jargon as possible.

Don't underestimate your audience, either. If you've written a business applications program, don't teach the user the fundamentals of that particular business, except as they apply directly to the program. For example, you don't have to explain how to amortize a mortgage to a real estate professional. You do have to explain to him how to enter the principal amount, interest rate, and the term of the loan.

Once you've determined your audience, you'll want to write an introduction spelling out exactly what the program is designed to do. If the program is designed to aid an electrician in troubleshooting television circuitry, state that fact in the first paragraph of your introduction. Explain the features that make your program better than others in subsequent paragraphs. But your first job is to state what the program will do.

Next, describe the hardware your program needs. List the mandatory equipment first and list the optional equipment it supports under a separate heading. Make sure to include the minimum memory size needed to operate the program. If it works in 4K or 16K, say so.

If you've written a disk program, list all the operating systems the program will run under. If the program needs to be modified to run under a certain operating system, make an appendix explaining the modifications and direct the user to it.

Walk Before You Run

The manuals that you write for applications programs—distinct from the reference manual that accompanies a utility or language product—must provide a walk-through or sample run of the program. Programmers like to call this kind of instruction “hand-holding” and it is an important part of any manual.

Instruction manuals should follow the step-by-step procedure that the operator will use to run the program. So, after the introductory materials, your manuals should include installation instructions, if necessary, loading instructions, and running instructions. In addition to these major components, you'll need a table of contents, an index, and possibly one or more appendices.

“If your program is a utility, you can presume your audience knows quite a bit about computers.”

Installation instructions should contain advice about the value of making back-up copies of the program and data disks or tapes. If you plan to incorporate a device to prevent unauthorized duplication of your program, this is the place to give the user that information. If you plan to incorporate a method for making one or two back-ups, explain the procedure here. If you plan to set up a registration system for users, tell the reader how to go about registering.

The installation instructions should also contain instructions on formatting data disks, hooking up peripherals such as printers and communications devices, and loading special drivers or routines to be protected in high memory. Installation instructions should also mention any peripheral software needed, such as upper/lowercase modifications or special driver routines for specific printers.

Instructions loading come next and should be very specific. The procedure should be explained step-by-step. Use plain language, not jargon:

● **RIGHT**—Place the operating-system disk in drive 0 and press your computer's

reset button.

● **WRONG**—Boot up your DOS and...

Make sure you spell program file names accurately, and include all extensions, where necessary. I recently was instructed to load a program called MAINMENU by an instruction manual, but obtained “program not found” error messages when I tried. Inspecting the directory of files on the disk, I discovered that the file's real name was MAILMENU. This simple error can be serious to a novice user.

(I place the file names of all programs on a disk along with a short description of each program in an appendix.)

Your loading instructions should include a description of what the operator will see on the screen at each step of the process and will be complete only when you have arrived at the first full screen display of the program itself.

Outline the Procedure

Next, you'll begin by outlining the general procedure the operator will use. Here's an example: A business program will usually be menu driven, offering the operator a choice of options from a list or menu. If the program requires data before a report can be printed, outline the procedure:

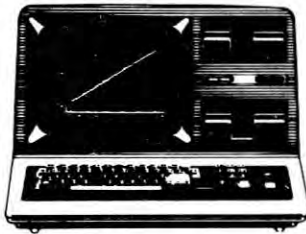
1. Select ADD DATA
2. Add names and account information
3. Return to menu
4. Select SORT DATA
5. Perform sort
6. Return to menu
7. Select PRINT DATA
8. Print data
9. Return to menu

Once you've outlined the general procedure, you can write entire chapters of instructions on the specific operations involved in performing the outlined task.

If your program is a game, make sure you list all the functions you've built into it. Here is where your program documentation comes in handy. I once wrote instructions, using an author's materials, for a football game written for the Apple computer. While playing the game, I mentioned to a coworker that it would be nice if you could pass as well as run. He suggested I call the author and ask if he could incorporate that feature into the game. When I called and made the suggestion, the author reported that that function was built into the game, but that he forgot to mention it in his instructions. We came close to publishing the game with one of its most important features unrecorded.

Game programs and utilities should

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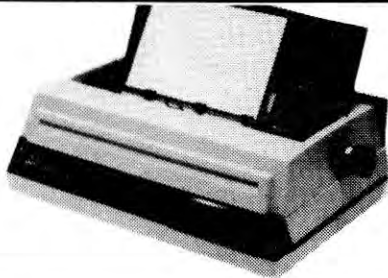
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Putting Pen to Paper

Now you know all the manual's ingredients: table of contents, introduction, installation instructions, loading and running information, and index. You sit down to start writing, but—whoops—the words come out all wrong. You try to write the introduction and end up with a detailed description of microprocessor bit manipulation instead. How do you really write this manual, anyway?

Start at the Beginning

Think back to those eighth-grade civics and history classes when you had to write a report on government of the Civil War. Once you researched your subject, the first step in preparing your report was to develop an outline.

Outlines give you a method of working your way into the subject gradually, starting with the essential background information and a general presentation of your findings and then moving into a detailed presentation.

An outline of your instruction manu-

al performs the same function. It provides you with an organizational base from which to start. A thorough outline also facilitates writing the table of contents. Take your time. You may have to produce two or three drafts over several days to complete your outline, but it will be time well spent once you begin the writing process.

The introduction to your manual is crucial. Like the lead in a newspaper or magazine article, your lead must capture the reader's attention while offering enough information about what is to follow to entice the reader to continue. The introduction must also tell the potential buyer what benefits he will derive from owning the program. Where possible, this enumeration of the benefits should be specific without being technical.

All too often an introduction (and even many product announcements) contain an impressive list of the technical features of a product, but never explain what the product is designed to do. For the majority of buyers, the process is much less important than the results. In fact, many products include outstanding features that go unused simply because they are never made understandable to the nontechnical user.

For example, a popular word-processing package claims, "... a printing chaining feature, permits installing special control characters in your text, loads ASCII files, EDTASM files..." and much more. These terms are meaningful to people experienced in using computers and word processors, but will mean little to the first-time buyer. It would be better to omit mention of these features in the introduction. They would be more suited to a section entitled "Advanced Features" for experienced buyers.

The key, then, to writing your introduction is to explain what your program will do as simply as you can. You'll have an opportunity to explain how it does these things later.

Some Dos and Don'ts

In any kind of technical writing for semi- or nontechnical readers, there are several rules to observe.

Observing these rules may add a little time to your manual preparation, but will be worth it in the long run. First, the Dos:

- Do use plain, simple English words to explain a function. Tell the reader to type words or commands, rather than



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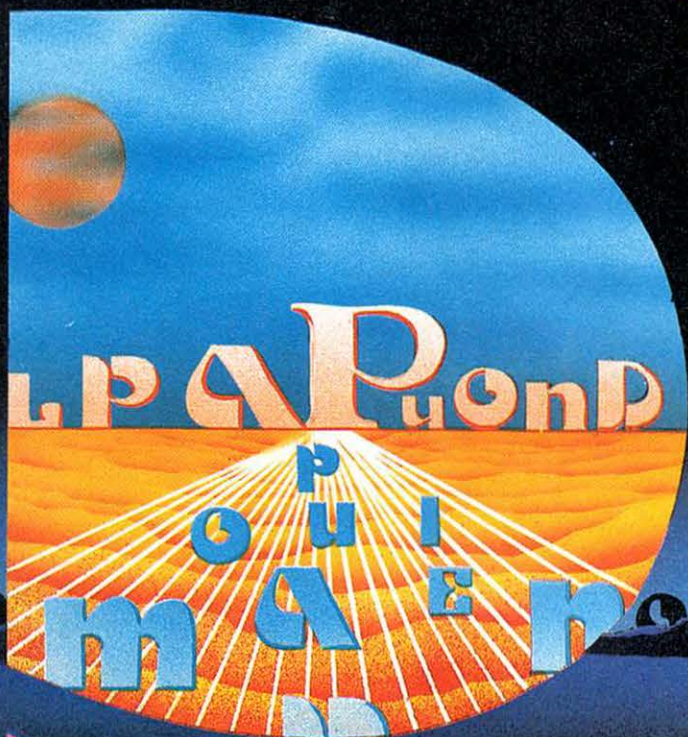
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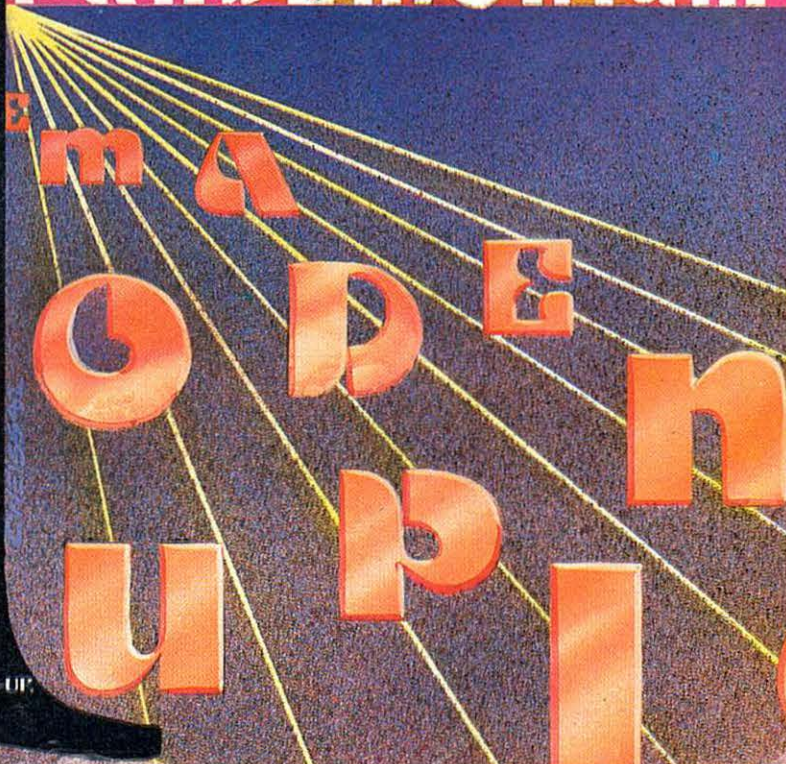
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to "keyboard" or "enter" them.

● Do maintain consistency throughout a document; once you adopt or establish a term or phrase, use it throughout your manual. If you call it a disk on page one, avoid calling it a "floppy" or a "diskette" on page four.

● Do use acronyms to modify nouns, not as stand-alone terms. Use "disk operating system," not DOS when referring to the disk operating system; DOS can modify disk or command, as in "DOS disk" or "DOS command," after you have defined it.

● Do define any terms you want to abbreviate. Define kilobyte (K) and its abbreviation before using the conventional "32K" in a memory description.

Here are some important Don'ts:

● Don't use unnecessary abbreviations such as "tech" for technical or "specs" for specifications. Abbreviations should be used sparingly.

● Don't assume your reader understands how to perform essential operations that are out of the ordinary. For example, if your program uses the Purge function that many disk operating systems make available, explain how to use the function or direct the reader to a reference that will outline the procedure.

● Don't use program names or features to describe a process: "Back up your disks" should be written, "Make back-up copies of your disks."

● Don't use nouns as verbs.

● Don't make up new words.

● Don't use jargon.

These rules will help you avoid some of the most confusing errors committed in writing about software.

A good test of your written materials is to give them to someone who knows nothing about computers. Ask him to read your manual. Have him point out fuzzy or vague passages and words or phrases he doesn't understand. You can then rewrite these passages to produce a manual that will be usable by almost anyone.

Cross-Referencing Means Never Having To Say You're Sorry

It is a frustrating fact of life that most people will not take time to read the instruction manual. Undoubtedly, they are so anxious to see what programming miracles you have wrought that they merely skim through the manual gaining only the barest idea of how to proceed. Subsequently, when they run into a problem, they pick up the manual and start flipping through its pages hoping the answer will jump out at them.

At this point you'll make a lot of

friends if you've had the wisdom to include a table of contents and an index. The longer the manual, the more important these components become. These two elements of a manual should not be treated as an afterthought; spend some time preparing them. Make them as complete as possible.

The basis for the table of contents will be the original outline of your manual adapted to conform to the final draft of the manuscript. Your chapters should be short and confined to the discussion of one subject, where possible. In a very long manual, the table of contents can include the chapter subheads. Make it easy on the reader to find the information he needs. Put the table of contents at the beginning of your manual.

*"Step one is
unmitigated torture.
That's right,
you're going to
have to read
your own manual."*

On a separate page just after your table of contents, you might consider listing all figures, tables, sample screens, and menus accompanied by appropriate page numbers. Often, such figures or sample problems are a short-cut solution to a user's indecision.

Indexing

Indexing is more difficult, but even more important. The index must contain a reference for each process discussed in your manual. The index is a rare bird in manual production; make sure you list it in the table of contents.

Different methods of preparing an index are worth an article in themselves. The most familiar is the card method. You must work quickly and scrupulously. Make yourself a pot of coffee, buy a thick stack of three-by-five cards and grab the family's recipe file box.

I say you must work quickly because an index is usually the last step in the preparation of a manual. Your publisher is waiting to go to press. But before you begin, you must have final page proofs with correct pagination. Unlike

many typeset books, technical manuals are often bound on 8½-by-11 sheets delivered by a line printer. This allows you the advantage of knowing where your material will fall on each page much earlier in the production cycle.

Step one is unmitigated torture. That's right, you're going to have to read your own manual. While reading, underline keywords about the subject under discussion, as well as indicator phrases about the aspects you are explaining. Each keyword followed by its indicators should be listed on a separate index card, page by page. Later, the cards can be collected in alphabetical order. Your indicator entries should be edited for redundancy and their page numbers combined.

If you composed your subheads carefully for the table of contents, these keywords will come easily; the indicator phrases are more difficult. Nothing is more useless to the reader than an index entry "disk" followed by 12, 18, 32-36, 94. If this is the best you can do, don't waste your time. The above entry does not give the reader a clue as to whether you are discussing information storage on disk (storage) or what happens when you leave one on overnight (care and handling).

"Disk" is distinct from "disk operating system," which itself must be itemized by user instructions, or special notes for use with certain peripherals.

Cross-referencing is another arcane and tedious art, but necessary. If you think the reader might be struggling to find DOS instructions, let him know they can be found under "disk operating system." If he's looking for ASCII character codes, make sure you direct him to "American Standard Code for Information Interchange."

There are a number of other tips to follow, and I recommend two good reference manuals: *A Manual of Style* is put out by the University of Chicago Press, and *Words into Type* is published by Prentice-Hall. They both have chapters delineating the protocol of indexing. They are standard editorial guides and you'll find them in the reference room of your city library.

The Home Stretch

Now that you've finished writing your manual, you're within sight of the end of this whole ordeal. All that remains is to proofread and edit your material after you write it. Let's take a close look at what an edit/proofread cycle will accomplish.

Proofreading

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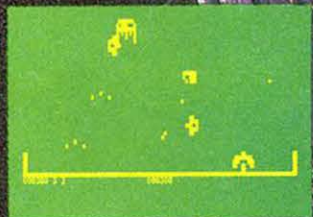
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527

Help Protect the Planet From A
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By Arthur Gleckler



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ining your text to locate and correct spelling and grammatical errors. The proofreading cycle should also verify the accuracy of all references to pictures, figures, and tables accompanying your text. Proofreading should also enable you to pick up errors like leaving out a chapter title or misnumbering pages.

If you proofread your own work, it's wise to set it aside for a few days, so the material will appear fresh. Better yet, give your manuscript to a friend who has a sharp eye for spelling and punctuation, and let this trusted soul make proofreading corrections.

Even though program listings are machine generated, and presumably error-free, it is a good idea to proofread these listings, too. Be on the lookout for misspelled words in print statements or routines. When you are writing a program, a misspelled word seems trivial, but when a software submissions editor looks over your work, those errors will leap off the screen. They can't help your cause and are so easy to avoid.

Of equal importance is editing. An editor examines a manuscript's content for style and readability. The content edit should be done with a critical eye. Ask yourself as you read each sentence,

"Did I say what I meant to say? Does this sentence read clearly and convey a coherent thought? Does it follow logically from the sentence preceding it?"

While editing, be conscious of your text's readability. If you feel that a sentence's meaning may be obscured because of its length, break the questionable sentence into two or more sentences, or rewrite it entirely.

Word Processing

A cold-blooded edit usually yields a greatly transformed manuscript. You'll find that word processing makes your job much easier. The ability to make liberal changes in your text without expending large amounts of time and energy can significantly improve the quality of your output.

There is one final editing opportunity that you will be afforded. (If you're not offered, insist!) You'll be asked to proofread your author's proofs. These proofs are galleys of the final version of your manuscript after it has been typeset by your publisher. This is the last opportunity to make sure that all your materials are correct and complete. Don't regard this responsibility lightly. Plan to spend a good deal of

time inspecting this nearly final product. Make sure it is as good as you and your editors can make it.

The End

If you take the time and invest the effort to write a good manual for your software, you'll be in a much stronger marketing position whether you try to sell your goods to a publisher or peddle the stuff on your own. Good manuals make your software look more professional. They will help prevent after-sale service problems. And they will make you feel better about your product.

I'm sure documentation will continue to take a lot of heat from software users who want to sound technologically chic—after all, criticizing something yields a feeling of power—and from people who still remember mainframe computer documentation that was *not* written for end users and was consequently obtuse.

At least you can now be sure that your manuals won't be counted among those that get slammed! ■

G. Michael Vose is a technical editor for 80 Micro.



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12. System requires Model I or III (or equivalent), Auto-Answer Modem, RS-232, and NEWDOS/80 V 2.0. Program will work on either model automatically. (NOTE: 1200 baud requires a specially modified cable.)

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Mailing List Compiler

by Gerald Sprouse

Use your Color Computer, a Line Printer VII, and this program to keep your mailing list up to date. It lets you print labels, too!

Program Listing

```

10 CLEAR 9000:T=40:L=38:DIMM$(T,8):N=0:M=7
20 CLS:PRINT"COLOR COMPUTER MAILING LIST" FOLLOWING OPTIONS A
AVAILABLE:"
30 PRINT" <A>DD NAMES TO THE MAILING LIST"
40 PRINT" <R>EAD MAILING LIST FROM TAPE <C>HANGE THE MAILING
LIST"
50 PRINT" <L>IST NAMES ON THE SCREEN <P>RINT MAILING LABE
LS"
60 PRINT" <W>RITE MAILING LIST ON TAPE <D>PRINT ADDRESS LIS
T"
70 PRINT" <E>ND"
80 PRINT" NUMBER OF NAMES IN LIST=";N
90 PRINT" KEY IN YOUR OPTION"
100 A$=INKEY$:IF A$="" THEN 100
110 ON INSTR("EARCLPWD",A$) GOTO 130,140,460,470,360,700,440,860
120 GOTO 20
130 END
140 CLS:PRINT"ADD NAMES TO THE MAILING LIST"
150 PRINT"DO YOU WANT INSTRUCTIONS ON HOW TO ENTER DATA(Y/N)?"
160 A$=INKEY$:IF A$="" THEN 160
170 IF A$="N" THEN 230
180 CLS:PRINT"NAME 1":PRINT"NAME 2":PRINT"NAME 3":PRINT"NAME 4"
190 PRINT"ORGANIZATION":PRINT"ADDRESS":PRINT"CITY,STATE,ZIP":PRI
NT"TELEPHONE"
200 PRINT"ABOVE ARE THE DATA ENTRY ITEMS. TYPE EACH ITEM AND PRE
SS ENTER."
210 PRINT"TO IGNOR AN ITEM JUST PRESS ENTER. "
220 LINEINPUT"PRESS ENTER TO BEGIN";A$
230 CLS:IF N<T THEN 250
240 GOTO 280
250 N=N+1
260 GOSUB 1000:IF M$(N,0)<>" THEN 250
270 N=N-1:GOTO 20
280 PRINT" OUT OF MEMORY ";PRINT"DO YOU WANT TO RECORD THE"
290 PRINT"CURRENT LIST ON TAPE(Y/N)?"
300 A$=INKEY$:IF A$="" THEN 300
310 IF A$="Y" THEN GOSUB 1130
320 PRINT"DO YOU WANT TO CLEAR THE MEMORY FOR ADDITIONAL NAMES(Y
/N)?"
330 A$=INKEY$:IF A$="" THEN 330
340 IF A$="Y" THEN N=0
350 GOTO 20
360 CLS:IF N=0 THEN GOSUB 1190:GOTO 20
370 PRINT"KEY IN SEARCH FIELD(1 TO 8)"
380 A$=INKEY$:IF A$="" THEN 380
390 IF A$<"1" OR A$>"8" THEN 370 ELSE F=VAL(A$)-1:I=I+1
400 J=1:CLS
410 PRINT I;" ";M$(I,F):J=J+1:I=I+1:IF I>N THEN 430:ELSE IF J<11 THEN 4
10
420 PRINT"":GOSUB 1110:LINE INPUT"":A$:GOTO 400

```

Listing continues

One way computers are used in the business world is to produce and maintain mailing lists. This article describes a mailing list program for the Color Computer with a Line Printer VII.

Since some labels must contain a person's name in addition to an organization's name and address, the program allows for up to four lines on the label. When the label must have three or four names, the program automatically prints the address information on two labels, because address labels only allow five lines of information.

For ease of operation, the program makes maximum use of INKEY\$ for program control. Additionally, each address line is checked for length and the operator cued for reentry. The program also allows the option of printing an address list with phone numbers for office use. This address list can be kept up to date and then used to correct the data stored in the data file on tape.

The program allows eight data fields for each label. Fields 1 to 4 contain names of specific individuals at each organization. Field 5 is the organization name while field 6 is the street address. The city, state, and zip code are in field 7 with the telephone number in field 8.

Program Operation

After inputting the program, enter

The Key Box

**Color Computer
16K RAM
Extended Color Basic
Line Printer VII**

PCLEAR1 to clear sufficient memory. The main menu allows the following options:

● A—adds names to the mailing list or starts a new list. This option provides user instructions for data entry. If the list becomes too long, the program offers the option of storing the current list on tape.

● R—reads in a mailing list from a tape data file.

● L—lists names on the screen. This option also allows the user to select other data fields for listing on the screen. For example, use of field 5 lists all organization names.

● C—changes the mailing list. The program presents a new menu with four options: D—delete a name from the list; C—change one of the eight fields for each address; A—another address (return to find another address); and E—exit this option to the main menu. The computer assigns a number to each address, and this number must be entered to find a specific address for deletion or change. The number is displayed on the screen during option L.

● P—prints address labels. Radio Shack recommends dry-gum labels (26-1456) for the Line Printer VII. However, these labels are two across.

Listing continued

```

430 PRINT" END OF LIST ":GOSUB1110:LINE INPUT";A$:GOTO20
440 CLS:IFN=0THEN GOSUB1190:GOTO20
450 PRINT"RECORD MAILING LIST ON TAPE":PRINT":GOSUB1130:GOTO20
460 CLS:PRINT"READ MAILING LIST":GOSUB1220:GOTO20
470 CLS:IFN=0THENGOSUB1190:GOTO20
480 PRINT "CHANGE"
490 PRINT "TO DISPLAY ADDRESS, ENTER ADDRESS # (IF UNKNOWN
    USE <L>)"
500 PRINT "TO EXIT THIS MODE PRESS ENTER "
510 PRINT":LINE INPUT"NUMBER";A$:I=VAL(A$):IFA$=""THEN20
520 CLS
530 PRINT" <D>ELETE NAME <C>HANGE A FIELD"
540 PRINT" <A>NOTHER NAME "
550 PRINT" <E>XIT"
560 FORJ=0TOM:PRINTJ+1;M$(I,J):NEXT
570 PRINT"KEY IN SELECTION"
580 A$=INKEY$:IFA$=""THEN580
590 IFA$<>"C"THEN660
600 PRINT"TYPE IN THE NUMBER OF FIELD AND THEN ENTER THE NEW VAL
    UE"
610 PRINT"KEY IN FIELD(1 TO 8)"
620 A$=INKEY$:IFA$=""THEN620
630 IFA$<"1"ORAS">"8"THEN610ELSEJ=VAL(A$)-1
640 LINE INPUT"NEW ITEM";M$(I,J):IF LEN(M$(I,J))<L+1 THEN520
650 PRINT"TOO LONG, REENTER":GOTO640
660 IFA$<"E"THEN680
670 GOTO20
680 IFA$="A"THEN470
690 IFA$<"D"THEN520ELSEM$(I,0)="":GOSUB1300:GOTO470
700 CLS:IFN=0THENGOSUB1190:GOTO20
710 PRINT"PRINT MAILING LABELS"
720 PRINT"DO YOU WANT A TRIAL RUN(Y/N)?"
730 A$=INKEY$:IFA$=""THEN730
740 IFA$="N"THEN760
750 FORJ=1TO2:I=1:GOSUB1330:NEXT:GOTO720
760 PRINT"PRESS <P> TO START PRINTING, <E> TO EXIT"
770 A$=INKEY$:IFA$=""THEN770
780 IFA$="E"THEN20
790 I=1
800 GOSUB1330:I=I+1

```

Listing continues

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Therefore, this option prints two identical labels for each address. This option allows a trial run of two labels to align the printer.

- D—prints address list with phone numbers.
- W—writes entire address list to a tape data file.
- E—end.

Program Structure

In line 10, variable T controls the total number of addresses in the list while L controls the length of each address field. Clear additional string space if T is increased.

Lines 20–130 are the main menu. Lines 140–350 are the A option. Delete lines 150–220 if data entry instructions are not required.

Lines 360–430 are the L option, lines 440–450 the W option, line 460 the R option, lines 470–690 the C option, lines 700–850 the P option, lines 860–930 the D option, and lines 1000–1630 the various subroutines called from the main program. ■

Gerald Sprouse can be reached at 9977 Caminto Chirimolla, San Diego, CA 92131.

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181

Listing continued

```

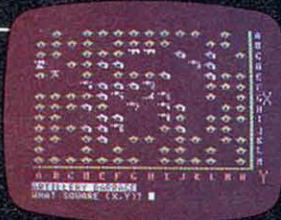
810 IFI<=N THEN800
820 PRINT"DO YOU WANT TO READ IN ANY MORE TAPES(Y/N)?"
830 A$=INKEY$:IFA$=""THEN830
840 IFA$="Y"THENGOSUB1220
850 GOTO20
860 CLS:IPN=0THENGOSUB1190:GOTO20
870 I=1
880 GOSUB1550:I=I+1
890 IFI<=N THEN 880
900 PRINT"DO YOU WANT TO READ IN ANY MORE TAPES(Y/N)?"
910 A$=INKEY$:IFA$=""THEN910
920 IFA$="Y"THENGOSUB1220
930 GOTO20
1000 LINE INPUT"NAME 1";M$(N,0):IF LEN(M$(N,0))>L THEN GOSUB1100
:GOTO1000
1010 IF M$(N,0)=""THEN1090
1020 LINE INPUT"NAME 2";M$(N,1):IF LEN(M$(N,1))>L THEN GOSUB1100
:GOTO1020
1030 LINE INPUT"NAME 3";M$(N,2):IF LEN(M$(N,2))>L THEN GOSUB1100
:GOTO1030
1040 LINE INPUT"NAME 4";M$(N,3):IF LEN(M$(N,3))>L THEN GOSUB1100
:GOTO1040
1050 LINE INPUT"ORGANIZATION";M$(N,4):IF LEN(M$(N,4))>L THEN GOS
UB1100:GOTO1050
1060 LINE INPUT"ADDRESS";M$(N,5):IF LEN(M$(N,5))>L THEN GOSUB110
0:GOTO1060
1070 LINE INPUT"CITY,STATE,ZIP";M$(N,6):IF LEN(M$(N,6))>L THEN G
OSUB1100:GOTO1070
1080 LINE INPUT"TELEPHONE";M$(N,7)
1090 RETURN
1100 PRINT"TOO LONG, REENTER":RETURN
1110 PRINT"PRESS ENTER TO CONTINUE";:RETURN
1120 PRINT"NO DATA IN MEMORY":RETURN
1130 GOSUB1200
1140 A$=INKEY$:IFA$=""THEN1140
1150 IFA$="E"THENPRINT"":RETURN
1160 PRINT"RECORDING DATA":OPEN"O",-1,"DATA"
1170 FORI=1TON:PRINT#-1,M$(I,0),M$(I,1),M$(I,2),M$(I,3),M$(I,4),
M$(I,5),M$(I,6),M$(I,7):NEXT
1180 CLOSE#-1:RETURN
1190 GOSUB1120:GOSUB1110:LINE INPUT"":A$:RETURN
1200 PRINT"SETUP THE RECORDER AND PRESS <R> WHEN READY":PRINT
"<E> TO EXIT"
1210 RETURN
1220 GOSUB1200
1230 A$=INKEY$:IFA$=""THEN1230
1240 IFA$="E"THEN RETURN
1250 PRINT"READING DATA":OPEN"I",-1,"DATA":N=1
1260 IF EOF(-1) THEN 1290
1270 INPUT#-1,M$(N,0),M$(N,1),M$(N,2),M$(N,3),M$(N,4),M$(N,5),M$
(N,6),M$(N,7)
1280 N=N+1:GOTO1260
1290 CLOSE#-1:N=N-1:RETURN
1300 CLS:PRINT"RECOVERING SPACE"
1310 N=N-1:FORJ=I TO N:PORK=0 TO 7:M$(J,K)=M$(J+1,K):NEXT:K=7
1320 RETURN
1330 IFM$(I,2)="" THEN 1430
1340 PRINT#-2,M$(I,0);TAB(42);M$(I,0)
1350 PRINT#-2,M$(I,1);TAB(42);M$(I,1)
1360 PRINT#-2,M$(I,2);TAB(42);M$(I,2)
1370 PRINT#-2,M$(I,3);TAB(42);M$(I,3)
1380 PRINT#-2,"":PRINT#-2,""
1390 PRINT#-2,M$(I,4);TAB(42);M$(I,4)
1400 PRINT#-2,M$(I,5);TAB(42);M$(I,5)
1410 PRINT#-2,M$(I,6);TAB(42);M$(I,6)
1420 PRINT#-2,"":PRINT#-2,"":PRINT#-2,"":RETURN
1430 IFM$(I,1)="" THEN 1500
1440 PRINT#-2,M$(I,0);TAB(42);M$(I,0)
1450 PRINT#-2,M$(I,1);TAB(42);M$(I,1)
1460 PRINT#-2,M$(I,4);TAB(42);M$(I,4)
1470 PRINT#-2,M$(I,5);TAB(42);M$(I,5)
1480 PRINT#-2,M$(I,6);TAB(42);M$(I,6)
1490 PRINT#-2,"":RETURN
1500 PRINT#-2,M$(I,0);TAB(42);M$(I,0)
1510 PRINT#-2,M$(I,4);TAB(42);M$(I,4)
1520 PRINT#-2,M$(I,5);TAB(42);M$(I,5)
1530 PRINT#-2,M$(I,6);TAB(42);M$(I,6)
1540 PRINT#-2,"":PRINT#-2,"":RETURN
1550 PRINT#-2,M$(I,0):IFM$(I,1)=""THEN1590
1560 PRINT#-2,M$(I,1):IFM$(I,2)=""THEN1590
1570 PRINT#-2,M$(I,2):IFM$(I,3)=""THEN1590
1580 PRINT#-2,M$(I,3)
1590 PRINT#-2,M$(I,4)
1600 PRINT#-2,M$(I,5)
1610 PRINT#-2,M$(I,6)
1620 PRINT#-2,M$(I,7)
1630 PRINT#-2,"":PRINT#-2,"":RETURN

```

Listing continues



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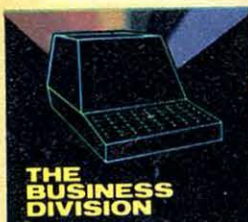
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Hardware Hacker—Part IV

Philip M. Van Praag
1630 West Jagged Rock Road
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My final article integrates the 32K Memory Mod, Centronics-Compatible Printer Interface, and Double Density

Disk Controller articles into a common Peripheral Support Interface (PSI) system.

As mentioned in each previous article, the individual projects are capable of stand-alone operation. Separate PC boards for each allow tailoring the system to your needs. Gradual investment will produce a complex, powerful adjunct to the TRS-80. In addition, initial trial (and troubleshooting) of in-

dividual system components is enhanced via the stand-alone operation concept.

Additional hardware presented in this article includes a ribbon cable distribution PC board and system cabinet construction details. The cable PC board simplifies board-to-board connections. If you have been building the system one board at a time, you have no doubt already assembled a 40-conductor

cable/card-edge connector for at least one of the boards. This same cable can be used to connect the TRS-80 and the new cable PC board. Then, even if you build all PC boards simultaneously, you can check out each project individually (rather than applying power to the entire system the first time). Simply attach the project board cables one at a time, verifying proper operation at each step before proceeding.

The system cabinet described here is also mentioned in the Disk Controller article. There is no electrical reason why a different metal cabinet configuration can't be used; but this particular cabinet is a compromise between cost, rapid construction, ease of circuit troubleshooting, and a handy means of elevating the video monitor a few inches closer to eye level. For those without facilities to prepare the cabinet, a completely drilled, punched, painted, and labelled version is available (see note at end of article).

System Integration

First, let's consider some system integration concepts, particularly as related to address/data line utilization and

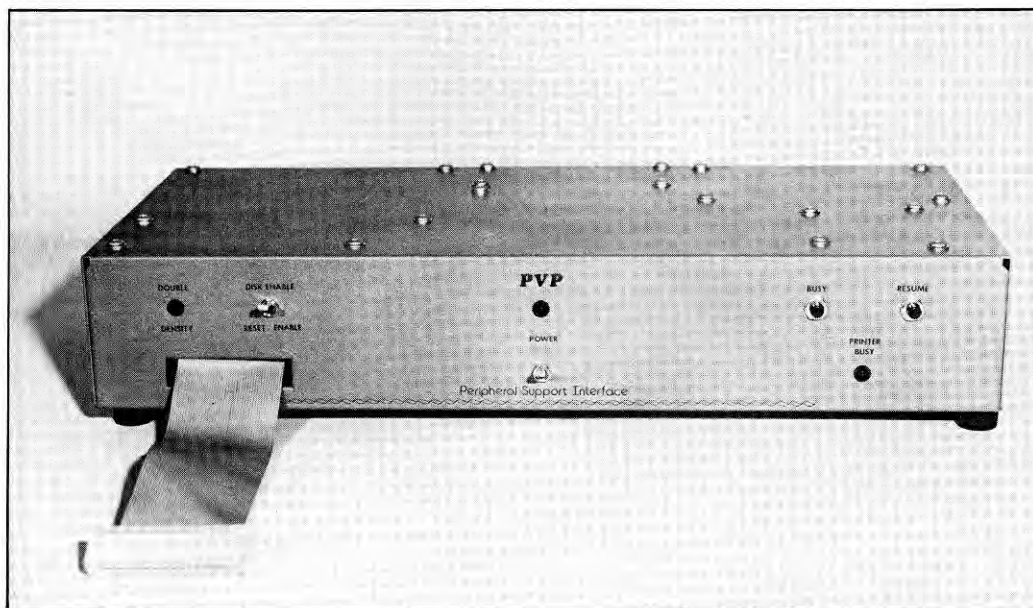
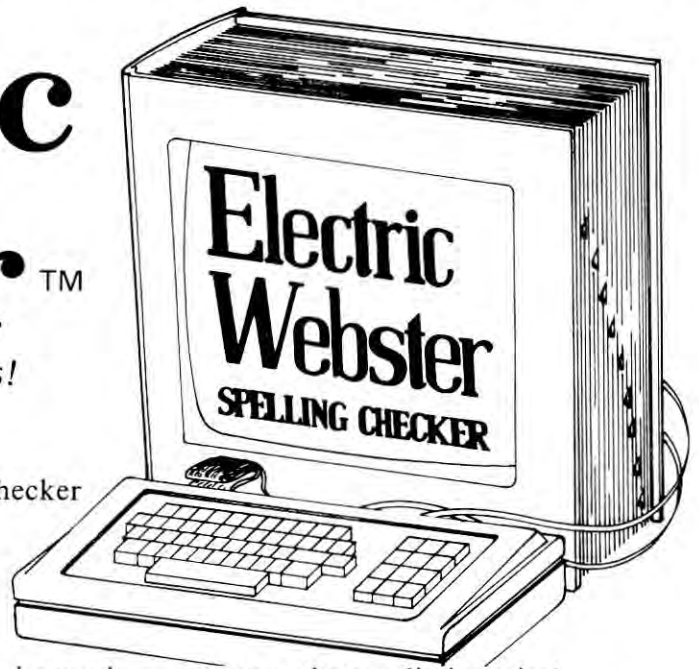


Photo 1

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power supply distribution.

Figure 1 contains a system view of how address lines are used in the PSI. The printer interface decodes A2-A15, looking for a 37E8 address. When 37E8 is decoded in the presence of a Write (WR) command, the current data bus character or instruction is clocked into a data buffer, then on to the printer. A busy signal tells the TRS-80 not to send more data until the current data is processed. 37E8 together with read (RD) feeds the printer status (out of paper, fault, for example) back to the TRS-80. (Since A0 and A1 are not decoded in the printer interface, addresses 37E9, 37EA, and 37EB produce the same result as 37E8. This is not a problem, as these three addresses are never used.)

The 32K memory mod decodes A14 and A15 to activate one of the two 16K blocks of memory on the board. When A15 is present along with row address strobe (RAS), the RAM memory block operating over addresses 32768-49151 is enabled. When both A15 and A14 are present along with RAS, the 49152-65535 block is enabled. Two groups of addresses (A0-A6 and A7-A13) are multiplexed to the RAMs. A0-A6 contain the row address information for the RAMs, while A7-A13 contain column address information.

The disk controller decodes A2, A3, and A5-A15, producing six key control signals used throughout the controller. These signals are used in the support circuitry for the floppy disk controller (FDC) ICs, and also within

“Even if you build all PC boards simultaneously, you can check out each project individually (rather than applying power to the entire system).”

the FDCs. There they combine with A0 and A1 to select a desired FDC register. A0 and A1 are also used with data access lines (DAL0 and DAL3-DAL7), write enable (WE), and system reset (SYSRES) to define the disk controller mode of operation.

Figure 2 contains a system view of data lines used in the PSI. The printer interface receives all eight data lines, latching the incoming data from the TRS-80 and holding it for use by the printer. Status feedback information from the printer is gated onto data lines D4-D7. Thus, the printer interface alternately routes information to and from the printer. (It does not alter data in any way.)

The 32K memory mod uses the data lines directly at the RAM data inputs. RAM data outputs, however, are gated onto the data lines only when directed by the TRS-80 (via decoding of A14, A15, and RD). As with the printer interface, strict control must be placed on when outputs can appear on the data lines. This avoids two or more sources trying to output data at the same time.

The disk controller uses a gated version of the data lines (DAL0-DAL7) for FDC activities

and as a decoding source for determining mode of operation. The FDC converts incoming TRS-80 parallel data to serial, allowing disk drive recording. Similarly, it converts serial read-data from the drives back into parallel for the TRS-80. The single density (SD)/double density (DD) decoder uses DAL0 and DAL3-DAL7, together with A0, A1, WE, and SYSRES to enable either the single density FDC (1771) or the double density FDC (1791) as commanded by the software. D0-D3 are connected directly to a disk drive select latch, activating the appropriate disk drive.

Figure 3 contains a system view of power supply distribution in the PSI. Sufficient reserve capability in the +12/+5/-5V power supply in the 32K memory mod article also allows it to provide +5V for the printer interface and +12/-5V for the disk controller. It cannot, however, provide the +5V needs of the disk controller. For this reason, a separate on-board +5V supply was included in the disk controller design. The printer interface PC board contains provisions for a simple zener diode regulator intended for the stand-alone application, where power is provided by a 6V dc wall plug-

in supply. In the PSI, however, power is obtained from a pre-regulated +5V source; therefore C3, D1, and R7 must be omitted from the board, and the +5V should be directly connected to C2.

If you have already built the 32K memory mod and are now building the PSI, it is a good idea to move the 32K memory mod to the PSI cabinet. This will enhance system noise characteristics and allow multifunction use of the 32K memory mod's power supply.

Ribbon Cable Distribution PC Board

A full-size etch pattern for the ribbon cable distribution PC board is in Fig. 4. Figure 5 contains a complete description of all conductor destinations on the board, including suggested ribbon cable lengths when using the cabinet described in the parts list. Provisions are included for four ribbon cables: one each to the printer interface, 32K memory mod, and disk controller boards, plus a cable to the TRS-80 keyboard expansion port card edge. Connections at the three PSI boards are identical to those described in the individual articles. If you have already built the three individual projects, and the ribbon cable lengths are sufficient for the PSI, there is no need for wiring changes at these three boards.

For simplicity and better adjacent-conductor isolation, ribbon cable connections at the cable PC board include all 40 conductors of each cable. Do not worry about the destination

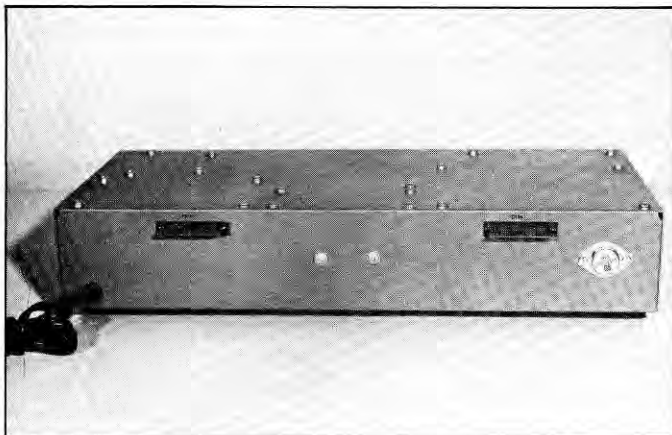


Photo 2

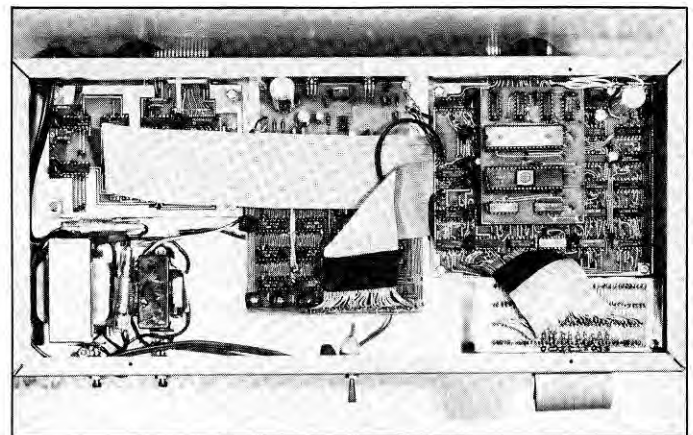


Photo 3

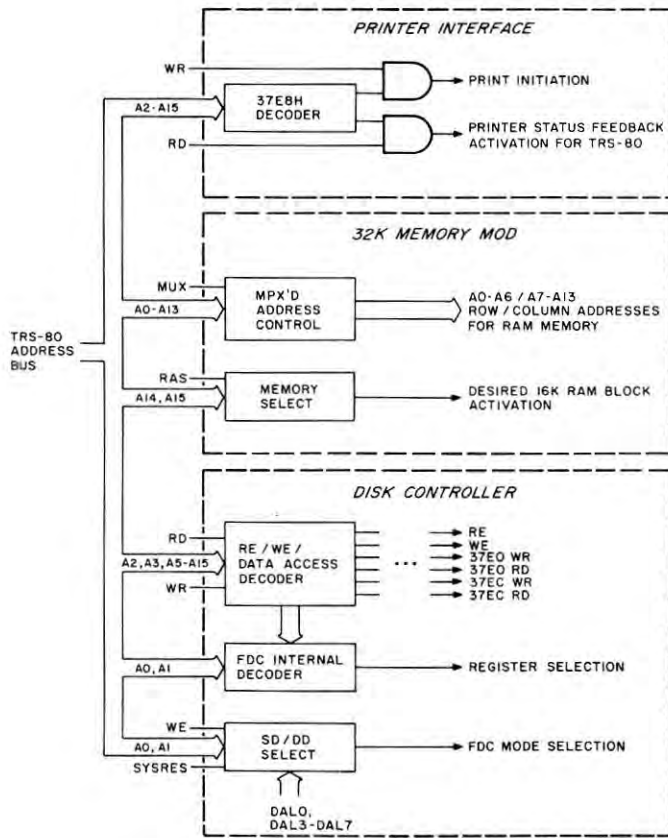


Fig. 1. TRS-80 address bus utilization in the PSI

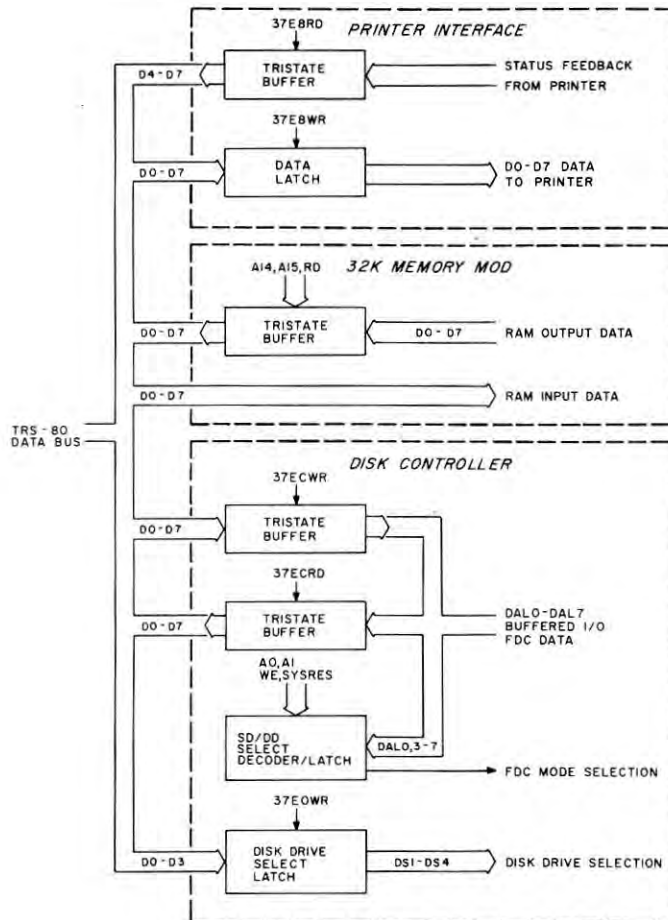


Fig. 2. TRS-80 data bus utilization in the PSI

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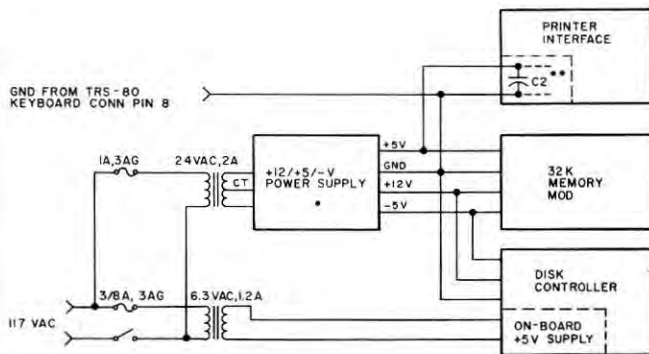


Fig. 3. Power supply distribution in the PSI. Be sure to use the version in the 32K Memory Mod article. Although the bare PC boards are the same in both the Mem Mod and Disk Controller articles, the components used on the board for the stand-alone disk controller are not suited for use as shown here.

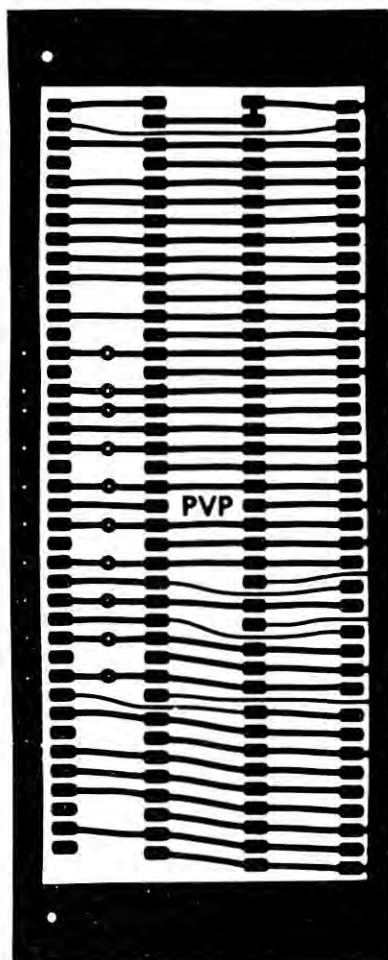


Fig. 4. Etch pattern for ribbon cable distribution PC board

of every wire, just be sure no cable is wired backward. Be certain that the A2-end of the ribbon cables at the cable PC board is the same end attached to the A2 pads of the three project boards. Because of the fan-out required to fit the 2-inch wide ribbon cable into pads spanning 4 inches, it is a good

idea to prepare the ribbon cable ends as shown in Fig. 6. Using an ordinary pair of scissors, trim a V-shaped notch with its apex about 1 1/4 inches from the cable end. Then separate each conductor back about 1/2 inch. Finally, strip about 1/8 inch insulation from each conductor. Insert the conductors in order,

TRS-80	DISK	PRINT	MEM
X	X	X	X
A2	A2	A2	A2
X	X	X	X
A6	A6	A6	A6
A5	A5	A5	A5
A7	A7	A7	A7
X	X	X	X
A3	A3	A3	A3
A4	X	A4	A4
D2	D2	D2	D2
X	X	X	X
D0	D0	D0	D0
A1	A1	X	A1
D5	D5	D5	D5
A0	A0	X	A0
D3	D3	D3	D3
X	X	X	X
D6	D6	D6	D6
INT	INT	X	X
D1	D1	D1	D1
X	X	X	X
D7	D7	D7	D7
A9	A9	A9	A9
D4	D4	D4	D4
RD	RD	RD	RD
X	X	X	X
WR	WR	WR	WR
X	X	X	X
A8	A8	A8	A8
X	X	X	X
A11	A11	A11	A11
A14	A14	A14	A14
A15	A15	A15	A15
GND	GND	GND	GND
A12	A12	A12	A12
A13	A13	A13	A13
X	X	X	X
A10	A10	A10	A10
RAS	X	X	RAS
SR	SR	X	X

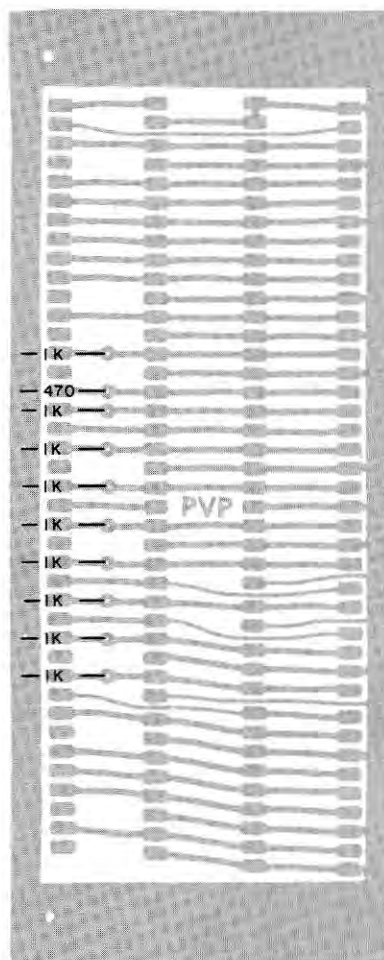
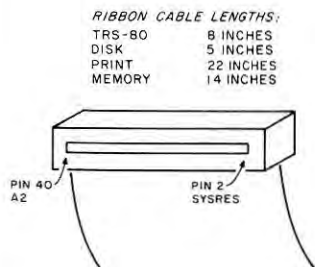


Fig. 5b. Ribbon cable PC board termination component placement. These resistors are designated R33-R42 in the disk controller article.

X = No usage of this conductor
SR = System Reset

Top View (with circuit trace pattern underneath)

Fig. 5a. Ribbon cable PC board conductor identification and suggested cable lengths. The 40-pin connector plugs into the keyboard with the ribbon cable exiting the bottom of the connector.

without skipping any conductors or pads. If you have already attached the other end of the cables, be absolutely certain that none of the cable PC board ends are attached backward. (Virtually all ribbon cables have some sort of color-coding to identify sides—the simplest method is a red stripe along the outermost conductor on one side.)

Figure 5b shows where the termination resistors are mounted on the cable PC board. These resistors are designated R33-R42 in the Disk Controller article. If you have already chosen the option of adding the

resistors directly to the disk controller main PC board, do not add a duplicate set to the cable PC board.

Figure 7 shows the proper routing of the ribbon cables. Insert the disk controller ribbon cable into the circuit trace side of the cable PC board, and the other three cables from the opposite side.

If you are connecting all four cables to the PC board at one time, attach the 32K memory mod cable first, then the printer interface, disk controller, and finally the TRS-80 cable. This is the simplest attachment order,

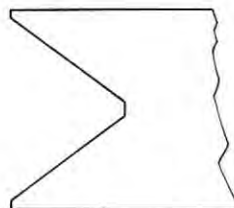


Fig. 6. Recommended trimming guide for cable-PC board end of ribbon cables

particularly if the other ends of these cables have already been wired.

The preparation and wiring of the ribbon cables is a tedious task. I rejected the alternative, to attach connectors to all the cabling. First, it would be quite costly; more significantly, it would reduce the long term reliability of the system by introducing 160 mechanical connections at the cable PC board, and about 80 connections at the three project PC boards.

Cabinet Construction and Wiring

Figures 8 through 10 provide the dimension details needed for cabinet preparation. Figure 8 contains dimensions for the front panel, Fig. 9 for the back panel, and Fig. 10 for the cabinet top. Make the rectangular cut-outs for the TRS-80 ribbon cable and the disk controller/printer interface card edge connectors by drilling several small holes and filing to the dimensions or by drilling one larger hole and then using a "nibbler" to punch the metal to the desired dimensions. (The Adel Nibbling Tool, available from Jameco Electronics in Belmont, CA, 94002, at \$7.50, is excellent for this purpose.)

All PC boards are attached to the cabinet top via threaded standoffs. Standoff heights should be 1/2 inch for the disk controller, printer interface, and 32K memory mod boards, 3/4 inch for the power supply board,

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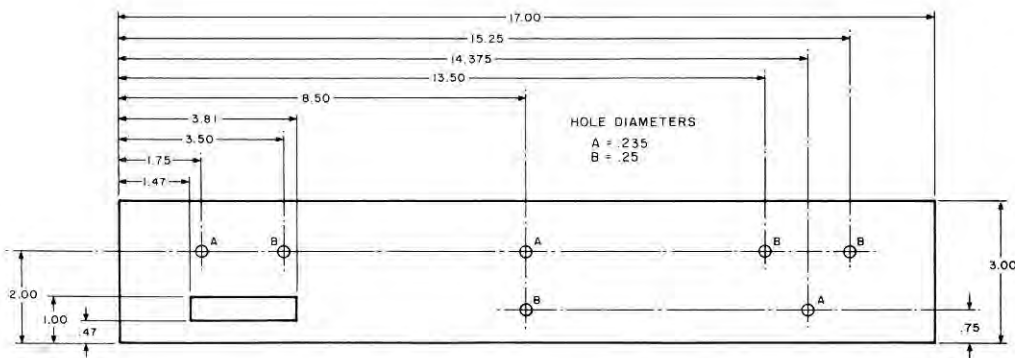


Fig. 8. Cabinet front panel dimensions

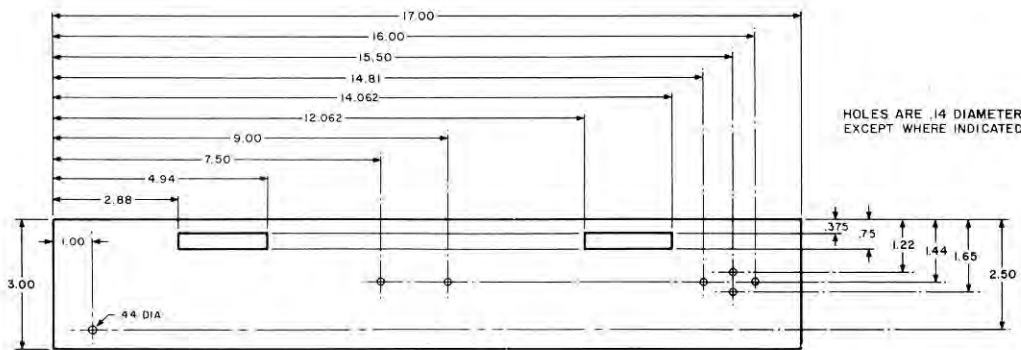


Fig. 9. Cabinet rear panel dimensions

and 1½ inches for the cable PC board. The two power transformers are also mounted to the top. Thus, you can remove the bottom cover to allow unobstructed circuit access for servicing.

Wiring connections, other than ribbon cables, between the PC boards and cabinet-mounted components are shown on Fig. 11. Be very careful to properly insulate the transformer primary and power switch connections to eliminate potential shock hazard. A good way to insulate the power switch is to slip a 1½ inch length of large-diameter shrink tubing over the switch, after soldering the wires and routing them out the front side instead of at the rear terminal locations. While the shrink tubing is still hot, pinch the rear portion of it (extending out beyond the solder terminals) with pliers and hold until the tubing has cooled. The tubing should remain pinched together. Before mounting the disk controller regulator to the outside of the

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ATTACH THOSE CONDUCTORS SHOWN IN FIG. 12 OF 32K MEMORY MOD ARTICLE

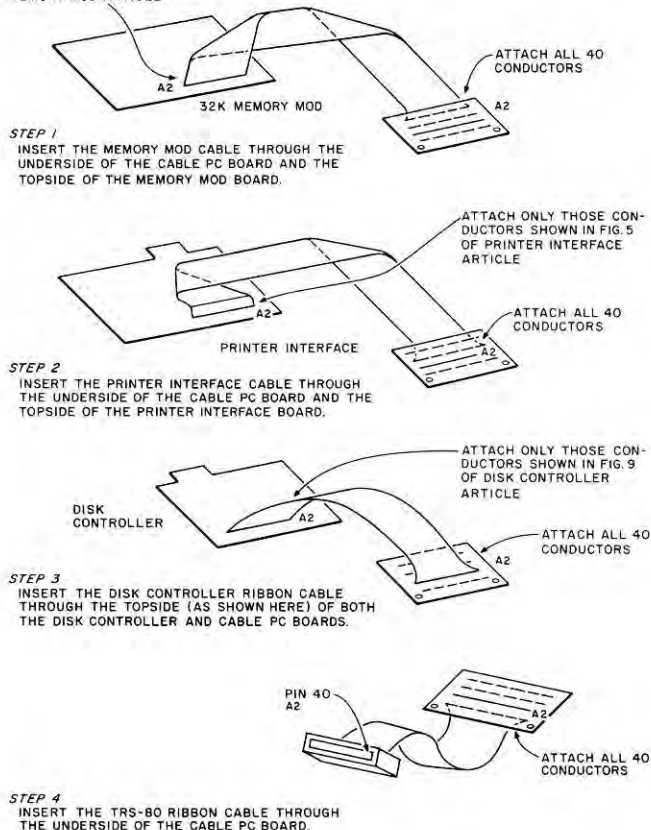


Fig. 7. Ribbon cable routing guide

cabinet, be sure to scrape away the paint in that area. The best way to do that is to temporarily place the regulator in position and trace its outline onto the cabinet. Using a small screwdriver, carefully scrape away the paint within the outline, then apply thermal heatsink compound before fastening the regulator. Attach a solder lug to one of the two screws to provide a regulator ground connection point inside the cabinet.

Operation

I have tested the PSI with two popular double density disk operating systems: DBLDOS by Percom, and Double Zap-Enhanced NEWDOS80 by Aparat. Other double density operating systems compatible with the hardware supported by these two systems should also work on the PSI. Of course, you can use any single density DOS designed for use with the Radio Shack Expansion Interface as well.

Just a quick note on opera-

tion of the keyboard Reset button in conjunction with the reset enable switch position on the PSI. When the keyboard is not

connected to any peripheral devices, prudent use of the Reset button is recommended. Depending on what software is

loaded and what the microprocessor happens to be doing at the time, the reset function may or may not do what is desired.

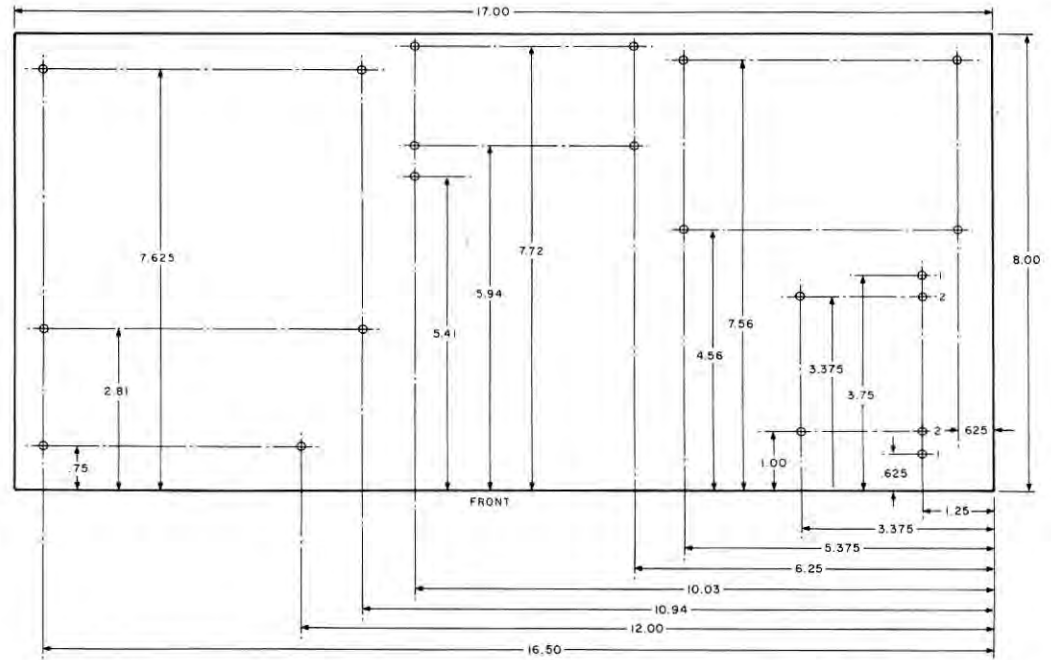


Fig. 10. Cabinet top panel dimensions. All holes are .14 inch in diameter. If the cabinet will house the 32K memory mod, use the #1 holes (shown at right) to accommodate its larger transformer. Otherwise use the #2 holes.

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For example, it may or may not allow you to recover from a hung up state where you have lost keyboard control. It may make a difficult situation hopeless...

or it may save the day! Remember that since you have disk drives powered up, even though the read linkage from the FDC to the TRS-80 is broken via the re-

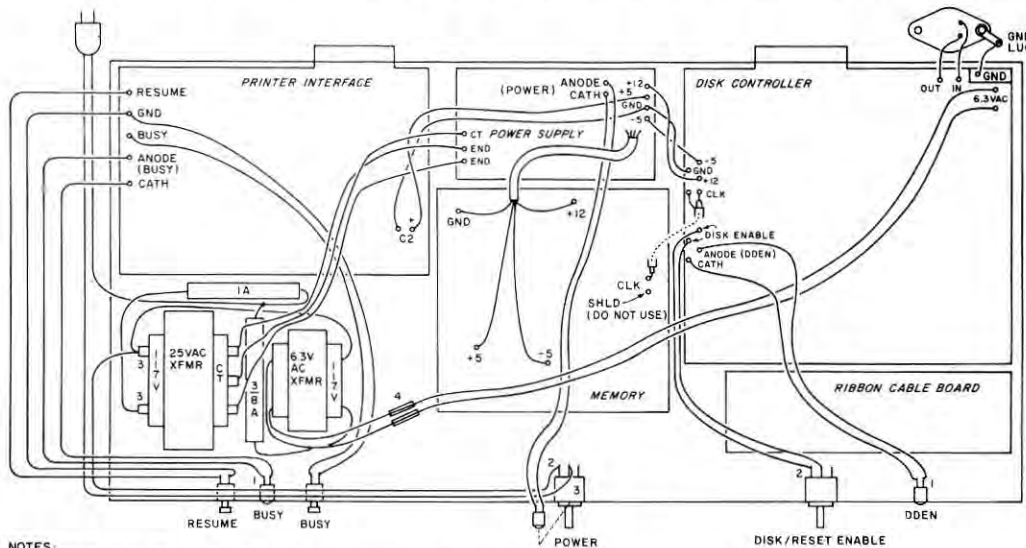
set enable switch position, this will not prevent action on a faulty command from the TRS-80 to the FDC. Until you can safely predict the conse-

quences of your planned activities while in reset enable mode, it is wise to first remove all disks from the drives (you don't need them while in reset enable mode anyway!).

You can be truly proud of your PSI construction achievement; not only for the unique end product, but also for the knowledge and personal satisfaction derived from a project of this complexity. Let me hear from you. I would appreciate your comments and suggestions on the material, as well as enhancements and new features you would like to see. ■

You can obtain the ribbon cable distribution PC board for \$7.95 and the prepared cabinet (predrilled, punched, painted, and labelled) with screws and threaded standoffs to mount all PC boards for \$59.95.

The above prices are postpaid in the continental U.S. Arizona residents add 4 percent sales tax. Order from PVP Industries, P.O. Box 35667, Tucson, AZ 85740.



- NOTES:
1. LONGER LEAD ON LEDS IS THE ANODE.
 2. TOGGLE SWITCH TERMINALS SHOWN HORIZONTALLY HERE FOR CLARITY; IN CABINET, UNUSED TERMINAL SHOULD FACE TOWARD CABINET TOP.
 3. 117VAC IS PRESENT HERE! BE CERTAIN TO INSULATE ALL TERMINALS WITH SHRINK TUBING OR ELECTRICAL TAPE TO PREVENT SHOCK HAZARD.
 4. THE 6.3V XFMR SECONDARY WINDING LEADS WILL NEED TO BE EXTENDED TO REACH THE DISK CONTROLLER BOARD. USE SHRINK TUBING OVER THE WIRE SPLICES.

Fig. 11. Interboard connections. This diagram illustrates all wiring other than ribbon cables. Wires are shown above the PC boards for clarity, but will look neater if routed beneath the boards.

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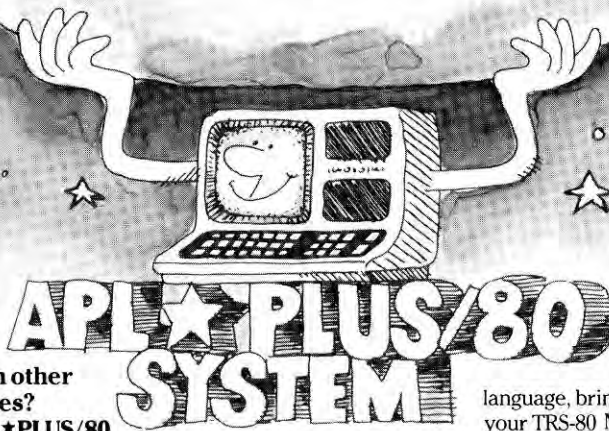
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Challenge to BASIC

Develop a subroutine to group and total unordered costs by job number. The result is a table showing the total cost for each active job, in ascending job order, formatted as a report. Use the following CHARGES:

8.20 5.55 1.59 995.00 2.44 14.32 .87 .79 1.01 149.03 3.42 .86
for JOBS numbered 213 33 4 4 4 9 33 213 4 33 33:

JOB	TOTAL
4	\$1,162.38
9	\$0.87
33	\$10.62
213	\$9.21

One APL solution is:

```

▽ COST FOR JOB;ONCE;SP
[1] ONCE*(JOB#1E38,1+JOB)/JOB+JOB[SP+JOB] ◇ ' JOB TOTAL'
[2] 'I4,CP/$/P12.2' [FMT ONCE,1.5] COST[SP]+.*JOB#.=ONCE
▽
    
```

Even if this kind of task is not among the problems you deal with, APL's ability to represent concise solutions can save you programming time and effort.

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DEMISE

By Case from Acorn

A fast-action space game that's **very** challenging! You must destroy the aliens with lasers and "smart bombs." Then, make your way carefully through a meteor storm and a rocky tunnel. Great sound effects; keyboard control.

16K Tape or Disk, \$19.95

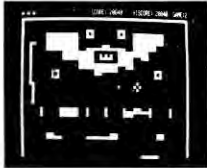


KING OF THE JUNGLE

By Vandewalle from Acorn

An unusual combination of fast pinball action plus the challenges and dangers of an arcade game. Keep the ball in play, scoring points as it caroms from obstacle to obstacle, while wandering through the jungle searching for the hidden crown. And try to avoid the deadly Cobra. Lots of action, sound and fun! Choice of 3 screens. Can be used with Trisstick joystick.

16K Tape or Disk, \$19.95

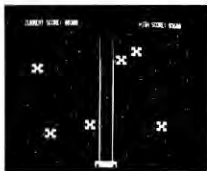


EVADE

By Knight from Acorn

You're in charge of the USS Krestan, an interstellar tri-ship. If you defeat the enemy aliens you encounter, you get a chance to earn extra points by successfully docking with a larger ship. **Then** come the evil Malicians and dangerous meteor showers. Never a dull moment with this one!

16K Tape or Disk, \$19.95



MYSTERIOUS ADVENTURE

ARROW OF DEATH, PART 1

By Brian Howarth from Acorn

Proper English only! This British import is Acorn Software's first adventure and it meets their reputation for high quality. The vocabulary you use in this adventure must conform to proper English standards—not the barbaric tongue spoken here in the colonies! You and Sorcerer Zardra must restore the kingdom from the engulfing sense of bitterness and ill feeling that forced the ruler to flee the palace.

16K Tape or 32K Disk, \$19.95

Hint Sheet, \$1.00



PANIK

By Demas from Fantastic

An arcade style game of a fascinating future world with high-res graphics and **voice**. Filled with action and excitement; in machine language.

16K Tape, \$19.95

32K Disk, \$24.95



ARMORED PATROL

By Westmoreland & Gilman from Adventure

As commander of a lumbering T-36 tank you have the firepower to destroy the enemy—if you can find them. They may be hiding behind the houses scattered about, the bleak terrain and your only view is thru the drivers port (your screen). Impressive animation in this arcade game.

16K Tape, \$19.95

32K Disk, \$24.95

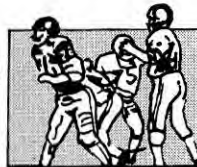


COMPUTER FOOTBALL STRATEGY

From Avalon Hill

Exciting computer version of the famous board game. You'll have to think fast as you plan the offensive and defensive formations for your team. Play against the computer or a friend.

32K Tape, \$20.95



ASYLUM

From Med Systems **

You are sitting alone at 2 AM. Your eyes are bloodshot as you peer into your computer's screen and cry, "I must be CRAZY!" If this has never happened to you, you've never tried ASYLUM. It's Med Systems most ambitious 3-D graphics adventure yet!

ASYLUM places you on a cot in a small (padded?) room. Periodically the janitor lobs a hand grenade through the window. What you do next could mean escape—or disaster.

16K Tape, \$19.95

32K Disk, \$22.95

Also available:

ASYLUM II

16K Tape, \$19.95

32K Disk, \$22.95



STRIKE FORCE

From Melbourne House

You are the warrior-savior of cities under relentless alien attack. You're armed with rapid-fire missiles, radar and incendiary star-shells; but you'll need your fastest thinking and instantaneous response to protect yourself and your people. Great real-time graphics!

16K Tape, \$15.95

32K Disk, \$19.95



PENETRATOR

From Melbourne House

Armed with missiles and bombs, you must fly your fighter to the enemy's cache of neutron bombs and destroy them. Your mission is in four stages, involving rugged terrain, caverns and manmade obstacles—not to mention enemy radar, missiles and paratroopers. This new departure in arcade gaming allows you to set up your own terrain and enemy emplacements, then save them for future use. Make your mission as hard or easy as you like. Joystick compatible.

16K Tape or 32K Disk, \$24.95



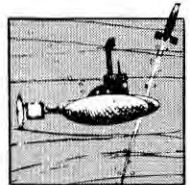
SEA DRAGON

By Westmoreland & Gilman from Adventure

Underwater adventure is yours as you command a nuclear sub armed with deadly missiles and torpedoes. Guide it carefully through sea mines and underwater mountains; watch out for depth charges being fired by overhead ships... and don't run out of air! Scrolling sea bottom for added excitement.

16K Tape, \$19.95

32K Disk, \$24.95



REAR GUARD

By Neil Larimer from Adventure Int.

A space battle between your cruiser and wave-after-wave of enemy ships. You can destroy them with your energy darts or you can ram them—as long as your shields are intact. The action takes place on a continuous horizontal landscape. You control the altitude and speed of your craft as you pursue the enemy. Skill level 1 is exciting, and there are four more levels available.

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CATERPILLAR

From Soft Sector Marketing
This is the fast-action arcade game you've been waiting to play at home! You must hit mushrooms and caterpillars—segment by segment—moths and tumble bugs. The challenges: they are all moving; when hit they split into additional segments or metamorphose into different shapes; when you destroy a caterpillar, the new one that replaces it is a segment *longer* than the original!

16K Tape, \$15.95
32K Disk, \$19.95



HYPERLIGHT PATROL

By Warren Green from Fantastic
Realistic space conflict simulation with continuous projection map display that shows you **complete globe** of space around your airship: front, sides, back, above and below. Your ship—and the enemy's—can maneuver in 3-D space, and can move by hyperlight jumps. You can only learn by playing what are the best strategies and tactics for survival. "Talks" through cassette port.

48K Disk, \$19.95

THE WYLDE Warriors of RAS, Vol. 3

By Masteller from Med Systems
The newest in this fascinating series of adventure/role playing games. You **create** the characters, then play the game, solving all its complex challenges. Save the games, and the characters. Characters are interchangeable among the 3 volumes. Machine language, great graphics. No "rules" to consult; no waiting for the computer.

48K Tape or Disk, \$29.95

Also available:
KAIV, Volume 2,
48K Tape or Disk,
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BOUNCEOIDS

From Cornsoft
We're not sure what they are, but they're **huge** and dangerous! BOUNCEOIDS bounce off walls, and can kill with one touch. Your mission is to destroy them with your new class 4 annihilator. Then there are the terrible bugs coming out of null space to crunch you to smithereens. You'll need coordination, strategy and courage! Joystick-compatible.

16K Tape, \$15.95 16K Disk, \$19.95

SKYSCRAPER

By Fine from Superior
3-part maze game for the nimble-fingered. First, you must move through maze while avoiding barrels coming at you; second, you must look out for fires that break out randomly on screen; third, you ride elevators up and down from platform to platform. The sky's the limit...how far can **you** go? 1 or 2 player game with sound; joystick compatible.

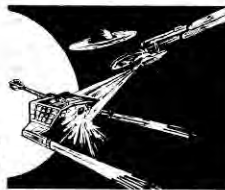
32K Tape, \$19.95 32K Disk, \$21.95



DEFIANCE

From Fantastic
The first talking space simulation! You're defending Starbase 12 during war between United Federation of Planets and the Klingon Empire. You have just been given command of the USS Defiance, and are authorized to take any action necessary to defend yourself and the Federation. "Talks" through cassette port; joystick compatible.

48K Disk, \$24.95



DUNZHIN Warriors of RAS, Vol. 1

By Masteller from Med Systems
The first adventure/role playing game to combine fast graphics, fast response time and complete computer implementation. DUNZHIN places you in a many-level dungeon, filled with demons and goblins. You must search for hidden treasures, but only **one** will win the game. In this series you create the characters, and can save them for future games, or use them in other volumes.

48K Tape or Disk, \$29.95



LEAPER

From Cedar Software
Fast action, machine language game for one or 2 players. Your frog must dodge traffic and cross river on fast-moving logs. Ready, set...**LEAP!**

16K Tape, \$15.95 16K Disk, \$19.95



INSTANT SORT/SEARCH DATABASE

By G. Hatton From Acorn
A database program that allows the user to store a large number of files in the form of lists, and provides the user a means to retrieve specific items of information from the file. Written in machine language, ISS can provide a multitude of sorts, sub-sorts, searches and categorizations in seconds. Because the processing is done in memory, it is extremely fast, and you can manipulate the data at will without risk to your database on tape or disk. (If further information is required, please call or write.)

16K Tape or 32K Disk, \$49.95



By Richard Wilkes from Acorn
Using your SuperScript modified Scripsit Word Processor and a compatible printer, you can now underline, boldface, insert text during printout, slash zeros, set type pitch, subscript and, of course, superscript! You can even read your directory and kill files without ever leaving Scripsit.
SuperScript comes with drivers for popular serial and parallel printers (now including Centronics 737 and RS Daisy II), and easy instructions for patching to your Scripsit program (does not include Scripsit).

32K Disk, \$49.95 Use Model I Scripsit

MONEY MANAGER

By Andrew P. Bartorillo from Acorn
A complete management tool for the home budget, it keeps track of your checkbook and provides for easy budget allocation. You can store information on up to 100 checkbook entries per month (250 with 48K), specify automatic withdrawals, keep records of tax deductibles, record expenses by category, even break up charge account payments into the proper categories.

32K Disk, \$39.95



POWER DRAW

By Kim Watt from Powersoft
A graphic screen editor that works with all major operating systems. Special features: graphics and text may be intermixed; screen may be saved to available memory buffers; buffers may be saved to tape or disk in 6 formats; single and double wide video are supported. With trace mode to constantly display cursor positioning; grid mode to aid in centering figures on screen. Alpha joystick compatible.

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A Pascal for All Seasons

by Bruce Powel Douglass

★★★★★

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Models I and III
48K RAM, one disk drive
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Advanced Development Package \$125
Manual \$30

Alcor Systems has produced an enhanced Pascal that thoroughly removes my reservations about Pascal being a serious applications programming language.

Alcor Pascal is a compiled language that executes 10 to 20 times faster for most programs than interpreted Basic. It runs on all DOSes and comes on three disks for the Model I, and two disks for the Model III, including an 8K database program used for tutorial. It compiles quickly and compiled programs can be sold without paying royalty fees.

Alcor also provides a one-year service contract that includes upgrades and patches. A benefit of Pascal programs is that they are portable to other machines, so that a program compiled under TRS-80 Model I will run with the CP/M run-time system for Alcor Pascal as-is.

The Manual

Alcor Pascal's 250-page manual is well organized and referenced, and the print is easy to read. It is divided into four main sections: Editor, System, Tutorial, and Reference.

The particularly outstanding sections

If procedure-oriented languages intrigue you, Alcor Pascal may be the answer to your needs.

of the manual are the Tutorial and Reference sections. The Tutorial can serve as a useful introduction or refresher to the world of Pascal. To learn the ins and outs will take a more in-depth treatment than is presented here, but nevertheless, the tutorial, with all its examples and explanations, is certainly an aid.

The Reference section is a complete reference on Alcor Pascal, including the standard Pascal procedures implemented, and the many enhancements. Each Pascal construct is explained, a short syntax diagram is given, and then examples follow.

The System section describes the system implementation on the TRS-80 Models I and III. It discusses the procedures of compiling and linking compiled code, as well as the compile-time error messages and the TRS-80 procedure and function library supported by Alcor Pascal. The Editor section shows the various Editor commands for the creation of Pascal source code to be fed to the compiler.

The Programs

The programs in the Alcor Pascal system work well. The Editor is a full-screen text editor. It is easy to use, although it is a little slow. I preferred to use my Newsprint word processor to enter the Pascal programs, but for those without such a word processor, the Editor will come in handy.

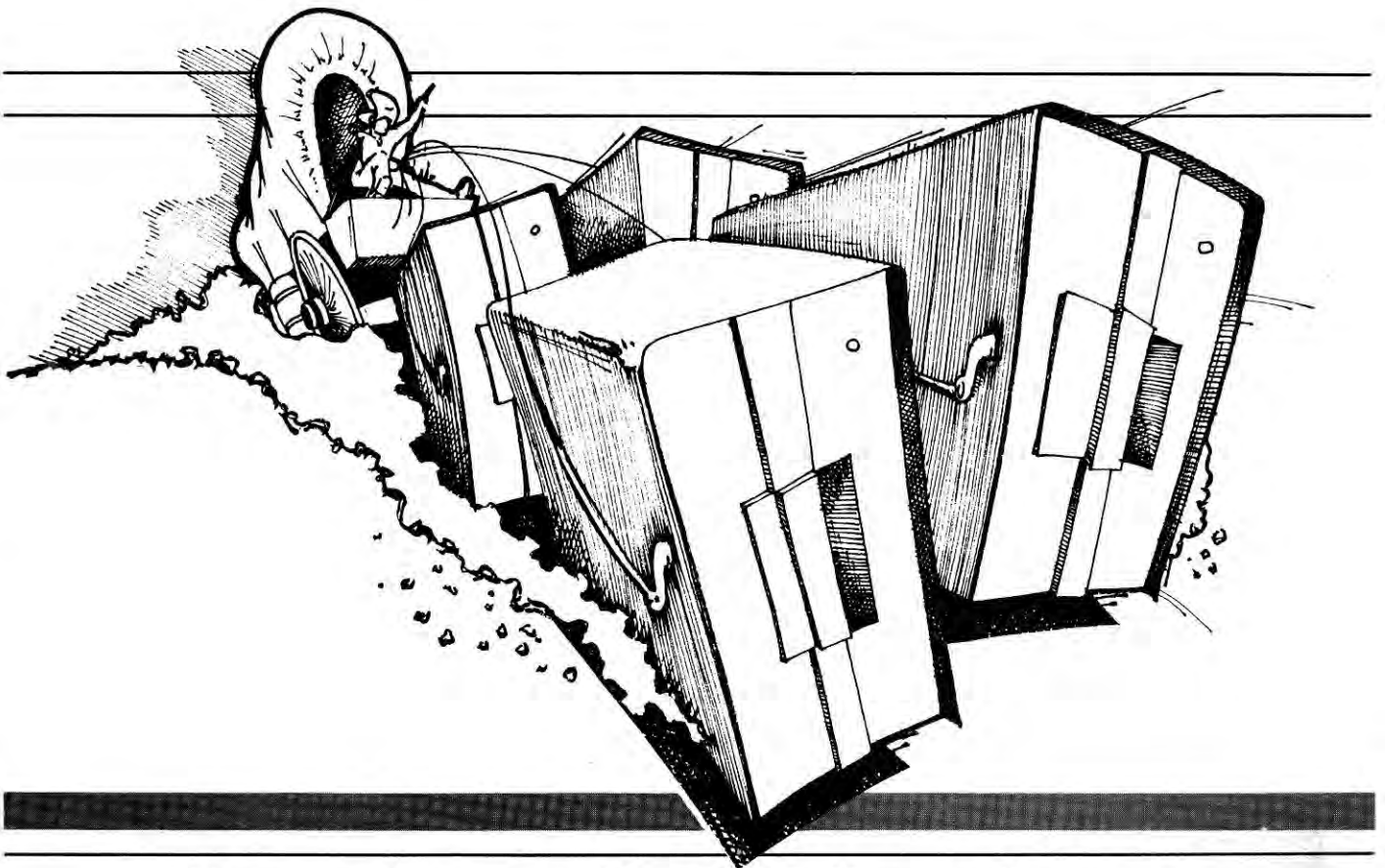
The Editor commands can be accessed by either entering a command

mode or by hitting certain predefined key sequences. The Editor supports quite a few options, such as full cursor movement (including tabbing right and left; scrolling up, down, left, or right; moving cursor to top of screen; and moving cursor to beginning or end of line), text deletion and insertion, and global modifications (including splitting and merging program lines, and searching and replacing strings). You can also insert special characters like hex 7B and 7D (curly brackets, which are used to enclose comments).

Editor allows you to edit new or old programs, and the maximum size of your data file is limited to the free space on a single disk. Editor has an on-line help menu for any topic. Editor provides a useful environment for the Pascal program development.

The other programs of note are the compiler, the linking loader, and the run-time module. The compiler comes in two formats. The first format is a single program that compiles your source program into a compact format called p-code or pseudo-code. Pseudo-code is much more compact than the original program and executes much faster than Basic. The Advanced Development Package, described later, can take this code and optimize it (reducing it in size by 20 percent to 30 percent) or generate true Z80 machine code, which executes even faster than the p-code.

The second format breaks up the compiler into several programs that use a common overlay area. This permits much more room for the symbol table generated by your source program during the compile process, thereby allowing much larger programs to be compiled. The efficiency of the compiler and the compactness of the code is demonstrated by the fact that the compiler



MACHINE LANGUAGE DISK I/O & OTHER MYSTERIES, TO HARNESS THE POWER OF DISK DRIVES.

The best and most complete book on TRS-80 Model I and Model III disk I/O available.

"Machine-Language Disk I/O & other mysteries" by Michael Wagner. Volume 5 of the popular "... and other mysteries" series published by IJG.

More than 190 pages of information and discoveries on the subject of disk I/O for the beginner and expert alike, using Z-80 Assembly Language to directly control the TRS-80 Model I and Model III disk drives and interrupt systems. With this book anyone can become a disk I/O "expert", and make more efficient use of disk space, or to write his or her own "full blown" disk operating system!

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Machine-Language Disk I/O & Other Mysteries is packed with source code and flow chart illustrations for every function and operation described. And the source code for two complete disk I/O driver routines, one for the Model I and one for the Model III, are also included for "instant" access to your floppy drive systems.

Plus, the source code for a small disk operation system (S/OS) is included as a bonus. This S/OS contains all of the routines described in the book and shows how all of the disk I/O and interrupt functions should be incorporated into a working system.

On machine language disk I/O.

Machine-Language Disk I/O & Other Mysteries explains what the floppy drive system is all about, what Tracks and Sector are,

the Western Digital Floppy Disk Controller 1771 and 1793 chips, read/write access, reading a selected drives' status, how to test and make sure a disk is in a drive or if a drive is on the system (on-line), the Head Restore command, the Head Step and Seek commands, the "Force-Interrupt of function" command, the Read Address command, the Read Track command, the Write Track (FORMAT) command, the Read Sector command, the Write

Sector command, Post Non-Maskable-Interrupt Processing for the model III, and much more.

On TRSDOS file I/O

and most TRSDOS-like operating systems, Machine-Language Disk I/O & Other Mysteries explains; what a disk file really is, what records are and how they're stored on the disk, creating a file, performing Direct Record I/O, performing Single Byte I/O, closing & killing files; error processing and TRSDOS error codes with their meanings, and much more.

Plus many other handy programs, routines, and revelations are included. Such as a TRSDOS error message displayer, a disk formatter program, a program to calculate a password for a given encode, a object file load-format displayer, a file oriented full screen file editor, and a FULL BLOWN smart terminal program.

Machine-Language Disk I/O & Other Mysteries is a must for all programmers at just \$29.95. Available at computer stores, selected B. Dalton Booksellers and independent book dealers. If your dealer is out of stock, order direct. Include \$4.00 for shipping and handling. Foreign residents add \$11.00 plus purchase price, in U.S. funds.



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itself is written in Pascal. It consists of over 8,500 lines of source code—and it still can execute in a 48K machine.

It is simple to compile a Pascal program. After you have written your program, you can execute the compiler in either of two ways. The first way is by executing the DOS command Pascal Filespec, where Filespec is the source-code program to compile. Here, the compiler searches for FILESPEC/PCL, sends the listing to the screen, and sends the object code to the file FILESPEC/PCL. Using the second format of Pascal, you will be asked for the names of the source and object-code files, and will be asked where to direct the listing.

Alcor Pascal has three default-device definitions that can be used. ':L' sends the listing to the line printer, ':C' or Enter sends the listing to the screen, and ':D' is a dummy device, used to discard output. Alternatively, you can output the listing to a disk file by specifying the name of the file. These default devices are available for all outputs from the Alcor Pascal system, including the compiler, linker, and compiled programs.

The ability to route the output of the program is handy not only for program execution, but also for looking at the

compile process for errors. If many errors occur, printing the listing that is created during the compile process gives you a complete error listing with notes and arrows indicating the exact place each one occurred. Then you can take the printout and edit your source code to remove the errors.

The compiler uses a single-pass, recursive-descent parser that operates quickly. Variable names can be eight characters in length and use the same amount of space regardless of length. This is handy, so you can use long variable names, to aid the readability of your programs. How many times have you wondered what QZ was? Now, you can use a descriptive label, such as Total, Result, or Seedcost for variables without increasing the size of the program and without increasing its runtime. Variables can include the characters "\$" and "-" in their names.

The compiler supports several options. There are compiler directives that tell the compiler to use double precision for all real numbers, or change the behavior of looping variables, conditional compilation, to disable code generation (used to build libraries), and more.

It is nice to have double precision, but the manual does not state that the tran-

scendental functions are single precision regardless of the declared precision. This is because Alcor Pascal uses ROM routines wherever possible, and they are single precision for these functions. Of course, with Alcor Pascal you can create libraries with your double-precision transcendental subroutines and link them with your compiled programs as desired.

Conditional compilation is very helpful for program development. It allows you to specify a Boolean variable and use the value of this variable to control the compilation of parts of the source code. For example, you can have debugging routines throughout your source code that you do not want to be in the compiled program after the program is debugged. One way to get rid of them is to remove each occurrence of the debugging code. With Alcor Pascal you can preface each debugging routine with a conditional compilation statement and by changing the value of a single variable at the start of your program, you can eliminate all the debugging code from the final compiled program. Once you get used to using this kind of debugging procedure, it is sorely missed in other languages.

The Nullbody compiler option can

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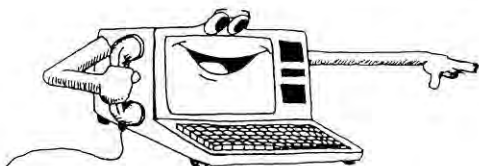
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disable code generation for a procedure, function, or program. This option lets you compile just the procedures used in a program without compiling the program itself, and in this way, you can build and compile subroutine libraries.

The Alcor linking loader enables you to build self-contained /CMD files, and create procedure and function libraries of commonly used routines and link them with compiled programs.

The run-time module contains all the machine-language subroutines needed to interpret and execute the p-code instructions. If desired, the linking loader can create a command file so that a separate run-time module is not needed. Generally, you will have a compiled program on disk with the file extension /OBJ if created by the compiler, /OPT if processed by the Optimizer, and /COD if turned into native machine code by CODEGEN (more on the latter two programs later in the section on the Advanced Development Package). To run these files, execute the command line RUN filespec <stack>. The file-spec names the compiled object code file to be executed. The stack parameter is optional, and specifies the amount of stack space allocated to the program.

When the program terminates, the memory location at termination and the amount of stack and heap space are displayed.

The Language

Alcor Pascal is a complete implementation of Jensen and Wirth Pascal plus many enhancements. In order to appreciate the enhancements, you must understand a little bit about standard Pascal.

Pascal was developed to be a beginner's language and approaches programming differently than Basic. It lends itself to writing readable programs and many programming problems that seem difficult in Basic are easier in Pascal.

When you write a Pascal program, it is not a collection of GOSUBs and GOTOs. It uses named functions and procedures to perform tasks. Thus, Pascal aids the conceptual development of a programming task. To program in Pascal, you can use either top-down or bottom-up style. In top-down programming, you develop the main program first and use black boxes called procedures and functions and build the program from the overall program into smaller and smaller problems, solving

each one at a time. In bottom-up programming, you decide what pieces you need and build them, and work your way up to the overall program.

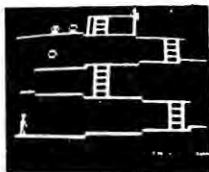
In either case, it is better than the usual blustering bombshell approach taken by many Basic programmers. Pascal allows you to develop the problem conceptually and then allows you to easily translate the conceptual solutions into procedures and functions. That is why Pascal is called a procedure-oriented language. So the difference between Pascal and Basic is primarily one of philosophy.

Pascal has other niceties, too. You can define your own variable types, such as Color=(Red, Black, Blue). A powerful data type is the Record. In Basic, if you have a data base with customer's name, age, address, and so on, the typical procedure would be to store them in separate arrays; use a string array for the names, an integer array for the age, another string array for the address, and so on. In Pascal, you can define Record to contain all the data. You might think of it as a more general-purpose type of array.

Pascal has several looping constructs, whereas Basic has only one: the For . . . Next loop. In Pascal, you can have

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For...Next, Repeat...Until, and While. Almost all jumping constructs, like GOTO, can be replaced with these. One thing I don't like about Pascal's For...Next loop is that the only variable type allowed for the loop is integer, and you can only increment (or decrement) by one. This is more than made up for by the other looping constructs, however.

Pascal also has more conditional statements. Not only is there the ever-popular If...Then, but there is also Case, which allows you to easily direct program flow when a number of conditions exist. A major fault of standard Pascal is that if none of the cases is met, the program will bomb. Alcor does it right, and includes an Otherwise clause to take care of all other cases to keep the program from bombing.

Another thing I don't like about standard Pascal is the pedantry of the language. For example, if you have an integer variable A and a real variable B, you cannot just set B := A, because they are different types. You must use a transfer function to move the values. Alcor Pascal allows you to cross-type your variables and use an assignment statement to move the value from one type of variable to another. You can readily cross-

type from Integer to Real, but you cannot easily cross-type Real with Pointer.

Although a few Disk Basics (such as MULTIDOS's Superbasic) support dynamic variables, microcomputers generally lack it. Typically, once a variable or an array is created, it sits around in the variable table and in memory taking up room, even though you may need the space for something else. You can Clear the variables, but you cannot delete a single array, or just a few strings. Pascal lets you do just that.

You can request a new storage location for a variable by invoking the Pascal procedure New. The procedure Dispose frees that memory. It does this through the use of a special variable type called Pointer. This is useful when you don't know ahead of time the amount of memory that a program will require. Also, you can use these pointer variables to link a list of items (which may be any variable type), creating a linked list.

The memory space used by New and Dispose is called the Heap. The rest of nonprotected memory is used by the stack. You can specify the relative amounts of Heap and Stack used by the program at run time by entering RUN filespec <stack>. The stack informa-

tion is optional. The default is to use half the free memory for the stack and the other half for the heap. If you don't use much heap, then you might want to let the stack have more of the free memory space.

Alcor Pascal supports TRS-80 graphics functions PEEK and POKE, INKEY\$, and INP, OUT, easy access to machine-language subroutines, plus a full complement of string functions. The graphics routine has what I consider to be a small bug, although the systems programmer I talked to at Alcor disagrees with that assessment. If you set a point on the screen and the screen has not been cleared with ClearGraphics, then spurious points are also set besides the one you asked for. The fix for that is easy. You simply check the byte to see that it is in graphics mode before ORing in the new pixel to be set; if it is not, then stuff an 80H there and then proceed. However, the ClearGraphics command will work also.

The User function is similar to USR in Basic and passes the value to the HL register pair. Even better is the CALL\$ function that allows you to set all the registers from Pascal.

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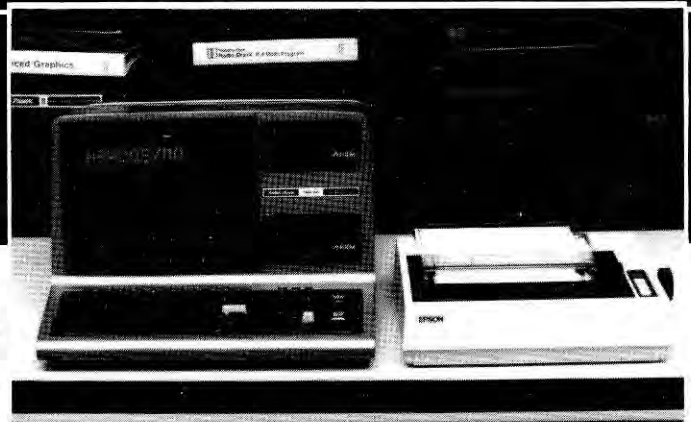
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from I/O and heap errors without the program crashing. This is one of the changes necessary to make Pascal a real programming language.

Alcor Pascal has all the string functions of familiar Disk Basic plus a few more, such as compare two strings, delete characters in the middle of a string, insert a substring into the middle of a string, and replace a substring in the middle of a string. For standard Basic programmers, these functions are great!

Advanced Development Package

The Advanced Development Package (ADP) is another incredibly useful tool for program development. It consists of two programs (Optimize and CODEGEN) and a data file.

Optimize takes your compiled p-code program and optimizes it for space. You will usually see an increase in speed of the program, but it is not generally that significant. For long programs (greater than 1,000 lines) or for programs that use a lot of space, this program can make the difference between having a working program and a failure.

CODEGEN performs essentially the same compaction as Optimize, but then goes on to produce native Z80 machine

code. Normally, this increases the size of the program by a factor of two or three, and speeds up the program by a factor of three to five. CODEGEN produces machine-language code, but it also produces Assembly-language source code if you wish. Unfortunately, the source code is in extended 8080 mnemonics.

One little trick that CODEGEN allows is that you can compile a dummy procedure and then CODEGEN it. Then take the object code output from your editor/assembler and insert it into the dummy procedure. The compiler and CODEGEN generate the appropriate addresses and provide the structure for easy insertion of machine-language routines that actually perform the function of the procedure.

Both these programs are great, but what about big, bulky programs? Often, in these types of programs, a small section of code is slowing down the rest of the program. Through the use of the linking loader, you can link CODEGENed files with Optimized files and have a small and much faster program. Remember that the linking loader allows you to create subroutine libraries and link the various parts of a program together. It turns out that through judi-

cious design, you can CODEGEN certain of your compiled modules, Optimize others, and use the linking loader to bring both together into a single application program. The net result of all this is that the Advanced Development Package lets you create smaller and faster versions of an already fast compiled program. If you program for a living, the Advanced Development Package is for you.

Alcor Pascal is an excellent implementation of an enhanced Pascal. It has an excellent manual, complete with a usable tutorial, reference guide, and system-implementation source. Alcor Pascal comes with its own full-screen text editor and linking loader. It has many important enhancements including graphics, port I/O, double-precision arithmetic, many string and other TRS-80 functions, plus patches to allow random-access records, and error trapping. This is the first serious Pascal I have seen. In terms of the power of the language, it is in the same league as Microsoft Basic, and is more efficient in a number of aspects. ■

Bruce Powel Douglass, 80 Micro's "Copernica Mathematica" columnist, can be reached at 1005 W. Main St., Vermillion, SD 57069.

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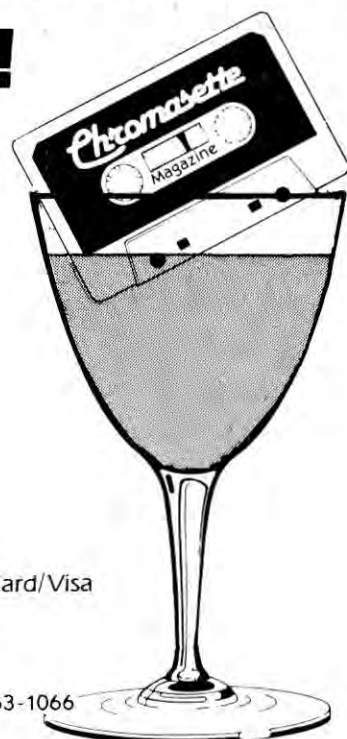
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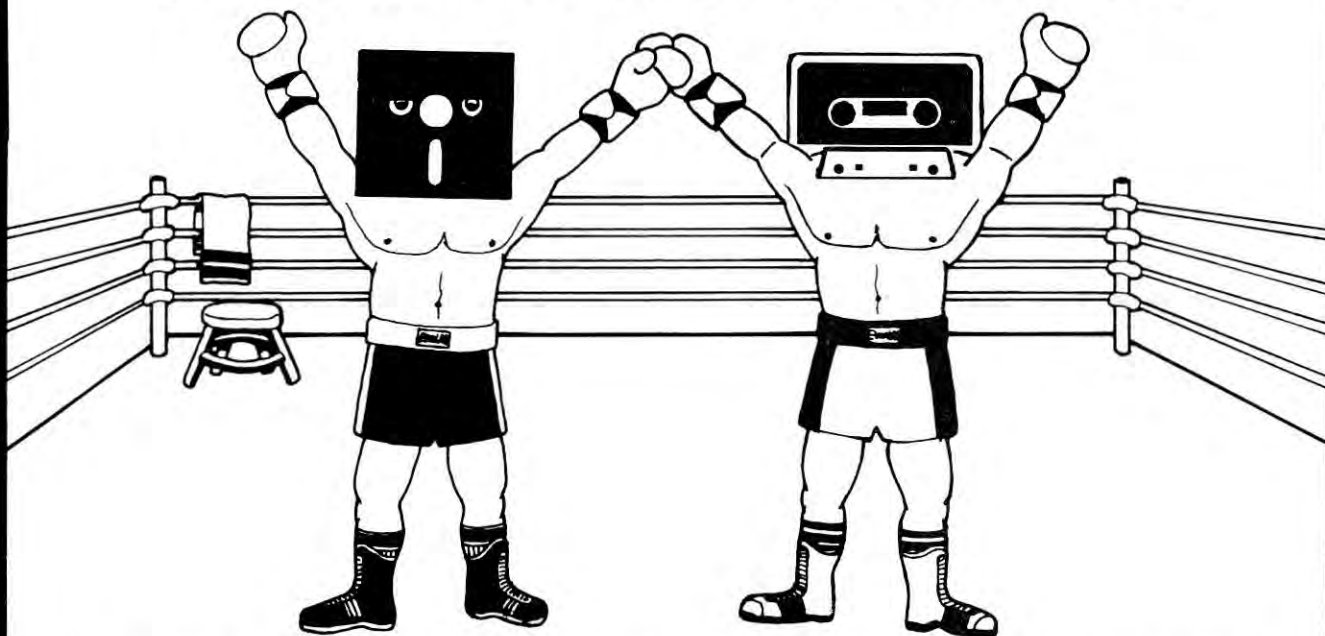
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by Anthony T. Scarpelli

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Your copyright is a personal-property right. This means state laws and regulations can affect it. If you want to will your copyright to someone, or transfer the rights to someone else, you should consult an attorney. Also, any transfer of exclusive rights has to be in writing and signed by the owner of the rights (or the owner's agent). These transfers are usually done by contract, and when done, although not required, should be recorded in the Copyright Office. You should write to the Copyright Office for information on recording the transfers, and on transfers in general.

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However, before publishing in another country, find out exactly what protection exists in that country. Some countries offer little or even no protection for foreign works. Circular R38a lists countries that maintain copyright relations with the U.S.

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Ready, Set, Register!

The persons legally entitled to submit a registration application form are the

author, the employer or other person for whom the work was prepared, the copyright claimant (the person or organization who has legal title to the work), the owner of exclusive rights, or any authorized agent of any of the above. And you don't need a lawyer to register.

What you do need is Application Form TX from the Copyright Office, Library of Congress, Washington, DC 20559. When ordering the form, be sure to ask for instructions. Also request Circular R1, "Copyright Basics." This particular circular contains all the important information you need to know about copyrighting, and was the source of the information in this article. The forms and circular are free.

Added Protection

Even though your works are protected by law when they are put into a fixed form, and even though they might be published, the process of registering them with the Copyright Office gives you certain advantages. For instance, a registered work establishes a public record of the copyright. It is also usually necessary to have your work registered before you can file any suits. If you register your work within five years of publication, it will indicate to the court that your copyright and the facts stated in the registration certificate are valid.

If you can register your works three months after publication, or prior to an infringement of your work, you will be able to collect both attorney's fees as well as damages in court actions. You can register a work any time within the life of the copyright and collect damages.

How long does a copyright last? The life of the copyright is the total length of time you are protected. Any work put into fixed form after January 1, 1978 will be protected for the life of the author plus 50 years. If two or more authors are involved, then protection is good for 50 years after the death of the last surviving author. If the work was made for hire, or if it was anonymous or if you didn't put your name on it or used a pseudonym (unless your true name is in the records), then the duration of the copyright is 75 years from publication or 100 years from creation, whichever is shorter.

A work created before 1978, but not published or registered, is automatically brought under the new law's protection. If the work was previously published or registered, you have to renew it to receive the added protection. Since the change can cause confusion in what is and what is not protected, Circulars

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	AUTHOR'S NATIONALITY OR DOMICILE: Citizen of _____ (Name of Country) or Domiciled in _____ (Name of Country)	If the answer to either of these questions is "Yes," see detailed instructions attached.	
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R15a, R15t, and R22, available from the Copyright Office, provide more detailed information on this subject.

Form TX is not difficult to fill out; just print or type the information. There are three pages to the form, with the instructions attached to both sides of the page you fill in. There is also a continuation form if you need more space, but the instructions discourage using it.

When you send the completed form TX, you must also include two copies of the work if it has already been published (if it hasn't been published, only one copy is required). If your work is a computer program, the copy should be a printed listing of the program. It's a good idea to include your name on each page, and also number them.

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It will take about three weeks to get the forms, and about a month after mailing the forms, you will receive the certificate of registration. This is merely a photocopy of the form TX you filled out, but now with an official seal, an official signature, and a number on it. You must refer to this number if you ever have to do any other business with the Copyright Office concerning this work. This is a legal document, so keep it in a safe place, and also keep a copy of the work you created with it.

This simple process gives you the protection you need. However, if someone copies your work without permission, and you want to initialize a court action, get a good copyright lawyer. If you do go to court, the key to winning or losing could be the copyright symbol. ■

Anthony Scarpelli can be reached at 98 Foxcroft Drive, Scarborough, ME 04074.

Planetary Orbits

by Don Carrera

If you're interested in knowing a planet's location at some time in the past or future, use this program to calculate its position.

Here's a program that tells you the location of the planets so you don't have to look up their positions in the *Astronomical Almanac*. Would you like to find out where the planets will be several years from now? If so, you should enjoy this program. It finds planet positions from 1500 A.D. to 2460 A.D.

The results have to be compared against a source. When the positions of more than two bodies are needed, you can obtain accurate answers by solving a system of differential equations. For

our solar system, you'll need at least nine equations, one for each planet. Usually, you'll need to solve more equations, because some of the larger asteroids are included. In addition, the Earth should be represented as the Earth-moon system, with its center of gravity located about 3,000 miles away from the true center of Earth. The sun and planets should not be modeled as spheres but as ellipsoids.

Solving this system requires more than the 16K of memory for a Basic program. A home computer would be slow at getting results, too. It's slow because to find a planet's position at any time, you must find its position at all intervening times. So, to find Jupiter's position in 1750 A.D., you have to find

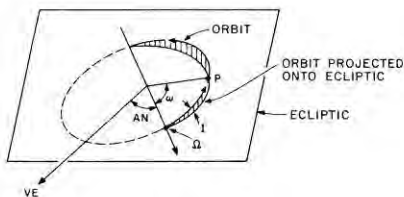
where it was in 1981, 1980, 1979, and so on, preferably at 1-10 day intervals. That makes for a lot of computing.

Solutions to these equations have been done on large computers, going backward and forward hundreds of thousands of years. These solutions give near-term accuracies (tens to hundreds of years) of .0000001 degrees in longitude for the inner planets. *Mutual Occultations of Planets: 1557 to 2230* provides the positions for several different planets at widely spaced times. It gives an exact time for the location of two planets when seen from the Earth. I have checked planet locations from this program against data in the *Astronomical Almanac* (formerly *Ephemeris*) for various dates in 1935, 1953, 1963, 1971, 1980, and 1981.

The Comet Halley Handbook, an Observer's Guide gives positions for Halley's comet from 1981 to 1987. I used it to check my calculations. For dates within a few years of 1982, program errors are less than .2 degrees in heliocentric longitude for the planets.

Orbit Theory

The plane of Earth's orbit around the sun is called the ecliptic. It provides the reference plane for determining a planet's heliocentric latitude. The point



- P—Planet at perihelion
- I—Inclination
- VE—Vernal equinox
- AN—Longitude of ascending node, measured in plane of ecliptic
- ω —argument of perihelion, measured in the orbit plane
- PER—Longitude of perihelion
- Ω —Ascending node; intersection of orbit with the ecliptic going from south to north of the ecliptic

Fig. 1. Orbit Elements

Planet	Degree of Error
Mercury	.023
Venus	.028
Mars	.019
Jupiter	.010
Saturn	.008
Uranus	.007
Neptune	.007
Pluto	.008

Table 1. The combined maximum degree of error for the four types of errors.

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at which the sun appears to cross Earth's orbit is the vernal equinox. This is the zero reference point for measuring heliocentric longitude. The distance of a planet from the sun is given in terms of astronomical units. An astronomical unit is the mean distance of Earth from the sun and equals about 92.9 million miles.

If the sun and only one other planet existed, that planet's orbit would be an ellipse. Since more than one planet exists, the true orbit is a "bumpy" ellipse. Not only does the sun attract planet A, but planet B also attracts planet A, with the sun's attraction being stronger. The resulting is considered an ellipse with many small bumps or perturbations.

To completely describe a body's position in space, you need six constants. Three constants determine the body's position in its own orbit. Three other constants show the orientation of the orbit with respect to the chosen coordinate system.

The orbit in space is defined by its inclination to the ecliptic, the longitude of the ascending node, and the longitude of perihelion (see Fig. 1). The inclination is measured in degrees and is positive if the planet orbits in the same direction as Earth. The ascending node refers to the intersection of a planet's orbit with the ecliptic. Since the orbit is a circle and the ecliptic is a plane, the two intersect in only two points. One point, the ascending node, occurs when the planet travels from below the ecliptic to above it. At the other point, the descending node, the planet is traveling from above the ecliptic to below.

Eccentricity, the semi-major axis, and the mean anomaly are needed to locate the planet in its orbit. (See the sidebar and Figs. 2a and 2b.) The mean anomaly varies from 0-360 degrees and is not "constant." You can find it by using two other constants: the mean daily motion (N) and the time when the planet passed its perihelion point (TPP).

To find the mean anomaly (MA), multiply the planet's mean daily motion by the number of days since it was at its previous perihelion:

$$MA = N * (JD - TPP)$$

JD (Julian day) is the day for which you want the planet's position. The time of perihelion passage is the Julian day of the most previous perihelion passage. In the program, I've used June 10, 1980, as my reference day, which has a Julian day number of 2444400.5. The perihelion passage for Mercury for example, is May 17, 1980, at 6:29 a.m., correspond-

ing to Julian day 2443976.770.

If Mercury is at its perihelion point, then the mean anomaly of Mercury is zero degrees by definition. In that case, JD will be the same as TPP. (Don't confuse this zero-degree reference with the zero reference point for measuring a planet's longitude. For Mercury to be at the zero-degree longitude position, it would have to be located at the vernal equinox.) No planet has its perihelion at the vernal equinox at this time. The above method for finding the mean anomaly works well if you know a planet's previous perihelion time. The method isn't good if you want one formula to cover a long time period. Remember, the other planets are attracting Mercury, changing its perihelion.

About every 88 days, Mercury passes through perihelion at a slightly different point, so you must make a correction to the calculation of the mean anomaly.

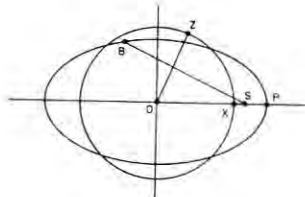
$$MA = N * (JD - DPP) - (DP - 1.3965) * DJ$$

Specifically for Mercury:

$$M = 4.0923388 * (JD - 24443976.770) - (1.5555 - 1.3965) * TJ$$

TJ is the number of centuries between June 10, 1980, and the Julian day of interest. The difference of .159 degrees (1.5555-1.3965) is the real advance of Mercury's perihelion in degrees per century. With this correction, keep TPP as a fixed number (see Fig. 3).

Since I'm trying to solve for planet positions using a closed formula, the constants to which I refer must be modified with time to maintain their accuracy. The constants are the primary approximations to the true value of a quantity. The first-order modifications that I showed for the mean anomaly apply in a similar manner to four of the constants. The perihelion passage (TPP) is a known number and will not

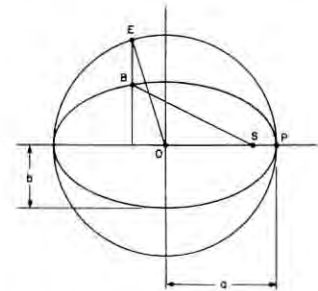


MA = Mean anomaly = angle XOZ $\approx 68^\circ$
 TA = True anomaly = angle PSB $\approx 155^\circ$
 S = Sun, at one focus of ellipse
 B = Planet
 Area XOZX = Area PSBP by definition of mean anomaly
 Eccentric of ellipse $\approx .81$

Fig. 2a Mean anomaly circle

change. Mercury, for example, really was at its closest point to the sun on May 17, 1980, at 6:29 a.m.

The mean daily motion (N) and semi-major axis (A) are constant over tens of thousands of years. No correction is made to them for the 900-year period of this program. The other four constants do change and can result in errors of



EA = Eccentric anomaly = angle POE $\approx 111^\circ$
 TA = True anomaly = angle PSB $\approx 115^\circ$

$$\frac{\text{Area POEP}}{\pi a^2} = \frac{\text{Area PSPB}}{\pi ab}$$

definition of eccentric anomaly
 B = Planet

Eccentricity of ellipse shown $\approx .81$
 a = Semi-major axis of orbit ellipse
 b = Semi-minor axis

Fig. 2b Eccentric anomaly circle

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heliocentric longitude if corrections aren't made.

The longitude of the ascending node and the longitude of perihelion change by over one degree per century. The changes in eccentricity and inclination are smaller, but you must consider them.

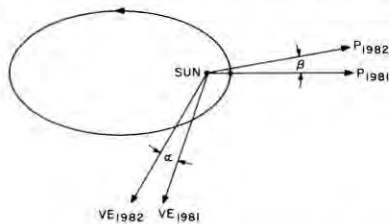
The large changes in the ascending node and perihelion result from a change in the position of the vernal equinox. The vernal equinox changes because of the precession of Earth on its axis. The moon's orbit is inclined about five degrees toward Earth's equator. Since Earth is not a perfect sphere, the moon's orbital inclination causes an uneven torque on the spinning earth. Earth precesses, or slowly changes, the direction in which its axis points. The vernal equinox is tied to a coordinate system centered on the earth's axis and equator, so our reference zero shifts slightly from year to year. It changes by 1.3965 degrees per century.

Imagine that the gravitational pull of the other planets doesn't change the perihelion of planet A. The perihelion would still change each year because of the shift of the vernal equinox. The vernal equinox was established as a reference point thousands of years ago, and it's doubtful a stationary reference will be agreed upon soon. You just have to account for precession, and this is easy to do.

The Program

See Table 3 for an index to the program sections. Here I'll explain the computing algorithms.

Run the program, and a brief description appears on the screen. Press any key to continue. You must select the coordinate system you want. Type 1 if you want heliocentric; type 2 if you want geocentric. Then, enter the year. It must be between 1500 and 2460 and must be a



VE₁₉₈₂ & VE₁₉₈₁ = Vernal equinox for 1982, 1981
P₁₉₈₂ & P₁₉₈₁ = Perihelion for 1982, 1981
α = precession change of VE = 1.3956° per century
β = real perihelion change due to gravitational attraction of other planets. Exact value depends on the planet.
DP = α + β. DP is data in the program.

Fig. 3. Precession and Perihelion changes

whole number. Next enter the month (an integer from 1-12). Finally, enter the day; this can have up to two decimal places. For example, 3.25 means 6:00 a.m. on the third day of the month, Greenwich Mean Time. If you want local time, you have to make the conversion yourself. For example, 3.25 would be 1:00 a.m., Eastern Standard Time.

Heliocentric Calculation

All planet data is read in line 920. Lines 930-960 convert the constants for June 10, 1980, to the correct values for

the Julian day of interest. To find the heliocentric coordinates, calculate the mean anomaly, using JD, TPP and N.

$$MA = (N*(JD-TPP)-(DP-1.3965)*TJ)/K2$$

Then, find the eccentric anomaly. Kepler's Equation, relating eccentric to mean anomaly, is:

$$MA = EA - ECC * SIN(EA)$$

You must rearrange this equation and

Definitions

Terms

Celestial Equator: Coplanar with Earth's equator. It is the zero reference plane for geocentric declination.

Declination (CL): The angular distance from the plane of Earth's equator to a planet. The highest value is for Pluto, whose declination will vary from -40.5 to +40.5 degrees over its 248-year orbit.

Eccentric Anomaly (EA): An intermediate angle for finding orbits. It is angle POE in Figure 2b.

Eccentricity (ECC and EICC): Measure of the deviation of the true orbit from a circle. If eccentricity is one, the orbit is a parabola, and is not a closed orbit. The eccentricity of Halley's comet is very near one, so that its orbit is a highly elongated ellipse. Earth's eccentricity is near zero, so its orbit is almost circular.

Ecliptic: The plane of Earth's orbit. Zero reference for heliocentric latitudes.

Inclination (I and II): The angle that a body's orbit makes with the ecliptic. Inclinations are positive if the body orbits in the same direction as Earth, and are negative if the body orbits in the opposite direction. Halley's comet has a -17.5 degree inclination.

Julian day (JD): Noon on January 1, 4713 B.C., has been defined as the start of day number one for astronomical purposes. The Julian day number for a particular date is the number of days that have passed since January 1, 4713 B.C. The Julian day for the start of the day June 10, 1980, is

2444400.5; noon on June 10, 1980, is 2444401.0.

Longitude of the Ascending Node (AN and AIN): The angle, measured from the vernal equinox, at which the planet's orbit intersects the ecliptic. The planet must be going from below the ecliptic to above the ecliptic.

Longitude of Perihelion (PER and PIER): The angle, measured from the vernal equinox, at which the planet is closest to the sun. It is measured from the vernal equinox to the longitude of the ascending node along the ecliptic, then in the orbit plane from the longitude of the ascending node to perihelion. It is the sum of two angles measured in different planes.

Mean Anomaly (MA): The angle, measured from the planet's perihelion, to the sun, and back to the planet's position, that would be described if the planet moved in a circular orbit of radius less than the semi-major axis. (See Fig. 2a.) I use two other constants (mean daily motion and time of perihelion passage) to calculate mean anomaly, since the mean anomaly changes rapidly. For Earth, the mean anomaly varies from 0-360 degrees every 365.25 days. For Mercury, the mean anomaly varies from 0-360 degrees every 88 days.

Mean Daily Motion (N): The average number of degrees that a planet moves around the sun during each 24-hour day. The value ranges from over four degrees per day for Mercury to less than .004 degrees per day for Pluto.

Continues on p. 162



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then solve it using iterations. EA is estimated in line 980.

$$EA = MA + ECC * \sin(MA)$$

Then an intermediate angle M0 is found in line 990.

$$M0 = EA - ECC * \sin(EA)$$

A correction to the estimate for EA is made using MA and M0.

$$DL = (MA - M0) / (1 - ECC * \cos(EA))$$

This difference is added to EA to yield a new value for EA.

$$EA = EA + DL$$

If DL is less than .0001 radians, the iteration continues, going back to line 990. Two iterations are all that are needed for the planets; Halley's comet may require up to five iterations since its eccentricity is so near to 1. Once EA is found, the distance from the sun is found in line 1030.

$$R(B) = A * (1 - ECC * \cos(EA))$$

The formula above is derived from the properties of an ellipse. You can now find the true anomaly (true angle) of a planet.

$$TA = 57.295 * 2 * \text{ATN} \left(\left[\frac{1 + ECC}{1 - ECC} \right]^{1/2} * \tan(EA/2) \right)$$

As this formula shows, if the eccentricity is zero, the true anomaly equals the eccentric anomaly. Another intermediate number, the argument of latitude (U), is then calculated. Finding U lets you make a small correction in the heliocentric longitude as a result of a planet's orbit inclination.

$$U = TA + PER - AN$$

The value of U must be brought within the range of 0-360 degrees. Then you can find the longitude L(B).

$$L(B) = AN + 57.295 * \text{ATN}(\cos(I)) * \tan(U)$$

This is the heliocentric longitude that is printed out after it is brought within 0-360 degrees. Notice in the equation for L(B) that if the inclination is small, COS(I) is approximately 1, and L(B) could be approximated as:

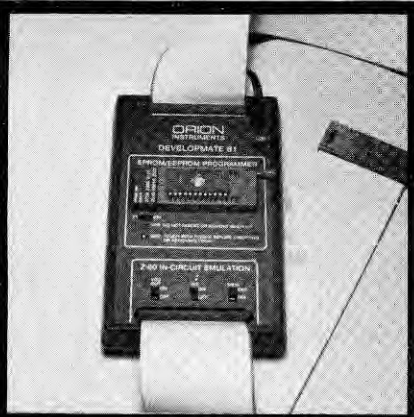
Julien Day is 2445318.5

	Dist to Sun A.U.	Helio Lon. (DEG)	12/15/1982 GMT Helio Lat. (DEG)
MER	0.42	310.3	-6.9
VEN	0.73	286.4	-1.7
EAR	0.98	82.7	0.0
MAR	1.38	331.6	-1.8
JUP	5.39	233.3	1.0
SAT	9.73	207.0	2.5
URA	18.90	245.2	0.1
NEP	30.25	266.8	1.2
PLU	29.92	207.2	17.0
HAL	10.71	102.9	-12.1

Want geocentric coordinates for same date? Y/N

Fig. 4. Heliocentric printout

CONVERT YOUR TRS-80 MODEL-I OR III INTO A DEVELOPMENT SYSTEM



Now you can develop Z-80 based, stand-alone devices such as games, robots, instruments and peripheral controllers, by using your TRS-80 as a development system. The DEVELOPMATE plugs into the expansion connector of your TRS-80 and adds **PROM PROGRAMMING** and **IN-CIRCUIT-EMULATION** capabilities to your system (with or without expansion interface).

Complete instructions and sample schematics are included to help you design your own simple stand-alone microcomputer systems. THESE SYSTEMS CAN BE AS SIMPLE AS FOUR ICs: one TTL circuit for clock and reset, a Z-80, an EPROM, and one peripheral interface chip.

When the In-Circuit-Emulation cable is plugged into the Z-80 socket of your stand-alone system, the system becomes a part of your TRS-80: You can use the full power of your editor/assembler's debug and trace program to check out both the hardware and the software. Simple test loops can be used to check out the hardware, then the system program can be run to debug the logic of your stand-alone device.

Since the program is kept in TRS-80 RAM, changes can be made quickly and easily. When your stand-alone device works as desired, you use the Developmate's PROM PROGRAMMER to copy the program into a PROM. With this PROM, and a Z-80 in place of the emulation cable, your stand-alone device will work by itself.

The DEVELOPMATE is extremely compact. Both the PROM programmer and the In-Circuit-Emulator are in one small plastic box only 3.2" x 5.4". A line-plug mounted power supply is included. The PROM programmer has a "personality module" which defines the voltages and connections of the PROM so that future devices can be accommodated. However, the system comes with a "universal" personality module which handles 2758, 2508 (8K), 2716, 2516 (16K), 2532 (32K), as well as the new electrically alterable 2816 and 48016 (16K EEPROMs).

The COMPLETE DEVELOPMATE 81, for Model I, with software, power supply, emulation cable, TRS-80 cable, and "universal" personality module \$329

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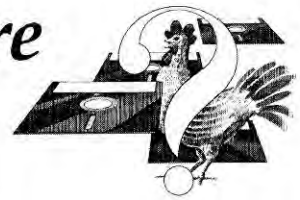
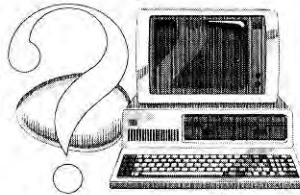
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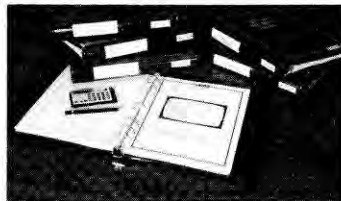
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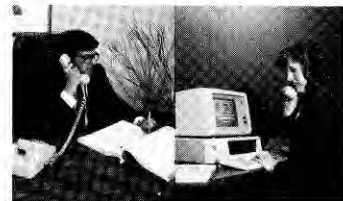
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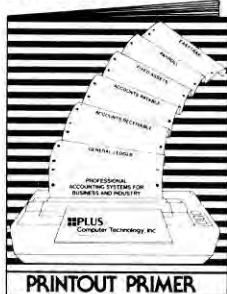


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$$L(B) = AN + 57.295 * U$$

where U is in radians. The heliocentric latitude is:

$$\text{SIN}(LAT) = \text{SIN}(I) * \text{SIN}(U)$$

Since Basic doesn't have the inverse sine function, you need lines 1150-1160 to get the inverse tangent.

$$LAT(B) = \text{ATN}(X1 / \text{SQR}(1 - X1 * X1))$$

LAT is multiplied by 57.295 when

printed. Figure 4 shows the heliocentric printout.

Geocentric Coordinates

The calculation of geocentric coordinates uses the results of the heliocentric coordinate calculation. The obliquity (Earth's tilt) is found for the day of interest in line 1420. Then the rectangular coordinates of Earth with respect to the sun are found in lines 1430-1450. This is merely a trigonometric transformation. Lines 1480-1500 find the rectangular coordinates of each planet with respect to the sun. With these equations, you

Continued from p. 158

Orbital Elements: The six "constants" required to describe a body's orbit in space.

Perihelion: Point of planet's closest approach to the sun.

Right Ascension (RA, RAH and RAM): The position of a planet relative to the vernal equinox. Usually it is given in hours and minutes, but it can be listed in degrees. One hour of right ascension equals 15 degrees.

Semi-major axis (A): The average distance of a planet from the sun.

Time of Perihelion Passage (TPP): The Julian day of the planet's last closest approach to the sun before June 10, 1980. TPP introduces the time variable into the equations.

True Anomaly (TA): The actual angle measured from perihelion, to the sun, and back to the planet in its true orbit.

Vernal equinox: The zero reference point for longitudes in the heliocentric and geocentric coordinate systems. Its location is determined when the apparent orbit of the sun around Earth crosses the equator from south to north. It moves each year, because of precession, at the rate of .013965 degrees. Usually called the equinox.

Coordinate Systems

Heliocentric: This coordinate system has the center of the sun as the origin. Distance of the planets from the sun is given in astronomical units (AU). Longitude is measured in degrees from the vernal equinox. Latitude is measured in degrees north or south of the eclip-

tic, which is the plane described by Earth's orbit around the sun.

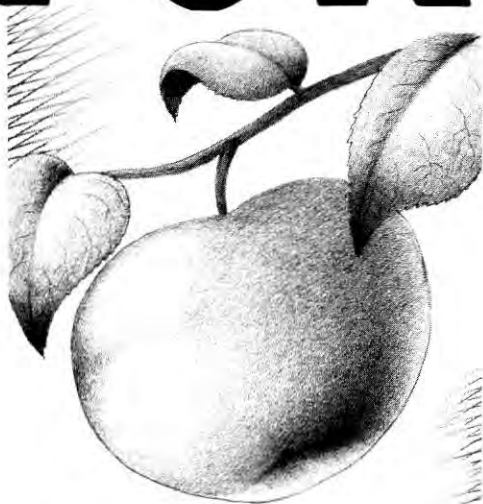
Geocentric: This coordinate system has the center of Earth as the origin. Distance of the planets from Earth is given in AU. Right ascension is given in hours and minutes measured from the vernal equinox. Declination is measured in degrees north or south from the plane described by Earth's equator.

Alt-Azimuth (altitude-azimuth): System based on seeing from your location. The horizon is taken as a reference. The altitude of a body is measured above or below the horizon. Plus or minus 90 degrees are the maximum values allowed. A negative altitude means that the body is below the horizon and so is not visible. To illustrate, the sun has a negative altitude at night. At sunrise or sunset, the sun's altitude is zero. Azimuth is measured from true north (0-360 degrees maximum). This system is a trigonometric transformation of the geocentric system.

Planetocentric: This system has the center of any planet as the origin. It is the general case of the geocentric coordinate system. For example, if you use the correct elements, you can determine how the solar system looks from Mars.

Topocentric: This system is a refined geocentric system. It takes into account the fact that you are located 4,000 miles from the center of Earth when viewing the planets. This makes a small change in the viewing angle. Strictly speaking, alt-azimuth coordinates should be found from the topocentric and not from the geocentric coordinates. The errors are small, and I have neglected them. ■

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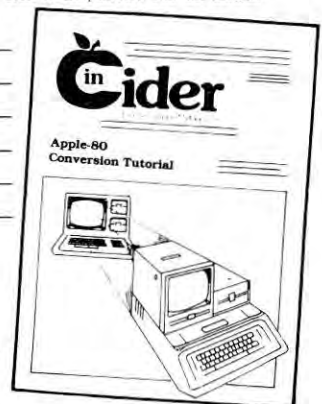
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know the distance and angle of Earth and each planet with respect to the sun. The program then solves for planet location with respect to Earth, again using trigonometry, a relatively simple procedure.

DS in line 1540 is the distance in three-dimensional space between Earth and another planet. Z0 in line 1550 is the inverse sine of the declination. The declination CL(B) is found by using the ATN function again. RA(B) in line 1570 is the ATN of the planet's Y-coordinate divided by its X-coordinate. Since right ascension is usually given in hours and minutes, conversion from degrees to hours/minutes is done in lines 1660-1720.

CL(B) and RA(B) in lines 1640-1650 are used only if you want to refer the RA and declination to a different year. For instance, most comet orbits are referred to the year 1950 or 2000 as a standard astronomical practice. Figure 5 shows the geocentric printout.

Alt-Azimuth Coordinates

Alt-azimuth coordinates are found in lines 1880-2060. Type in your latitude and longitude. I arbitrarily limited latitudes to less than 65 degrees north or

south. The value can be changed to 90 degrees. Longitudes are limited to plus or minus 180 degrees.

LST is the local sidereal time in line 1960. This is an important number for finding the hour angle HRA in line 1990. Sidereal time and hour angle relate the rotation of Earth to the background of stars. Any star rises and sets at the same sidereal time every day. The hour angle is necessary for finding the azimuth angle.

Lines 2000-2030 are the spherical trigonometric transformations from geocentric to alt-azimuth coordinates. Proper quadrant corrections need to be made in lines 2040-2060, so that azimuth is printed from 0-360 degrees.

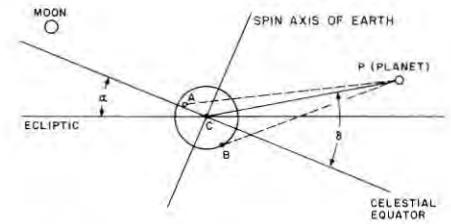
Accuracy and Errors

This program has six sources of error: nutation; planetary aberration; parallax; Earth-moon system; dropping of squared and higher-order terms; and gravitational perturbations.

The first four affect viewing from Earth. They do not affect any planet's true heliocentric position.

Geocentric Errors

Nutation is a slight wobble in Earth's



α = obliquity of ecliptic

δ = declination

A = center of gravity of earth-moon system. Origin for differential equation solution.

B = point on Earth's surface from which you look. Origin for topocentric coordinate system.

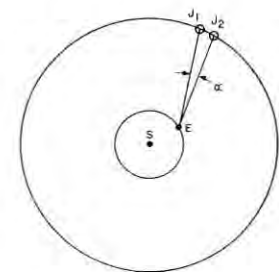
C = center of Earth. Origin for the program's geocentric coordinate system.

As explained in the text, alt-azimuth coordinates are transformed from the geocentric. They should be transformed from the topocentric coordinates. Alt-azimuth coordinates are therefore in error by angle BPC, which is less than $.009^\circ$.

Fig. 6. Parallax and coordinate system errors

axis caused by the moon. It is much smaller than precession. Nutation occurs because the orbit plane of the moon is tilted about five degrees toward the plane of Earth's equator, and the orbit is elliptical. Error due to nutation is about $.006$ degrees in right ascension and declination. The error is nearly the same for all the planets.

The moon also causes another type of error. Earth and the moon must be considered a double planet. The true center of gravity of the Earth-moon system is located about 3,000 miles from Earth's center. Earth swings around this point, and the planets are shifted a slight amount. Maximum error is about $.007$ degrees for Venus in right ascension. This error occurs at Venus's closest approach to Earth, about 26 million miles. The smallest errors, about $.0001$ degrees, are for Uranus, Neptune, and Pluto. (See Fig. 6.)



S = SUN

E = Earth at time t

J₁ = Jupiter at time t

J₂ = Jupiter at time (t-40 minutes) as seen from Earth.

α = angular error, $\leq .003^\circ$ for Jupiter

Fig. 7. Planetary Aberration

Planet	Maximum Error in degrees	Average Error in degrees
Mercury	.05	.02
Venus	.07	.03
Earth	.07	.04
Mars	.15	.06
Mars	.15	.06
Jupiter	.46	.20
Saturn	1.10	.51

Table 2. Maximum and Average Errors in Longitude due to Perturbations

Want geocentric coordinates for same date? Y/N
 equinox of date? Y/N
 Want referred to equinox of date? Y/N

	Dist to Earth A.U.	RT Ascen. (HR/MIN)	Declin (DEG)
MER	1.31	19/28.5	-25.5
VEN	1.68	18/11.9	-24.1
MAR	1.96	20/25.4	-20.6
JUP	6.27	16/42.7	-18.9
SAT	10.32	14/0.9	-9.8
URA	19.85	16/16.7	-21.2
NEP	31.23	17/45.7	-22.2
PLU	30.47	14/10.5	4.6
HAL	9.82	6/58.8	9.5

Want alt-azimuth coordinates? Y/N

Fig. 5. Geocentric Printout

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Planetary aberration is the apparent change in a planet's position because of the time it takes light to reach us. When we look from Earth, we see Saturn where it was about one and one half hours ago. The error from planetary aberration varies with each planet, since the planets travel at different speeds and are at various distances from earth. Errors range from a high of .009 degrees in right ascension and declination for

Mercury down to a low of .001 degrees for the outer planets. (See Fig. 7).

Parallax arises because you look at the other planets from Earth's surface, while the heliocentric positions are calculated as if seen from Earth's center. On Earth's surface you can be displaced up to 4,000 miles one way or the other from its center. The errors range from .009 degrees in right ascension for Venus down to .0001 degrees for

Program Listing

```

100 DEFDBL A,C-Z
110 CLS
120 PRINT "*****"

130 PRINT"                PLANETARY ORBITS"
140 PRINT "AUTHOR--DON CARRERA                COPYRIGHT 1981"
150 PRINT "*****"

160 'THE PROGRAM AUTOMATICALLY CALCULATES THE JULIAN DATE
170 'TPP IS THE TIME OF PERIHELION PASSAGE.
180 'ALL DATA IS GIVEN AS OF JUNE 10,1980.
190 'AN IS THE LONGITUDE OF THE ASCENDING NODE. PER IS THE LONG
ITUDE OF PERIHELION. ECC IS THE ECCENTRICITY OF THE ORBIT. I IS
THE ORBIT INCLINATION. A IS THE SEMI-MAJOR AXIS OF ORBIT. N IS
THE DAILY MOTION OF PLANET IN DEGREES.
200 'DA,DP,DI ARE THE CHANGES IN AN,PER AND I IN DEGREES PER CEN
TURY. DE IS CHANGE IN ECC PER CENTURY (DIMENSIONLESS).
210 'MA,EA,TA ARE MEAN ANOMALY, ECCENTRIC ANOMALY AND TRUE ANOM-
ALY (RADIAN OR DEGREES).
220 'U IS THE ARGUMENT OF LATITUDE.
230 'RA IS RIGHT ASCENSION IN DEGREES; RH & RM ARE HOURS & MINUT
ES OF RA.
240 'HRA IS HOUR ANGLE FOR CALCULATING ALT-AZIMUTH COORDINATES.
250 PRINT "THE PROGRAM CALCULATES PLANET POSITION IN SEVERAL COO
RDINATE SY-STEMS FOR A GIVEN MONTH/DAY/YEAR. YOU MUST INPUT YOU
R LATITUDE AND LONGITUDE FOR ALT-AZIMUTH COORDINATES."
260 PRINT
270 PRINT "YOU CHOOSE SUN-CENTERED (HELIOCENTRIC) COORDINATES OR
EARTH-CEN-TERED (GEOCENTRIC) COORDINATES. GEOCENTRIC COORDINAT
ES MUST BE FOUND BEFORE ALT-AZIMUTH COORDINATES ARE COMPUTED."
280 PRINT
290 PRINT "YOU MAY CHOOSE ANY DATE FROM 1500 A.D. TO 2460 A.D.":
PRINT
300 PRINT "PRESS ANY KEY TO CONTINUE"
310 IF INKEY$="" THEN 310
320 K2=57.295779
330 DIM H(13)
340 CLS
350 PRINT "WHICH COORDINATE SYSTEM DO YOU WANT?"
360 PRINT "(ALT-AZIMUTH MUST BE CALCULATED AFTER GEOCENTRIC)"
370 PRINT
380 INPUT "HELIOCENTRIC (1)    GEOCENTRIC (2)";CRD
390 IF CRD=1 OR CRD=2 THEN 400 ELSE 380
400 PRINT
410 PRINT "INPUT DATE: "
420 INPUT "YEAR IS :";YEAR
430 IF YEAR=0 THEN 440 ELSE 450
440 PRINT "THERE IS NO YEAR ZERO":GOTO 420
450 IF ABS(YEAR-1980)>480 THEN 470
460 IF YEAR<>INT (YEAR) THEN 420 ELSE 480
470 PRINT "TOO FAR AWAY":GOTO 420
480 PRINT
490 IF REP=1 THEN 500 ELSE 510
500 RESTORE
510 FOR B= 1 TO 13
520 READ H(B):NEXT B
530 IF (YEAR/4)-INT(YEAR/4)=0 THEN 540 ELSE 570
540 IF (YEAR/400)-INT(YEAR/400)=0 THEN 560
550 IF (YEAR/100)-INT(YEAR/100)=0 THEN 570
560 FOR B= 3 TO 13:H(B)=H(B)+1:NEXT B
570 INPUT"MONTH (JAN=1): ";MNTH
580 IF MNTH<1 OR MNTH>12 OR MNTH<>INT(MNTH) THEN 570
590 INPUT "DAY OF MONTH :";DY
600 IF DY>=1 AND DY<=(H(MNTH+1)-H(MNTH)+.99) AND ABS((DY*100)-IN
T(DY*100+.99))<.001 THEN 610 ELSE 590
610 CLS
620 IF YEAR<0 THEN YEAR=YEAR+1
    
```

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Listing continued

```

630 J0=YEAR+4712
640 LYR=INT((J0-1)/4)
650 JD=365*J0+LYR
660 IF YEAR<1582 THEN 720
670 IF YEAR=1582 AND((MNTH<10)OR (MNTH=10 AND DY<15)) THEN 720

680 JD=JD-10
690 YR1583=INT((YEAR-1501)/100)
700 LPYR1583=INT((YEAR-1201)/400)
710 JD=JD-YR1583+LPYR1583
720 JD=JD+DY+H(MNTH)-.5
730 IF YEAR<=0 THEN YEAR=YEAR-1
740 PRINT "JULIAN DAY IS ";JD;"          ";MNTH;" / ";DY;" / ";YEAR;"  G
MT"
750 TJ=(JD-2444400.5)/36525
760 IF CRD=2 THEN 800
770 PRINT "          DIST. TO SUN          HELIO LON.          HELIO LAT."
780 PRINT "          A.U.          (DEG)          (DEG)"
790 GOTO 910
800 GEO=0
810 PRINT
820 PRINT "WANT REFERRED TO EQUINOX OF DATE? Y/N"
830 GOSUB 2120
840 ON Q1 GOTO 850 ,880
850 INPUT "WHAT YEAR DO YOU WANT RESULTS REFERRED TO";Y1
860 K=Y1-YEAR:CRD=4
870 PRINT "RESULTS REFERRED TO YEAR ";Y1
880 PRINT "          DIST TO EARTH          RT ASCEN          DECLIN"
890 PRINT "          (A.U.)          (HR/MIN)          (DEG)"
900 IF GEO=1 THEN 1420
910 FOR B=1 TO 10
920 READ Z$(B),N,A,ELCC,I1,PLER,ALN,DA,DP,DE,DI,TPP
930 AN=A1
+DA*TJ
940 PER=PLER+DP*TJ
950 ECC=ELCC+DE*TJ
960 I=I1+DI*TJ
970 MA=(N*(JD-TPP)-(DP-1.3965)*TJ)/K2
980 EA=MA+ECC*SIN(MA)
990 M0=EA-ECC*SIN(EA)
1000 DL=(MA-M0)/(1-ECC*COS(EA))
1010 EA=EA+DL
1020 IF ABS(DL)>.0001 THEN 990
1030 R(B)=A*(1-ECC*COS(EA))
1040 TA=K2*2*ATN(SQR((1+ECC)/(1-ECC))*TAN(EA/2))
1050 U=TA+PER-AN
1060 IF U>0 THEN 1080
1070 U=U+360
1080 IF U>360 THEN U=U-360
1090 L(B)=AN+K2*ATN(COS(I/K2)*TAN(U/K2))
1100 IF U>90 THEN 1120
1110 GOTO 1140
1120 IF U>270 THEN L(B)=L(B)+360:GOTO 1140
1130 L(B)=L(B)+180
1140 IF L(B)>360 THEN L(B)=L(B)-360
1150 X1=SIN(I/K2)*SIN(U/K2)
1160 LAT(B)=ATN(X1/SQR(1-X1*X1))
1170 IF CRD=2 OR CRD=4 THEN 1190
1180 PRINT USING "% %          ##.##          ###.#          ###.#
";2$(B);R(B);L(B);LAT(B)*K2
1190 NEXT B
1200 IF CRD=2 OR CRD=4 THEN 1420
1210 DATA 0,31,59,90,120,151,181,212,243,273,304,334,365
1220 DATA MER,4.0923388,.387099,.205631,7.00437,77.1509,48.0994,
1.1852,1.5555,.00002,.002,2444376.770
1230 DATA VEN,1.60213,.723332,.006783,3.39444,131.2958,76.5038,.
8998,1.4080,-.00005,.001,2444323.110
1240 DATA EAR,.985609,1,.016717,0,102.6040,0,0,1.7192,-.00004,0,
2444242.321
1250 DATA MAR,.524033,1.52369,.093387,1.8498,335.6989,49.4066,.7
7099,1.8408,.00009,-.0007,2443951.049
1260 DATA JUP,.083091,5.2028,.0484687,1.3042,14.008,100.251,1.01
08,1.6111,.00016,-.006,2442636.0
1270 DATA SAT,.0334597,9.53884,.055614,2.4889,92.665,113.486,.87
306,1.9583,-.0003,-.004,2442078.0
1280 DATA URA,.011732,19.1818,.047262,.77194,170.34,73.90,.5111,
1.6250,.0003,.0006,2439384.2
1290 DATA NEP,.005981,30.058,.008590,1.7719,44.453,131.565,1.10
17,.8778,.0001,-.009,2408034.7
1300 DATA PLU,.003921,39.829,.25478,17.137,223.014,109.96,.8,1.5
,0,0,2355886.7
1310 DATA HAL,-.0130008,17.95,.9673,-17.5,306.9,60,3.3,1.6,0,0,2
418781.5
1320 IF CRD=2 OR CRD=4 THEN 1420
1330 PRINT "WANT GEOCENTRIC COORDINATES FOR SAME DATE? Y/N"
1340 GOSUB 2120
1350 ON Q1 GOTO 1380 ,1360

```

Listing continues


```

1360 GEO=1
1370 GOTO 810
1380 GOSUB 2110
1390 GOSUB 1810
1400 GOTO 340
1410 PRINT
1420 OBLIQ=(23.4419-.013*TJ)/K2
1430 XSUN=R(3)*COS((L(3)+180)/K2)
1440 YSUN=R(3)*SIN((L(3)+180)/K2)*COS(OBLIQ)
1450 ZSUN=R(3)*SIN((L(3)+180)/K2)*SIN(OBLIQ)
1460 FOR B=1 TO 10
1470 IF B=3 THEN 1740
1480 XP=R(B)*COS(LAT(B))*COS(L(B)/K2)
1490 YP=R(B)*(COS(LAT(B))*SIN(L(B)/K2)*COS(OBLIQ)-SIN(LAT(B))*SIN(OBLIQ))
1500 ZP=R(B)*(COS(LAT(B))*SIN(L(B)/K2)*SIN(OBLIQ)+SIN(LAT(B))*COS(OBLIQ))
1510 XT=XP+XSUN
1520 YT=YP+YSUN
1530 ZT=ZP+ZSUN
1540 DS=SQR(XT*XT+YT*YT+ZT*ZT)
1550 Z0=ZT/DS
1560 CL(B)=K2*ATN(Z0/SQR(1-Z0[2]))
1570 RA(B)=K2*ATN(YT/XT)
1580 IF XT>0 THEN 1610
1590 RA(B)=RA(B)+180
1600 GOTO 1630
1610 IF YT>0 THEN 1630
1620 RA(B)=RA(B)+360
1630 IF CRD=4 THEN 1640 ELSE 1680
1640 CL(B)=CL(B)+.005567*K*COS((RA(B)+.0064*K)/K2)
1650 RA(B)=RA(B)+.0128*K+.005567*K*SIN(RA(B)/K2)*TAN(CL(B)/K2)
1660 IF RA(B)<0 THEN RA(B)=RA(B)+360
1670 IF RA(B)>360 THEN RA(B)=RA(B)-360
1680 RH=INT(RA(B)/15)
1690 RM=(RA(B)/15-RH)*60
1700 IF RM<60 THEN 1730
1710 RH=RH+1
1720 RM=0
1730 PRINT USING"% %      ##.##      ##/##.#      ###.#  "
;Z$(B);DS;RH;RM;CL(B)
1740 NEXT B
1750 PRINT "WANT ALT-AZIMUTH COORDINATES? Y/N"
1760 GOSUB 2120
1770 ON Q1 GOTO 1780,1870
1780 GOSUB 2110
1790 GOSUB 1810
1800 GOTO 340
1810 PRINT "WANT ANOTHER DAY? Y/N"
1820 GOSUB 2120
1830 ON Q1 GOTO 1860,1840
1840 REP=1
1850 RETURN
1860 STOP
1870 CLS
1880 Z8=(DY-INT(DY))*24
1890 INPUT "LATITUDE = ";ATAZ
1900 IF ABS(ATAZ)>65 THEN 1890
1910 INPUT "LONGITUDE = ";AZLN
1920 IF ABS(AZLN)>180 THEN 1910
1930 PRINT MNTH;"/";DY;"/";YEAR;" GMT"
1940 PRINT "          ALTITUDE          AZIMUTH"
1950 PRINT "          (DEG)          (DEG)"
1960 LST=17.2182+.0657093*(JD-2444400.5)+1.0027*Z8
1970 FOR B=1 TO 10
1980 IF B=3 THEN 2080
1990 HRA=(15*LST-RA(B)-AZLN)/K2
2000 Z9=SIN(CL(B)/K2)*SIN(ATAZ/K2)+COS(CL(B)/K2)*COS(ATAZ/K2)*COS(HRA)
2010 ALT=K2*ATN(Z9/SQR(1-Z9[2]))
2020 Z1=-COS(CL(B)/K2)*SIN(HRA)
2030 Z2=SIN(CL(B)/K2)*COS(ATAZ/K2)-COS(CL(B)/K2)*SIN(ATAZ/K2)*COS(HRA)
2040 MU=K2*ATN(Z1/Z2)
2050 IF Z2<0 THEN MU=MU+180
2060 IF MU<0 THEN MU=MU+360
2070 PRINT USING"% %      ##.##      ##.##";Z$(B);ALT;MU
2080 NEXT B
2090 GOSUB 1810
2100 GOTO 340
2110 FOR B=1 TO 100:NEXT B:RETURN
2120 A$=INKEY$
2130 IF A$="N" THEN Q1=1:GOTO 2160
2140 IF A$="Y" THEN Q1=2:GOTO 2160
2150 GOTO 2120
2160 RETURN
    
```

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Uranus, Neptune, and Pluto.

These four types of errors displace the planets from their positions as calculated in relation to Earth. The errors could be zero for three of the four cases. That happens if you are at the right spot on Earth's surface, and the moon is in a "good" position (see Figs. 6 and 7). Planetary aberration always displaces the planets as seen from Earth. You can make corrections in the

program by allowing for the travel time of light when finding the heliocentric positions. (See References 3 and 5 for further explanation.)

Table 1 shows the combined maximum errors for each planet. These errors combine right ascension and declination. The program output lists right ascension to .1 arc minutes, which corresponds to about .025 degrees. The four error terms give an error of plus or

minus .1 arc minutes in right ascension.

Heliocentric Errors

In finding the heliocentric positions, I approximated the true variations of the orbit elements by a straight line. For example, in line 950:

$$ECC = E1CC + DE * TJ$$

This means that the eccentricity at any time (ECC) equals the eccentricity on June 10, 1980 (E1CC), plus the rate of change of eccentricity per century (DE), times the number of centuries from June 10, 1980 (TJ). Including terms that use the variable "time" (in this case TJ) to the second power would give a better approximation:

$$ECC = E1CC + DE * TJ + DDE * TJ * TJ$$

This requires more data to be listed; you need DDE for all 10 planets. Since the program has ample room, you could easily do this. By using only first powers of time and going back 480 years, maximum errors of about .02 degrees in true longitude occur for Jupiter and Saturn. The further back in history you go, the greater the error becomes.

Line 100—Many of the constants require more than six-digit accuracy, TPP in particular. The counter B must not be double precision.

410-600—Date input with checkpoints. H(B) is the counter for the day of the year, corrected for leap years.

620-730—Julian day calculation. It is correct for any year from 4713 B.C. onward.

750—TJ is the number of centuries between the Julian day of interest and June 10, 1980 (JD = 2444400.5).

820-870—Select results referred to the vernal equinox of the date entered, or referred to the position of the vernal equinox of another year.

910-1190—Calculates the heliocentric coordinates. Need to get results in the proper quadrant due to use of the arc tangent (ATN) function.

1220-1310—Data for the planets and Halley's comet.

1420-1740—Calculates geocentric coordinates; lines 1640-1650 find the right ascension and declination if you want results referred to a different year. Heliocentric coordinates must be found before geocentric.

1880-2080—Calculates alt-azimuth coordinates. Geocentric coordinates must be found before alt-azimuth coordinates.

Table 3. Program Explanation

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I assumed that orbit elements changed linearly. In fact, they don't. They vary in a cyclical, nonrepetitive manner, with periods of a few years to tens of thousands of years. Over a short time, a linear approximation is adequate, but it becomes less accurate with a time span.

The last error term results from the gravitational perturbations on each planet by the other planets. If enough of these error terms are included, the true heliocentric positions can be found for any time. The problem is how to find these terms and how many to include.

The terms' values are listed in astronomy texts, usually under the name "perturbation theory." *Astronomical Formulae for Calculators* includes an excellent presentation of perturbation terms. These terms can be called long-period terms, and you should include about 100 of them. I didn't include perturbation terms in the program because of the extra time and memory they require.

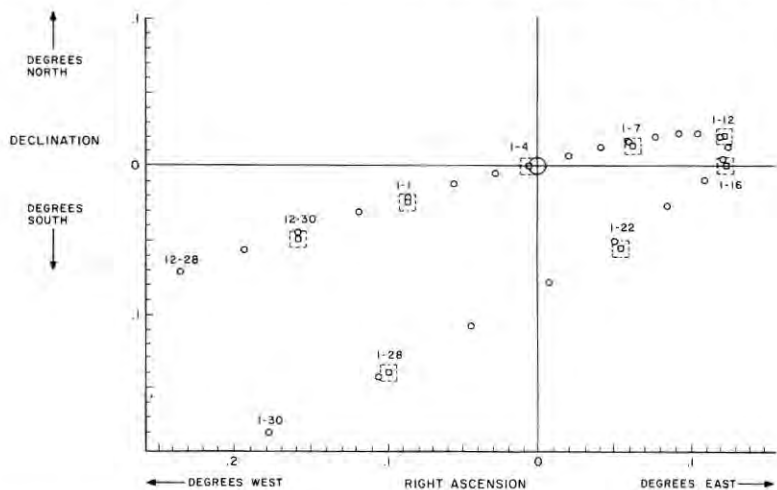
The maximum error of the perturbation terms for the planets from Mercury to Saturn is 1.1 degrees (see Table 2), which means Saturn can be up to 1.1 degrees away from the longitudes found with the program. For the years around

1982, the greatest error is less than .2 degrees. Errors in latitude are less than .01 degrees and usually can be neglected. Errors in distance from the sun are typically .001 AU.

Errors for Uranus and Neptune can be greater than 2 degrees. Pluto's orbit

has not been reduced to a closed form to allow easy error calculations. Data for Halley's comet applies only from 1980-1990. It will be visible in small telescopes from 1985-1987.

The errors are the differences between the values from my program and



- Jupiter—as seen from earth, .012° diameter
- Neptune—as seen from Earth, .0007° diameter. True orbit
- error band, does not include perturbation terms
- ◻ position calculated by program

Fig. 8. Position of Neptune with respect to Jupiter December 28, 1612 to January 30, 1613 (Reprinted with permission, Scientific American, December, 1980).

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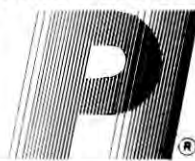
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the values listed in the *Astronomical Almanac*. The perturbation errors produce the greatest differences, and you can neglect most other errors. You obtain the true positions by solving simultaneous differential equations. For each year, an equivalent set of orbit elements is calculated from the simultaneous equation solution. Astronomers determine how much the elements change from year to year and try to approximate this change. For any one year, each element can be considered constant. For hundreds of years, a linear approximation is used. For longer periods, squared and cubed terms are necessary.

Halley's Comet

For Halley's comet, the maximum error between the program's results and those in *Comet Halley's Handbook* will

occur when it is closest to Earth—November 1985 and April 1986.

There are two reasons for this. The comet is changing its distance from both the sun and Earth very rapidly. The geocentric coordinates are approximately equal to the arc tangent of the heliocentric position divided by the distance to earth. As the comet's distance from Earth decreases, the viewing error becomes greater.

A second, more basic reason is that Halley's comet is nearing a heavy object—Earth. Earth's gravitational attraction pulls the comet out of the smooth, elliptical orbit astronomers assumed it followed.

The maximum error is approximately .6 degrees for the two closest approaches on November 27, 1985, and April 11, 1986. The errors at Halley's perihelion and after June 10, 1986, are typically

.25 degrees. When Halley's comet is at perihelion, it will be on the opposite side of the sun from Earth. The program results for the comet are only valid for 1980–1990.

Occultation of Neptune by Jupiter in 1613

A rare event occurred on January 4, 1613. As seen from Earth, Jupiter occulted (passed in front of) Neptune (see Fig. 8). The small circles in Fig. 8 show the true position of Neptune with respect to Jupiter as found by Steven Albers from the solution for the differential equations of motion. The small squares show the results from my program, along with the error limits resulting from all error terms except for the long-period terms. Figures 9 and 10 show the program's calculations for the right ascensions and declinations of all the planets on January 4, 1613, at 4:19 a.m. GMT. I've listed the numbers to three decimal places, because the separation of the centers of Jupiter and Neptune are about .001 degrees apart. Since Jupiter's disk is .012 degrees in diameter, it completely covered the disk of Neptune.

The data in Fig. 10 refers to the year 1950. Doing this allows us to compare the right ascension and declination values of the program to the values in "Mutual Occultations of Planets: 1557 to 2230." Both declination and right ascension are in error by .1 degree. Most of this error is due to long-period terms. That's good agreement by the listed program for a date over 350 years ago. The positions of all the planets for January 4, 1613, are shown in Fig. 11. The Earth-Jupiter-Neptune line-up is easily seen.

Julien Day is 2310199.68		1/4.18/1613 GMT	
	Dist to Sun A.U.	Helio Lon. (DEG)	Helio Lat. (DEG)
MER	0.41	311.863	-6.99
VEN	0.72	163.479	3.39
EAR	0.98	104.108	0.00
MAR	1.59	89.897	1.27
JUP	5.43	166.677	1.25
SAT	9.57	348.420	-2.13
URA	18.99	84.440	0.17
NEP	30.23	174.841	1.33
PLU	49.98	39.159	-15.94
HAL	15.70	137.724	-17.50

Want geocentric coordinates for same date? Y/N

Fig. 9. Program's Calculations for Right Ascensions and Declinations of All Planets on January 4, 1613, at 4:19 am GMT.

Want referred to equinox of date? Y/N

What year do you want results referred to? 1950

Results referred to year 1950

	Dist to Earth A.U.	RT Ascen. (HR/MIN)	Declin (DEG)
MER	1.36	19/57.485	-22.912
VEN	0.87	16/9.326	-18.222
MAR	0.68	4/47.757	25.460
JUP	5.06	12/6.990	0.700
SAT	10.04	23/19.283	-6.596
URA	18.06	5/51.676	23.663
NEP	29.92	12/6.993	0.701
PLU	49.58	3/0.682	0.363
HAL	14.93	9/23.345	-4.079

Want alt-azimuth coordinates? Y/N

Fig. 10. Further Calculations for Right Ascensions and Declinations of All Planets on January 4, 1613, at 4:19 am GMT.

Program Improvements

To save memory and improve the speed of calculating, you can make several changes to the program. You can write the mean anomaly in the form $((a + b*T)*T) + c*T$ (see Reference 5). I didn't do this because I wanted to follow the definition of mean anomaly.

If you are certain that you won't enter bad data, delete all the checkpoints for data input. For example, you know you won't enter 14 when inputting the month, or -2.3 for the day. You can delete lines 410–470, 570, and 590.

Formulas for finding the Julian day can be written on one program line. They don't show how to obtain the Julian day, but they do give the right number for it. You can substitute such a formula for lines 620–730. (Although the earliest year on my program is 1500

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ZBASIC 2.2 SPEED COMPARISON DEMO

To help give you an idea how fast compiled programs are, we have included this demo program:

ZBASIC 2.2 DEMO PROGRAM

Time to compile and run complete program	: 0 MIN. 2 SEC.
BASIC Execution speed MOD 1, LEVEL II	: 7 MIN. 34 SEC.
BASIC Execution speed MOD 1, LEVEL II	: 0 MIN. 18 SEC.
BASIC Program size (WITHOUT VARIABLES)	: 895 BYTES
ZBASIC Program size (WITHOUT VARIABLES)	: 2733 BYTES

(Remember that the ZBASIC program includes an 1879 byte sub-routine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```

10 ***** ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST*****
20 CLS:CLERR100:DEFINT A-X:DEFSTR Z:DIM AA(64,24),Z(50):RANDOM
30 AA=100:BB=-1000:CC=3:DD=-3:EE=-9999:ST="START TIME "+TIME$
40 FOR I=1 TO 127 STEP 2 :FOR J=47 TO 1 STEP -3:XX=POINT(I,J):SET(I,J)
50 XX=(I-J)/CC*(7+I+J):XX=ABS(INT(RND(I*J)-AA)+7):RESET(I,J)
60 XX=PEEK(I+J):POKE15360+I+J,J:OUT255,J AND (3*J):XX=INP(I)
70 AB=STR$(I+J):BA$=LEFT$(AB$,2):AA(I/2,J/2)=VAL(BA$)+AA*3
80 BA$=BA$+RIGHT$(BA$,RND(3)):XX=INSTR(1,BA$,"9"):XX=SDR(I*J)
90 BA$=MID$(BA$,2,2):MID$(BA$,1,1)=Z:IF XX THEN 100 ELSE CLS
100 IF LEN(BA$) > 3 OR SGN(XX)=1 AND ASC(BA$)=32 THEN PRINT"+++"
110 IF POS(0) < 62 THEN TRON:TROFF:PRINT ELSE XX=NOT(RND(99))+100
120 A$=INKEY$:IF A$="Y" OR A$="y" AND I < 120 THEN PRINT"TRUE.."
130 RESTORE:READA,C,Z(J),D:GOSUB170:GOSUB170:GOSUB170:GOSUB170
140 NEXT:PRINT"*":NEXTI:CLS:PRINT@512,ST$,"STOP TIME "+TIME$
150 STOP ***** END OF MAIN TEST LOOP *****
160 DATA 12345,-1,"TEST",-9999
170 ON RND(6) GOTO 180,190,200,180,190,200
180 RETURN
190 RETURN
200 RETURN
210 ON RND(9) GOSUB 180,190,200,180,190,200,180,190,200
220 GOTO140
    
```

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A.D., the Julian day calculation is accurate for any time after 4713 B.C.) Also, if you don't want geocentric or alt-azimuth coordinates, eliminate most of lines 1360-2120. To decrease the display time for heliocentric positions, change line 100 to: DEFDBL J,T.

What Else Can You Do?

You can also adapt this program to look at the solar system from another planet. The heliocentric calculations stay the same since they give the true locations of the planets. Find the heliocentric positions before calculating any other coordinate system information.

You must make changes in lines 1460-1510. In line 1460, OBLIQ is the tilt of the ecliptic with respect to the planet from which you are looking. For the listed program, this planet is Earth. On June 10, 1980, Earth's tilt was 23.4419 degrees. If you want to look from Mars, using "marcentric" coordinates, the ecliptic should remain the plane of Earth's orbit, so you don't have to change the constants in the data statements. Change OBLIQ to 23.98. This is the tilt of the Martian axis of rotation to the ecliptic. Line 1460 will look like this:

```
1460 OBLIQ=(23.98-.002*TJ)/K2
```

The -.002 term is the precession term. Mars's precession is much less than Earth's since Mars has no large moon to perturb it. The precession of Mars results from influences by the sun and Jupiter. The following lines also change:

```
1470 XSUN=R(4)*COS((L(4)+180)/K2)*
COS(LAT(4)/K2)
1480 YSUN=R(4)*SIN((L(4)+180)/K2)*
COS(OBLIQ)*COS(LAT(4)/K2)
1490 ZSUN=R(4)*SIN((L(4)+180)/K2)*
SIN(OBLIQ)*COS(LAT(4)/K2)
```

The COS(LAT) terms take into account Mars's inclination to the ecliptic. Similar terms would have appeared in finding XSUN for Earth, except that Earth's inclination is defined as zero. In reality, the latitude of Earth is not

always zero, but can be as "high" as .03 degrees. Because COS(.03 degrees) is about .99999985, the latitude term can be ignored for Earth.

Since Mars is the fourth planet, all references must be to it, not to Earth, in the equations. The counter B must be changed from 3 to 4. Line 1510 becomes:

```
1510 IF B=4 THEN 1760
```

With these changes you can find the ascensions and declinations of the other planets as they would be seen from Mars. Martian alt-azimuth coordinates are more difficult to find. You must use Martian latitudes and longitudes, which can be found in some observational astronomy texts. You must obtain a relation between the Martian day and an Earth day. Mars rotates once every 24 hours, 37 minutes, but the formulas are based on Earth's 24 hours per day, 365.25 Julian days per year.

You can also adapt this program to find the path of a spaceship sent from Earth to Mars. Normally, you know the spacecraft's x, y, and z-coordinates, as well as the x, y, and z-velocities with respect to Earth. These quantities usually come from direct radar or accelerometer information.

A spacecraft changes orbit by firing its engines, giving it a velocity change in the x, y, or z direction, or all three. The velocity changes are seldom translated into changes in the orbital elements. In real time, you don't need orbit elements when you have the distances and velocities. However, some formulas let you change the orbit elements for use in a program like this one. Texts that deal with satellite dynamics can give you the methods for changing orbit elements due to a spacecraft's velocity changes.

If you are interested in the alt-azimuth coordinates for a star, you can use lines 1880-2080. Input the right ascension and declination of the star. The star's right ascension would be read as RA(B) in line 1990. The declination becomes CL(B) in line 2000. You must

also calculate the Julian day to find the local sidereal time (LST) in line 1960. The printout will list the altitude and azimuth of the stars as you see them from your latitude and longitude.

You can calculate the transmission time for sending a message from Earth to another planet. The distance from Earth to the planet is found and printed out with the geocentric coordinates and can be used in your own application. Light (and radio waves) travels one A.U. in about 498.5 seconds.

Planet brightness can be calculated, too. Each planet reflects a certain amount of sunlight from its surface. This percent reflectance is called albedo. You can find the planet's brightness, as seen from Earth, if you know the planet's albedo, diameter, distance from the sun, and distance from Earth. The planet's distances from the sun and from Earth are known. All you need to do is read the extra data concerning albedo and diameter for the 10 bodies. ■

Don Carrera is an engineer with Westinghouse Electric. Contact him at 50 Suhan Drive, RD 11, Irwin, PA 15642.

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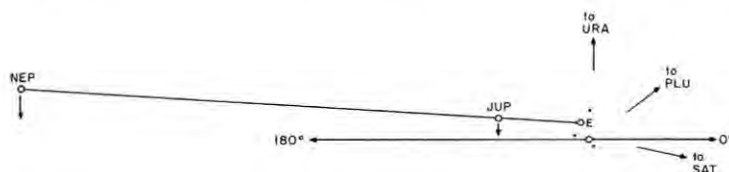


Fig. 11. Alignment of Jupiter and Neptune can be easily seen here. Positions are plotted from data from Fig. 9. The planets orbit counter-clockwise. Three planets are off the scale of the drawing; Halley's comet position shown by the program is meaningless at this date. The 0° mark indicates the direction of the vernal equinox for 1613 A.D.



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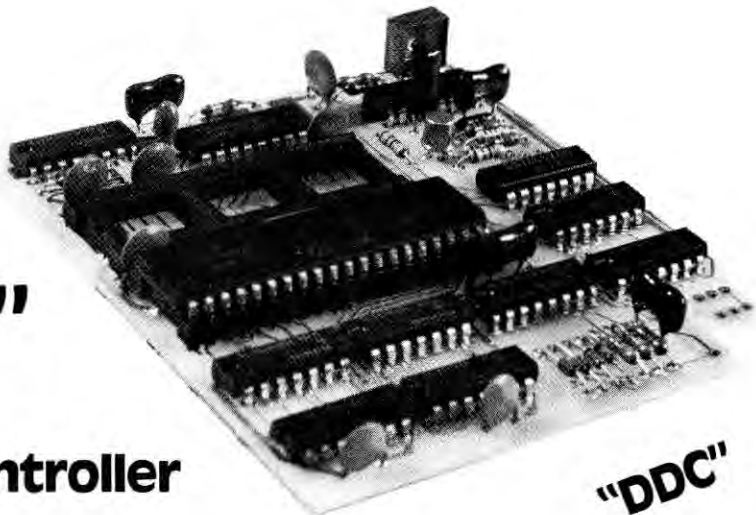
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MFR & PRODUCT	SECTORS LOCKED OUT (AVG)
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PERCOM "DOUBLER II"	18
PERCOM "DOUBLER A"	250
LNW "LNDOUBLER"	202

Note: test results available upon written request. All tests conducted prior to 8-25-81

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MFR. & PRODUCT	SECTORS LOCKED OUT	
	WITHOUT "DDS"	WITH "DDS"
PERCOM "DOUBLER II"	18	1
PERCOM "DOUBLER A"	250	0
LNW "LNDOUBLER"	202	0

Note: Same test procedures as "DDC".
* Trademark of Percom Data Co.
** Trademark of LNW
*** Trademark of Tandy Corporation

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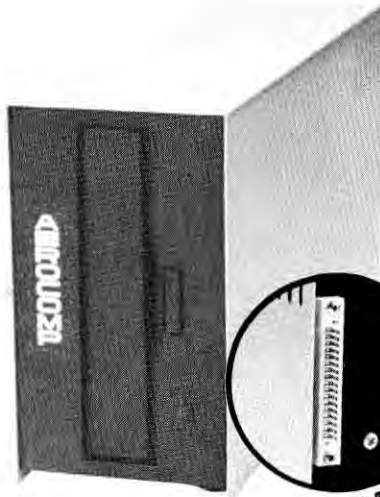
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Block Letters for The Mod II

by George Berman

Following a heavy session of statistical analysis, I found myself peering at a ream of fanfold, trying to decipher what I had done on each page. Then I remembered the clearly titled output I used to get in batch runs at a service bureau, and I realized I needed a titling routine to make my listings readable. The program I designed will add big block-letter title pages to your fanfold stacks.

Program Listing 1 shows how the titles are generated. It draws upon a di-

Make your printed program listings more readable with these big block-letter title pages.

rect-access file, called Block, which contains each character from ASCII(33) through ASCII(96). In this file, each record number corresponds to the

ASCII code of the character, less 32.

Within a record, five fields define rows 1-5 of the enlarged block letter. These are mostly constructed from # signs, with a few exceptions (see Fig. 1). The program produces a 5-by-5 representation of each character in your title. It centers each line horizontally, and centers the entire title block vertically on the page. You will need to insert the appropriate page length and width in lines 201 and 202. To run the program, set the top of form on your printer and align the paper perforation. Then, answer the prompts for the number of lines and for what's in each line of your title, and the printing will begin.

When loading the direct-access file, Block, remember Program Listing 2 is a user-friendly file loader. Every time you specify a character, it displays a 5-by-5 block outline on the screen and lets you fill the rows one by one. If necessary, you can shut down and begin later. The sequence of entries is unimportant, and you don't have to complete all characters if you don't think you'll need them. Feel free to redesign the characters. Some people like to use the lowercase letter instead of the # sign, but I think it results in an uneven appearance. By following the character designs in Fig. 1, without making many changes, you should be able to load Block in less than thirty minutes. ■

Contact George Berman at 84 Franklin Ave., Yonkers, NY 10705.

```

0 REM          TITLE/UTL          9 MAY 82          G R BERMAN
1 REM          Prints block titles using 5 x 5 characters
2 '
10 REM          INPUT FILE
11 REM          BLOCK/UTL ..... Direct-access file of block-letter strings
12 '
20 REM          VARIABLES
21 REM          FS(4) ..... Fields for strings defining a character
22 REM          LS(NL) ..... Lines of title
23 REM          NL ..... Number of lines in title
24 REM          R ..... Record containing character
25 REM          TH ..... Horizontal tab to center each line
26 REM          TV ..... Vertical tab to center title block
27 '
100 DEFINT A-Z : DEFSTR F
110 DIM FS(4)
111 '
200 REM          CONSTANTS
201 P=66' ..... Page length, lines
202 W=96' ..... Page width, characters
203 '
300 OPEN "D", 1, "BLOCK/UTL", 25
310 FIELD 1, 5 AS F(0), 5 AS F(1), 5 AS F(2), 5 AS F(3), 5 AS F(4)
311 '
400 CLS : PRINT CHR$(26); " TITLE "; CHR$(25)
410 INPUT "HOW MANY LINES"; NL : DIM LS(NL)
420 FOR I = 1 TO NL
421 INPUT LS(I)
422 IF 7*LEN(LS(I)) > W THEN 630
423 NEXT
430 TV = (P - 7*NL)/2
440 FOR I = 1 TO TV : LPRINT : NEXT
450 FOR I = 1 TO NL
460 TH = (W - 7*LEN(LS(I)))/2
470 FOR K = 0 TO 4
480 LPRINT TAB(TH);
490 FOR J = 1 TO LEN(LS(I))
500 R = ASC(MID$(LS(I),J,1)) - 32
510 IF R>0 THEN 530
520 LPRINT " "; : GOTO 550
530 GET 1, R
540 LPRINT F(K);
550 LPRINT " ";
560 NEXT J
570 LPRINT
580 NEXT K
590 LPRINT : LPRINT
600 NEXT I
610 SYSTEM "T"
620 END
630 PRINT : PRINT CHR$(26); "LINE"; I; "TOO LONG. START OVER." ; CHR$(25)
640 FOR J = 1 TO 2500 : NEXT
650 GOTO 400

```

Program Listing 1

The Key Box

Model II/16
32K RAM
TRSDOS
Printer

```

##### # # #####
# # # # # # # # # # # # #
##### # # # # # # # # # #
# # # # # # # # # # # # #
# # ##### ##### ##### # # #####

```

```

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# # # # # # # # # # # # # # # #
##### # # # # # # # # # # # #

```

```

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##### # # # # # # # # # # # # # # # #

```

```

# ##### # # # # # # # # # # # # # # # # * *
## # # # # # # # # # # # # # # # # # # # # *
# # # # # # # # # # # # # # # # # # # # # # * *
# # # # # # # # # # # # # # # # # # # # # #
##### ##### # # # # # # # # # # # # # # # #

```

```

##### ##### # # # # # # # # # # # # # # # #
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##### # # # # # # # # # # # # # # # # # # # # # #
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##### # # # # # # # # # # # # # # # # # # # # # #

```



Figure 1

```

0 REM          LOADBLOC/UTL          9 MAY 82          G R BERMAN
1 REM          Loads file with title characters in 5 x 5 format
2 '
10 REM          OUTPUT FILE
11 REM          BLOCK/UTL ..... Direct-access file of block-letter strings
12 '
20 REM          VARIABLES
21 REM          AS ..... Temporary variable
22 REM          CS ..... String defining character
23 REM          F(4) ..... Fields for strings defining a character
24 REM          LS ..... Character being coded
25 REM          R ..... Record containing character
26 '
100 DEFINT A-Z : DEFSTR F
110 DIM F(4)
111 '
200 OPEN "D", 1, "BLOCK/UTL", 25
210 FIELD 1, 5 AS F(0), 5 AS F(1), 5 AS F(2), 5 AS F(3), 5 AS F(4)
211 '
300 CLS : PRINT "TYPE 'END' TO QUIT"
310 INPUT "CHARACTER TO BE CODED"; LS
320 IF LS = "END" THEN 430
330 R = ASC(LS)-32
340 PRINT @ (5,0), STRINGS$(5,124) : PRINT @ (11,0), STRINGS$(5,124)
350 PRINT @ (6,0), ""
360 FOR I = 0 TO 4
365 LSET F(I) = "" : CS = ""
370 AS = INKEY$: IF AS = "" THEN 370
380 IF AS = CHR$(13) THEN PRINT AS; : GOTO 400
390 PRINT AS; : CS = CS + AS : GOTO 370
400 LSET F(I) = CS
410 NEXT
420 PUT 1, R : GOTO 300
430 END

```

Program Listing 2

What's After Basic?

If you ever wished that you had a better programming language, PASCAL 80 may be the language you dream about. It is a compiled language, faster, more accurate and easier to modify than Basic. Yet it is so easy to use that you can forget the hassles and diskette spinning of other compiled languages, including other versions of Pascal.

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The Garbage Collector

*Bob Snapp
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Variable length character strings are a boon to the high-level language programmer. Consider printing an employee's name on a paycheck. If the name were John Jones, you would not want it on the check

as John Jones, but with the last name immediately adjacent to the first. Using fixed-length strings, each name field is as long as the longest practical name and is filled with blanks. For the desired appearance you would have to tediously count the number of trailing blanks in the first name field and subtract that from the maximum field length. We should be grateful Microsoft chose the variable length approach such that we can `LPRINT NF$;" ";NL$`.

Suppose the application program constructs an array of names where the longest is 30 characters, but the average length is only 12. If storage were statically allocated, an array of 1000 names would gobble up 30,000 bytes of memory. North Star Basic and IBM's VSBasic handle strings this way. Our current generation processors address

only 65,536 bytes of memory. The question is not "Can I justify the cost of more memory?", but "What would I do with more memory if I had it?"

Again, Microsoft made the wiser choice. Memory is allocated dynamically as required. In the example above, only 12,000 bytes of memory are required to implement the string array.

Good things are not free. In exchange for flexible, memory efficient string handling, we require complex overhead to manage the strings.

Table 1 is a map of memory allocation for Microsoft Basic. Two of the map areas are completely dynamic: The stack moves downward and the variable/array tables move upward. Stack requirements are normally minimal, but deeply nested GOSUBs

Reserved memory Allocated by Memory Size?
String Space Allocated by Clear statement
Stack (moves downward)
Free memory
Array Table and Variable Table (moves upward)
Resident Basic program
File buffers Allocated by Number of Files?
Basic interpreter, Reserved storage, Operating system.

Table 1. Microsoft Basic Memory Map.

The Key Box

**Model I, II, or III
Microsoft Basic**

After 10	F	F	F	F	F	F	F	F	F	F	F	F
After 20	F	F	F	F	F	F	F	F	F	A\$	A\$	A\$
After 30	F	F	F	F	F	F	B\$	B\$	B\$	A\$	A\$	A\$
After 40	F	F	F	C\$	C\$	C\$	B\$	B\$	B\$	A\$	A\$	A\$
After 50	C\$	C\$	C\$	G	G	G	B\$	B\$	B\$	A\$	A\$	A\$
During 60	F	F	F	C\$	C\$	C\$	B\$	B\$	B\$	A\$	A\$	A\$
After 60	A\$	A\$	A\$	C\$	C\$	C\$	B\$	B\$	B\$	G	G	G

Table 2

or For...Next loops can make it quite large. When the stack is about to bump into the variable/array tables, or vice versa, the dreaded OM error results.

Let us direct our attention to the string space. A storage pool for strings is set aside immediately below any reserved memory. The size of this area is determined by the Clear nnnn statement; defaults are 50 or 100 bytes, depending upon the TRS-80 model.

Within the variable table, a string occupies three bytes of storage: one byte for the current length of the string (0-255), two bytes for the location of string data. The string data can be in one of four places. If the string was named in a Field statement the data is in the file buffer area. If it was created by a Let or Read statement the data is contained within the Basic program. A string length of zero has no string data. In any other situation the string data is located somewhere in the string pool.

Space in the pool is allocated to active strings starting from the top. Pointers are maintained by Basic to next available string location and to top of stack. To store a string in the pool, the number of bytes required is subtracted from next available. The result is compared to top of stack.

When the comparison shows available space the string is stored, next available is updated and processing continues.

Here is a simple Basic program; a diagram of what the string pool will look like is in Table 2.

```
10 CLEAR 12
20 A$ = STRING$(3,"")
30 B$ = STRING$(3,"")
40 C$ = A$
50 C$ = B$
60 A$ = C$
```

The letter F indicates a free position in the pool. Following the execution of line 10, all 12 positions are free. When line 20 is executed, the top three positions are allocated to A\$. In lines 30 and 40, space is further allocated to B\$ to C\$. Note carefully the results of line 50. When C\$ is assigned a second value, additional space was taken from the pool for the new value. The old space occupied by C\$ is abandoned! This space is marked with the letter G (for garbage).

The problem arises during the execution of line 60. The interpreter determines three more bytes of string storage are needed for the new value of A\$, but no space is available.

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```
GARBAGE-COLLECTOR: PROCEDURE;
IF PACKED-INDICATOR = TRUE THEN SIGNAL ERROR (OUT-OF-STRING-SPACE);
PACKED-INDICATOR = TRUE; /* caller sets back to false */
NEXT-AVAILABLE-STRING-LOCATION = TOP-OF-STRING-SPACE;
DO UNTIL (HIGH-STRING-LOCATION = 0);
HIGH-STRING-LOCATION = 0;
POSITION = START-OF-WORKSPACE;
DO WHILE (POSITION < END-OF-WORKSPACE);
CALL EVALUATE-STRING-LOCATION;
INCREMENT POSITION TO NEXT WORKSPACE ENTRY;
END; /* do while (position < end-of-workspace) */
POSITION = START-OF-VARIABLE-TABLE;
DO WHILE (POSITION < END-OF-VARIABLE-TABLE);
IF VARIABLE-TYPE = STRING THEN CALL EVALUATE-STRING-LOCATION;
INCREMENT POSITION TO NEXT VARIABLE ENTRY;
END; /* do while (position < end-of-variable-table) */
POSITION = START-OF-ARRAY-TABLE;
DO WHILE (POSITION < END-OF-ARRAY-TABLE);
IF ARRAY-TYPE = STRING THEN DO;
CALCULATE SIZE OF ARRAY AND POINT POSITION AT FIRST ELEMENT;
DO WHILE (MORE ELEMENTS IN THIS ARRAY);
CALL EVALUATE-STRING-LOCATION;
INCREMENT POSITION TO NEXT ELEMENT;
END; /* more elements in this array */
END; /* array type = string */
INCREMENT POSITION TO NEXT ARRAY;
END; /* position < end-of-array-table */
CALL PACK-SELECTED-STRING;
END; /* until high-string-location = 0 */
RETURN; /* that's all, folks! */
EVALUATE-STRING-LOCATION: PROCEDURE;
IF STRING-LENGTH = 0 THEN RETURN;
/* don't bother with null strings */
IF STRING-DATA-ADDRESS > NEXT-AVAILABLE-STRING-LOCATION THEN RETURN;
/* above test indicates this string already packed */
IF STRING-DATA-ADDRESS < BOTTOM-OF-STRING-SPACE THEN RETURN;
/* above test indicates this string not in string space */
IF STRING-DATA-ADDRESS < HIGH-STRING-LOCATION THEN RETURN;
/* this means that this is not the highest string data */
HIGH-STRING-LOCATION = STRING-DATA-ADDRESS;
HIGH-STRING-DESCRIPTOR-ADDRESS = CURRENT-STRING-DESCRIPTOR-ADDRESS;
RETURN;
END; /* EVALUATE-STRING-LOCATION */
PACK-SELECTED-STRING: PROCEDURE;
/* references here relative to high-string-descriptor-address */
MOVE STRING DATA TO (NEXT-AVAILABLE-STRING-LOCATION - STRING-LENGTH + 1);
STRING-DATA-ADDRESS = (NEXT-AVAILABLE-STRING-LOCATION - STRING-LENGTH + 1);
NEXT-AVAILABLE-STRING-LOCATION =
NEXT-AVAILABLE-STRING-LOCATION - STRING-LENGTH;
RETURN;
END; /* PACK-SELECTED-STRING */
END; /* GARBAGE-COLLECTOR */
```

Program Listing 1

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“Garbage collection occurs in inverse proportion to the amount of unused string space.”

$$CT = (((149 * SV \text{ (use 129 for Mod II)} \\ + 271 * AC \text{ (use 251 for Mod II)} \\ + 92 * AE \\ + 53 * NS \\ + 219 * NN \text{ (use 199 for Mod II)} \\ + 21 * SS \\ + 258 * PS) + (83 * BC)) / CS$$

Where: CT is collection time in seconds;
SV is the number of simple (non-array) variables; including string variables;
AC is the number of arrays;
AE is the number of string array elements;
NS is the number of null (zero length) string elements,
NN is the number of non-null string elements, including those located outside the string pool;
SS is the number of simple (non-array) string elements;
PS is the number of non-null string elements located in the string pool;
BC is the total number of bytes used for string data; and
CS is the Z-80 clock speed, in cycles per second:
Unmodified TRS-80 clock speeds are:
Model I-1774083,
Model II-4000000,
Model III-2027520.

Figure 1

The Garbage Collector

Alarms go off all over the place! The interpreter calls the Garbage Collector. The garbage collector arrives and finds a hole in the middle of the pool. He pushes the value of C\$ upward into the hole, leaving a new free area at the bottom of the pool. The garbage collector departs, leaving his bill behind. In this case his invoice is not for money, but for time.

In this example, the garbage collector acts quickly. When many strings are active his job can become rather formidable. He always comes through, but sometimes his bill is very large.

I have transcribed his operations guide into a PL/I-like pseudocode, in Listing 1. The amount of work he has to do grows exponentially with the number of strings. The main loop, Do until High-String-Location = 0, is executed once for each string in the pool. The hottest subroutine, Evaluate-String-Location, is executed (for each iteration of the main loop) once for every string.

The formula in Fig. 1 calculates the time it takes the garbage collector to do his work:

Many factors are usually not significant in determining the final result. A good approximation can usually be found from: $CT = 310 * PS^2 / CS$ (300 for Model II).

The second formula was derived from experimentation, rather than calculations and is often more accurate than the first.

The time required to garbage collect is roughly proportional to the square of the number of strings. If you double the number of strings, you multiply the garbage collection time by four.

For a Model III program with 500 active strings, using the second formula, we get: $310 * 500^2 / 2027520$ or 38.224 seconds. Dur-

ing this time, the machine will seemingly lock up, not responding even to the Break key. Your machine is not malfunctioning.

To take the matter to its ridiculous extreme, the program shown below will produce a garbage collection time (Model III) of 3 hours, 26 minutes, 24 seconds, again using the second formula.

```
10 CLEAR 9100
20 DIM A$(9000)
30 FOR I% = 1 TO 9000
40 A$(I%) = CHR$(32)
50 NEXT
60 PRINT TIMES
70 PRINT FRE(A$)
80 PRINT TIMES
```

Garbage Reduction Methods

Reducing garbage collection time can be divided into two main groups: Reducing the frequency of garbage collection and reducing the time required for garbage collection. Reducing frequency is simpler.

Without changing the code in the program, increase the value in Clear to cause less frequent garbage collection. Garbage collection occurs in inverse proportion to the amount of unused string space. In a program using 1000 bytes of string space with 1100 bytes as a string pool, garbage collection occurs at some general rate N. If you were to clear 6000 bytes, the unused string space is 50 times as large and garbage collection occurs at the rate N/50. Your best choice is to clear the largest possible value.

You determine this by trial and error. Keep increasing the cleared value until you get OM errors, then reduce it until OM errors go away. To be safe reduce it by a few hundred bytes more than seems necessary.

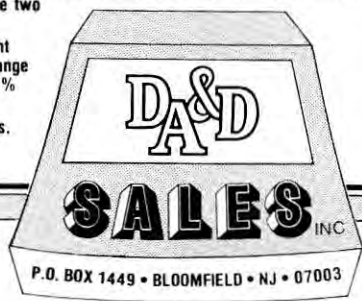
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**"Multiple concatenation is
another string space villain."**

Programs tend to require changes. To keep from re-doing the trial and error use a reverse logic clear. The space required for variables and stack changes slowly when modifications are made to the program. Use the following technique: Determine, through the trial and error process, the largest practical amount to clear. Call this value X. Enter: CLEAR 0: PRINT MEM. Call this value Y. The expression Y-X represents the space needed for variables and stack. Call this value Z. Replace the Clear statement in the program with CLEAR 0: CLEAR MEM - Z, plugging in the number derived above.

Each time a string variable appears on the left side of an assignment statement (statement containing an equal sign), the old value of the string variable is abandoned unless the string variable is used with LSET, RSET or MID\$. The easiest way to benefit from this is to prevent the abandonment of a string when its value, not its length, changes. If A\$ and B\$ both have a length of 15, A\$ = B\$ causes the previous space occupied by A\$ to be abandoned, contributing to the fragmentation which calls the garbage collector. The execution of MID\$(A\$,1,15) = B\$, will not contribute to fragmentation.

Multiple concatenation is another string space villain. If A\$, B\$, C\$, D\$ and E\$ all have a length of 5 and we want to construct Z\$ with the five other strings strung together, the execution of Z\$ = A\$ + B\$ + C\$ + D\$ + E\$ will play havoc with the

string space. Basic will execute the statement as if you had entered:

```
T1$ = A$ + B$
T2$ = T1$ + C$
T3$ = T2$ + D$
Z$ = T3$ + E$
```

A much less damaging set of code would be:

```
Z$ = STRING$(25,0)
MID$(Z$,1,5) = A$
MID$(Z$,6,5) = B$
MID$(Z$,11,5) = C$
MID$(Z$,16,5) = D$
MID$(Z$,21,5) = E$
```

The first statement in this sequence could be omitted if Z\$ already had a length of 25.

A typical set of code found in an INKEY\$ routine might look like:

```
100 W$ = ""
110 I$ = INKEY$: IF I$ = "" THEN 110
120 IF ASC(I$) = 13 THEN RETURN
130 W$ = W$ + I$
140 IF LEN(W$) = N THEN RETURN ELSE 110
```

A less damaging code would be:

```
100 W$ = STRING$(N," ")
110 I$ = INKEY$: IF I$ = " " THEN 110
120 IF ASC(I$) = 13 THEN 150
130 K = K + 1: MID$(W$,K,1) = I$
140 IF K = N THEN RETURN
150 FOR J = N TO 1 STEP -1
160 IF MID$(W$,J,1) < " " THEN P = J: J = 1
170 NEXT
180 W$ = LEFT$(W$,P) + RETURN.
```

```
100 CLEAR 12000
110 OPEN "R",1,"DATAFILE"
120 FIELD 1, 10 AS FK$, 90 AS DT$
130 DIM RR$(LOF(1)), KT$(LOF(1))
140 FOR I% = 1 TO LOF(1)
150 GET I,I%
160 KT$(I%) = FK$
170 RR$(I%) = I%
190 NEXT
200 'INVOKE A MACHINE LANGUAGE SORT HERE. SORT KT$ and RR$
210 'USING KT$ AS KEY, RR$ TAGGING ALONG.
220 LINE INPUT "NAME";SA$: IF LEN(SA$) <> 10 THEN 220
230 GOSUB 10000
240 IF ER% THEN PRINT "NOT FOUND" ELSE PRINT DT$
250 GOTO 220
10000 'BINARY SEARCH OF STRING ARRAY,
RECORD RETRIEVED IF FOUND,
ER% SET IF NOT.
10010 ER% = 0
: ZB% = 1
: ZD% = LOF(1) + 1
: ZC% = (ZB% + ZD%) / 2
10020 IF SA$ = KT$(ZC%) THEN GET I,RR$(ZC%)
: RETURN
10030 IF KT$(ZC%) > SA$ THEN ZD% = ZC%
: ZC% = (ZC% + ZB%) / 2
: IF ZC% = ZD% THEN ER% = -1
: RETURN
ELSE 10020
10040 ZB% = ZC%
: ZC% = (ZC% + ZD%) / 2
: IF ZC% = ZB% THEN ER% = -1
: RETURN
ELSE 10020
```

Program Listing 2

TERMINAL-WAR IS HERE

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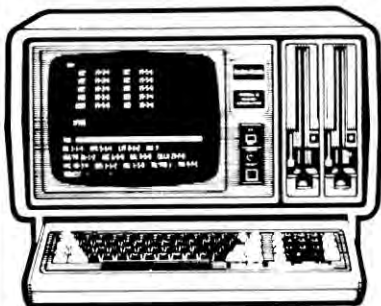
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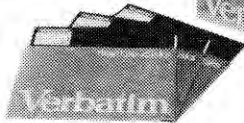
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"A reduction of only 30 percent in the number of strings cuts the collection time in half."

In the first set of code, a string will be abandoned once per character input. In the second example, strings will be abandoned only twice.

On the Model II, Swap exchanges two values without leaving a trail of garbage behind. On the Model I or III, the following combination of VARPTR, PEEK and POKE can be used:

```
FOR I% = 0 TO 2
  T% = PEEK(VARPTR(A$) + I%)
  POKE (VARPTR(A$) + I%), PEEK(VARPTR(B$) + I%)
  POKE (VARPTR(B$) + I%), T%
NEXT
```

Keep in mind the collection time is roughly proportional to the square of the number of strings. While this means doubling the number of strings multiplies the time by four, it also provides a fertile ground for time saving. A reduction of only 30 percent in the number of strings cuts the collection time in half. This is the area to attack. Reducing the number of strings is the only effective way to reduce the collection time.

A list of names and addresses will provide a good example of string reduction. With a table of 100 you might be tempted to DIM, for example, separate arrays for last name, first name, address, city, state and zip code. That technique would create 600 strings. Merging each data item into a single string using a home-grown delimiter

cuts the 600 to 100. Any time you see more than one string array with the same dimension, it is probably a prime opportunity to cut strings.

In building an index to a large data file, suppose the data file has 1000 records, each uniquely identified by a 10 character string. To gain speedy access to each record by its identifier string, you might pass through the file once, building parallel arrays of the identifier (string) and the record number (integer). Sort the arrays on the identifier, with the record number tagging along. When the user requests a record by identifier, binary search the string array, using the record number corresponding to the located string as the key for direct retrieval of the complete data record desired. Program Listing 2 is a sketch of this approach.

This routine performs quickly. Unfortunately, garbage collection is in the 150 second range on a Model III.

Modifying the technique eliminates garbage collection, with some additional overhead in disk accesses. After sorting the arrays, get rid of the string array. On the Model II, use erase. On the Model I or III, pass through the string array setting all the strings to nulls. Use the array of record numbers as a key to do the same binary search on disk. Binary searching 1000 records never takes more than 10 probes. The individual searches are slower, but more consistent (see Program Listing 3). ■

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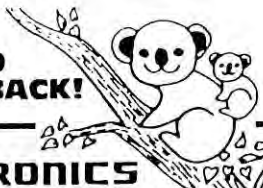
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```
100 CLEAR 12000
110 OPEN "R",1,"DATAFILE"
120 FIELD 1, 10 AS FK$, 90 AS DT$
130 DIM RR%(LOF(1)), KT$(LOF(1))
140 FOR I% = 1 TO LOF(1)
150 GET 1,I%
160 KT$(I%) = FK$
170 RR%(I%) = I%
190 NEXT
200 'INVOKE A MACHINE LANGUAGE SORT HERE. SORT KT$ and RR%
210 'USING KT$ AS KEY, RR% TAGGING ALONG.
211 FOR I% = 1 TO LOF(1)
212 KT$(I%) = ""
213 NEXT
220 LINE INPUT "NAME";SA$: IF LEN(SA$) <> 10 THEN 220
230 GOSUB 10000
240 IF ER% THEN PRINT "NOT FOUND" ELSE PRINT DT$
250 GOTO 220
10000 'BINARY SEARCH OF DATAFILE,
      RECORD RETRIEVED IF FOUND,
      ER% SET IF NOT.
10010 ER% = 0
      : ZB% = 1
      : ZD% = LOF(1) + 1
      : ZC% = (ZB% + ZD%) / 2
10015 GET 1,RR%(ZC%)
10020 IF SA$ = FK$ THEN RETURN
10030 IF FK$ > SA$ THEN ZD% = ZC%
      : ZC% = (ZC% + ZB%) / 2
      : IF ZC% = ZD% THEN ER% = -1
      : RETURN
      ELSE 10015
10040 ZB% = ZC%
      : ZC% = (ZC% + ZD%) / 2
      : IF ZC% = ZB% THEN ER% = -1
      : RETURN
      ELSE 10015
```

Program Listing 3

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From the January 1981 issue of the CSRA Computer Club newsletter:

There was some amusement at the November meeting when the Radio Shack representatives stated that the software in the ROM cartridges could not be copied. This month's 68 Micro Journal reported they had disassembled the programs on ROM by covering some of the connector pins with tape. They promise details next month. Never tell a hobbyist something can't be done! This magazine seems to be the only source so far of technical information on the TRS-80 color computer™. Devoted to SS-50 6800 and 6809 machines up to now, 68 Micro Journal plans to include the TRS-80 6809 unit in future issues.

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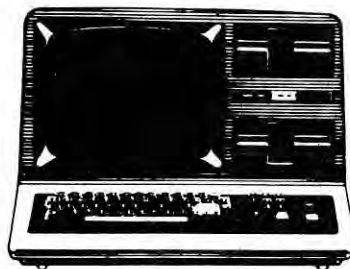
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Lunar Lander

by Nat R. Koch

Games are rarely written for the Model II, but here's one that lets you make a lunar landing.

Few games are written for the Model II, so here is one you might like to try. Lunar Lander is not an arcade-style game, but it is realtime. It is written in Model II Basic and runs relatively fast.

The object of the game is to land your spaceship on one of the designated landing areas (thin horizontal lines) without touching the rest of the surface or running out of fuel. To control the ship (^), thrust the main engine by hitting the space bar. You can also fire lateral rockets by using the < and > keys.

You have several options for preventing a crash: abort, hyperspace, and freeze. Abort, A, provides the combined effects of several simultaneous thrusts. Hyperspace, H, moves the ship to a random position on the top six lines of the screen. Freeze, F, freezes the ship's lateral and vertical motion. You

are allowed 1-3 hyperspaces per round, and you might not be allowed to freeze.

All three options use up more fuel than thrusting or firing the lateral rockets. If you run out of fuel, your ship plummets to the surface and the

game ends. If you go over the top of the screen, you are automatically put in hyperspace.

When the program is run, you will be asked three questions: Game # asks you which of seven playing boards you want

Program Listing

```

11 '
12 ' *****
13 ' * LUNAR LANDER *
14 ' * FOR THE MODEL II *
15 ' * BY NAT KOCH *
16 ' *****
17 '
19 CLEAR 3000
20 CLS:RANDOM
70 DIM SCREEN(2160),CC(520)
100 '
101 ' WORKING PROGRAM
102 '
110 '
120 INPUT" Game number (1-7) ";GN
130 IF GN<1 OR GN>7 THEN GOTO 120
135 D=40
140 INPUT" Speed (1-80) ";D
150 IF D<1 OR D>80 THEN GOTO 140
155 D=ABS(D-81)
160 INPUT" Gravity (1-5) ";G
170 IF G<1 OR G>5 THEN GOTO 160
180 '
181 ' CLEAR OLD BOARD
182 '
190 FOR C1=0 TO 520:SCREEN(CC(C1))=0:NEXT C1
210 F=1000:VEL=0:SW=0:GRAV=1:H=RND(3):FR=RND(2)-1:P=80:FLAG=0:C2=0
220 '
221 ' READ DATA
222 '
225 CLS:RESTORE
230 READ AA,AB,AC
240 IF AA<>GN THEN GOTO 230
250 READ S,E,I
260 IF S=GN+1 THEN GOTO 300
270 IF I=9999 THEN GOSUB 1200 ELSE GOSUB 1100
280 GOTO 250
300 '
301 ' MAIN PROGRAM
302 '
310 IN$=INKEY$:IF IN$="" THEN GOTO 400
320 IF IN$="," THEN SW=SW-1:F=F-RND(5)*10
330 IF IN$="." THEN SW=SW+1:F=F-RND(5)*10
340 IF IN$=" " THEN VEL=VEL-1:F=F-RND(10)*10
350 IF IN$="A" THEN GOSUB 700
360 IF IN$="H" THEN GOSUB 750
370 IF IN$="F" THEN GOSUB 800
400 PRINT@P," ";

```

Listing continues

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to use. Speed is the time between ship movements—at 80 it is very slow, but at 1 the game is impossibly fast. Beginners should start at about 50. Gravity asks you what level of gravity you want. At gravity level 1 the ship floats, while at 5 it drops like a rock. A beginner should use gravity level 2.

All the boards are drawn with lines. Each data statement contains a list of start and end-line coordinates and increments. If the increment is 9999, that line is interpreted as a landing area (a thin line on the screen). Even though board #8 has no instructions, it is necessary, because the board-scanning variable starts at one board and ends at the next.

If you design your own playing board with several vertical surfaces, you might get a BS error from the Basic interpreter. To correct this you need to dimension the CC array larger and clear more memory. However, the program is fine for most boards. ■

Nat Koch, 13, is an eighth grade student at Queen Anne School in Prince George's County, Maryland. He lives at 3304 Carlton Ave., Temple Hills, MD 20748.

Listing continued

```

410 PRINT CHR$(02);
420 '
421 ' MOVE SHIP USING VEL,SW,UD,AND GRAV
422 '
430 IF SW>3 THEN SW=3 ELSE IF SW<=-3 THEN SW=-3
440 IF VEL>3 THEN VEL=3 ELSE IF VEL<=-3 THEN VEL=-3
450 '
460 GRAV=GRAV+G:IF GRAV>8 THEN VEL=VEL+1:GRAV=1
470 '
480 UD=VEL*80
490 P=P+(UD+SW)
500 IF P<0 THEN GOSUB 1000
510 IF P>1919 THEN GOTO 950
520 IF SCREEN(P)=1 THEN GOTO 900
530 IF SCREEN(P)=2 THEN GOTO 850
540 PRINT@P," "
545 IF FLAG=1 THEN GOTO 640
550 PRINT@0,"F:";P;" H:";H;" FRZ:";FR
560 '
561 ' DELAY HERE
562 '
570 FOR DELAY=1 TO D*10:NEXT DELAY
580 IF F>0 THEN GOTO 310
590 '
591 ' SHIP OUT OF FUEL SEQUENCE
592 '
600 PRINT@30,"OUT OF FUEL":FOR Z=1 TO 1000:NEXT Z
605 F=0
610 PRINT@30,SPACE$(59)
615 PRINT@0,"F:0 H:";H;" FRZ:";FR;" "
620 FOR FALL=1 TO 24
630 FLAG=1:GOTO 500
640 PRINT@P," ";P=P+80:PRINT@P," ";
650 NEXT FALL:END
700 '
701 ' -----
702 '
703 ' SUBROUTINES FOR WHAT HAPPENS TO SHIP
704 '
710 ' --- ABORT ---
720 PRINT@30,CHR$(26)"ABORT"CHR$(25):FOR Z=1 TO 500:NEXT Z
730 PRINT@30,SPACE$(59)
740 VEL=VEL-(2+RND(3)):F=P-RND(15)*10:RETURN
750 ' --- HYPERSPACE ---
760 PRINT@P," ";
780 H=H-1:IF H<0 THEN H=0:PRINT@30,"HYPERSPACE NOT FUNCTIONAL":FOR Z=1 TO 1000:NEXT Z
790 EXT Z:PRINT@30,SPACE$(59):RETURN
790 PRINT@30,CHR$(26)"HYPERSPACE"CHR$(25):FOR Z=1 TO 500:NEXT Z:PRINT@30,SPACE$(59)
800 ' --- FREEZE ---
810 FR=FR-1:IF FR<0 THEN FR=0:PRINT@30,"FREEZE NOT FUNCTIONAL":FOR Z=1 TO 1000:NEXT Z
820 Z:PRINT@30,SPACE$(59):RETURN
820 PRINT@30,CHR$(26)"FREEZE"CHR$(25):FOR Z=1 TO 500:NEXT Z:PRINT@30,SPACE$(59)
830 F=P-RND(10)*10
830 VEL=0:SW=0:RETURN
850 ' --- LAND OR CRASH ON PAD ---
853 IF FLAG=1 THEN GOTO 860
855 IF VEL<3 THEN GOTO 875
860 PRINT@30,"YOU CRASHED ON THE PAD";:PRINT@P,"X":FOR Z=1 TO 1000:NEXT Z:Z=RND(3)
870 IF Z=3 THEN PRINT@30,"There were no survivors";
873 GOTO 2000
875 PRINT@P,"A";
880 PRINT@30,"YOU LANDED SAFELY : Rating =";F+H*100+FR*200:GOTO 2000
900 ' --- CRASH ---
905 PRINT@P,"*";
910 C1$="*"+CHR$(255)+CHR$(252)+CHR$(252)+"*":C2$="*"+CHR$(255)+CHR$(255)+CHR$(252)+CHR$(252)+CHR$(252)+"*":C3$="*"+CHR$(255)+CHR$(252)+"*":C4$="*"+CHR$(255)+CHR$(255)+CHR$(252)+CHR$(252)+CHR$(252)+"*":

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Listing continues

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Listing continued

```

920 PRINT@30,"CRASH":FOR Z=1 TO 300:NEXT Z
940 PRINT@P-80,C1$;:FOR Z=1 TO 300:NEXT Z:PRINT@P-80,C3$;:PRINT@P-160,C2$;:FOR Z
  =1 TO 300:NEXT Z:PRINT@P-160,C4$;
943 PRINT@40,"There were no survivors"
945 GOTO 2000
950 ' --- OVERSHOOT BASE ---
960 PRINT@30,"YOU OVERSHOT THE BASE":GOTO 2000
1000 ' --- OUT OF ORBIT ---
1010 PRINT@30,"SHIP OUT OF ORBIT":FOR Z=1 TO 1000:NEXT:PRINT@30,SPACE$(59):P=
  RND(480)-1:F=P-RND(10)*10:VEL=0:SW=0:RETURN
1100 '
1101 ' SUBROUTINE TO DRAW IN TERRAIN
1102 '
1110 FOR LN=S TO E STEP I
1115 PRINT@LN,CHR$(153);
1125 SCREEN(LN)=1:CC(C2)=LN:C2=C2+1
1130 IF I=80 THEN SCREEN(LN+1)=1:CC(C2)=LN+1:C2=C2+1:SCREEN(LN+2)=1:CC(C2)=LN
  +2:C2=C2+1:GOTO 1170
1140 IF I=80 THEN SCREEN(LN-1)=1:CC(C2)=LN-1:C2=C2+1:SCREEN(LN-2)=1:CC(C2)=LN-
  2:C2=C2+1:GOTO 1170
1150 SCREEN(LN+80)=1:CC(C2)=LN+80:C2=C2+1:SCREEN(LN+160)=1:CC(C2)=LN+160:C2=C2+
  1:SCREEN(LN+240)=1:CC(C2)=LN+240:C2=C2+1
1170 NEXT LN:RETURN
1200 '
1201 ' SUBROUTINE TO DRAW IN BASE
1202 '
1210 FOR LN=S TO E STEP I
1220 PRINT@LN,"_"
1230 SCREEN(LN)=2:CC(C2)=LN:C2=C2+1:SCREEN(LN+80)=1:CC(C2)=LN+80:C2=C2+1:SCREEN
  (LN+160)=1:CC(C2)=LN+160:C2=C2+1
1240 NEXT LN:RETURN
2000 '
2001 ' END GAME
2002 '
2005 FOR Z=1 TO 1000:NEXT Z
2010 PRINT@0,"F:";F;" H:";H;" FRZ:";FR;SPACE$(59)
2045 GOTO 110
9000 '
9002 ' *** BOARD #1 ***
9004 '
9006 DATA 1,0,0
9008 DATA 640,644,1, 565,567,1, 488,490,1, 571,895,81
9010 DATA 976,977,9999, 1058,1301,81, 1302,1306,1, 1387,1468,81
9012 DATA 1469,1471,1, 1552,1795,81, 1796,1797,1, 1718,1639,-79
9014 DATA 1560,1562,9999, 1643,1645,1, 1566,934,-79, 854,614,-80
9016 DATA 535,543,1, 464,467,1, 548,548,0, 629,630,9999
9018 DATA 711,712,1, 793,1036,81, 1117,1118,9999, 1199,1199,0
9020 '
9022 ' *** BOARD #2 ***
9024 '
9026 DATA 2,0,0
9028 DATA 320,324,1, 405,1045,80, 1126,1526,80, 1607,1688,81
9030 DATA 1769,1771,9999, 1692,1218,-79, 1138,658,-80, 579,273,-79
9032 DATA 264,268,1, 349,905,81, 916,918,9999, 999,1566,81
9034 DATA 1567,1569,1, 1490,1490,0, 1411,1412,9999, 1493,1493,0
9036 DATA 1574,1577,1, 1498,1178,-80, 1099,388,-79, 469,469,0
9038 DATA 550,551,9999, 632,793,81, 794,797,1, 718,478,-80
9040 DATA 399,399,0
9042 '
9044 ' *** BOARD #3 ***
9046 '
9048 DATA 3,0,0
9050 DATA 400,405,1, 326,247,-79, 248,250,1, 331,1141,81
9052 DATA 1221,1541,80, 1622,1703,81, 1784,1786,9999, 1707,1712,1
9054 DATA 1633,1554,-79, 1555,1557,1, 1478,1241,-79, 1322,1565,81
9056 DATA 1646,1647,9999, 1728,1809,81, 1810,1814,1, 1735,1735,0
9058 DATA 1656,1658,9999, 1579,1579,0, 1500,940,-80, 861,387,-79
9060 DATA 388,391,1, 472,473,9999, 554,557,1, 478,479,1
9062 '
9064 ' *** BOARD #4 ***
9066 '
9068 DATA 4,0,0
9070 DATA 240,247,1, 328,1688,80, 1769,1771,9999, 1692,812,-80
9072 DATA 733,496,-79, 416,256,-80, 177,185,1, 266,752,81
9074 DATA 832,1712,80, 1793,1794,9999, 1715,1235,-80, 1156,436,-80
9076 DATA 357,199,-79, 200,204,1, 285,605,80, 686,1739,81
9078 DATA 1740,1741,9999, 1742,1747,1, 1668,1115,-79, 1035,395,-80
9080 DATA 316,319,1
9082 '
9084 ' *** BOARD #5 ***
9086 '
9088 DATA 5,0,0
9090 DATA 1440,1124,-79, 1045,1047,9999, 968,257,-79, 258,265,1
9092 DATA 186,193,1, 274,436,81, 517,518,9999, 599,923,81
9094 DATA 1003,1403,80, 1484,1486,1, 1567,1570,9999, 1491,291,-80
9096 DATA 292,293,9999, 294,1494,80, 615,616,9999, 1575,1578,1
9098 DATA 1499,393,-79, 314,315,9999, 316,317,1, 398,1438,80
9100 DATA 1519,1519,0
9102 '
9104 ' *** BOARD #6 ***
9106 '
9108 DATA 6,0,0
9110 DATA 1840,260,-79, 181,183,9999, 264,1560,81, 1481,296,-79
9112 DATA 217,219,9999, 300,1919,81
9114 '
9116 ' *** BOARD #7 ***
9118 DATA 7,0,0
9120 DATA 1520,1530,1, 1451,1135,-79, 1056,1057,9999, 1138,1786,81
9122 DATA 1787,1798,1, 1799,1799,9999, 1800,1809,1, 1730,1330,-80
9124 DATA 1251,1093,-79, 1014,1015,9999, 936,778,-79, 698,378,-80
9126 DATA 299,301,1, 382,463,81, 544,546,9999, 467,230,-79
9128 DATA 231,235,1, 316,1756,80, 1837,1839,1
9132 '
9134 ' *** BOARD #8 ***
9136 '
9138 DATA 8,0,0

```

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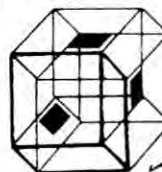
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Dogfight

by Ralph White

Here's an arcade game for your Color Computer—envision yourself as a flying ace sitting in a cockpit while shooting the enemy's biplanes.

Flying Ace is an arcade-type game for the TRS-80 Color Computer with Extended Basic, 16K of memory, and the right joystick. Using graphics mode 3

consumes a great deal of memory, so only about 2,500 bytes remain unused for expansion of the program.

The screen shows the view from your

plane's cockpit. Biplanes appear, and by using the right joystick, you maneuver your plane to get the enemy's biplane in your sights. Then, press the button on the joystick to fire the machine guns.

The object is to shoot as many planes as possible in about six minutes of flying time; approximately 30 seconds are allotted for each plane. The score formula in line 520 is based on the number of shots taken, hits, planes escaped, and total elapsed time. Speed and accuracy improve your score; misses and letting planes escape hurt it.

The program operates in a cycle that draws the plane, computes a new position, and reads the joystick. You can exit the cycle in only two ways: by successfully shooting a plane or by allowing a plane to escape.

Moving the joystick to the extreme right, left, top, or bottom will bring the enemy plane into your sights quickly; slightly moving the joystick makes the target plane move more slowly.

The value of the firing button is checked twice in each cycle (lines 300 and 340), to ensure that the button responds when pushed. If the button is pushed, memory location 65280 will contain either 126 or 254. If the button is not pushed, memory location 65280 will contain a 255.

The Sound function provides a tone burst with each shot. Line 380 contains

A(34,20)	Airplane graphics array
A	Horizontal position of the joystick
B	Vertical position of the joystick
G	Number of planes that escaped
H	Number of planes shot down
R	Number of planes presented
S	Shots taken
T	Elapsed time on current plane
TT	Total elapsed flight time
X	Horizontal distance from plane's center to center of sights
Y	Vertical distance from plane's center to center of sights

Table 1. List of Variables

Lines	Function
70-150	Draws airplane
250-280	Assures plane will be within screen boundaries
290	Draws the plane on the screen
300	Checks firing button
310	Generates random movement of the plane
340	Checks firing button
350-380	Firing routine
380	Boundary values to determine a hit or miss
400-430	Display for a hit
440-640	Scoreboard
650-790	Instructions

Table 2. Program Outline

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the boundary values for determining if a shot hits or misses a plane; when a plane is hit, a series of tone bursts is generated. The difficulty of the program can be altered by changing the boundaries of a successful shot.

The position of the joystick is not read on every pass through the cycle. The value of MV alternates from -1 to 1. If MV = 1, the cycle is short circuited. The enemy plane is allowed to move more quickly.

Lines 70-150 draw the biplane and store the plane in a graphics array. The Put command is then used to rapidly draw the plane on the screen. The border of the array around the plane is a series of blanks. When a new plane is Put on the screen, it is printed directly over the old image without erasing it. Since the new image is in a slightly different position, the border of blanks assures the old image is entirely covered.

The high resolution graphics modes do not support text, so after each downed or escaped plane, the computer returns to the text mode to display all necessary information. ■

Ralph White can be reached at 529 S. Vermont, Columbus, KS 66725.

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```

10 GOTO650
20 PCLEAR4
30 PMODE3,1
40 DIMA(34,20)
50 PCLS
60 SCREEN1,1
70 FORI=4TO28:PSET(I,8,3):PSET(I,7,3):PSET(I,14,3):PSET(I,13,3):
NEXTI
80 FORI=5TO12:PSET(17,I,3):NEXTI
90 FORI=14TO18:PSET(I,10,3):PSET(I,12,3):NEXTI
100 FORI=9TO12:PSET(9,I,3):PSET(25,I,3):NEXTI
110 FORI=13TO21:PSET(I,11,3):NEXTI
120 PSET(17,9,3)
130 PSET(13,16,3):PSET(15,15,3):PSET(20,16,3):PSET(19,15,3)
140 PRESET(4,8,1):PRESET(28,8,1):PRESET(15,8,1):PRESET(19,8,1)
150 PRESET(4,14,1):PRESET(28,14,1)
160 GET(0,0)-(34,20),A,G
170 PCLS
180 R=1:T=0:TT=0:S=0:MV=1
190 X=0:Y=0
200 X=RND(200)-100:Y=RND(180)-90
210 A=0:B=0
220 PSET(128,86,0):PSET(128,106,0):PSET(108,96,0):PSET(148,96,0)
:PSET(128,85,0):PSET(128,107,0):PSET(106,96,0):PSET(150,96,0)
230 X=X+INT((32-A)/12):Y=Y+INT((32-B)/12)
240 T=T+1:IFT>84GOTO440
250 IFY>75THENY=75
260 IFY<-75THENY=-75
270 IFX<-112THENX=-112
280 IFX>108THENX=108
290 PUT(113+X,86+Y)-(147+X,106+Y),A,PSET
300 IFPEEK(65280)=126ORPEEK(65280)=254GOTO350
310 X=X+RND(5)-3:Y=Y+RND(3)-2
320 MV=-MV:IFMV=1GOTO240
330 A=JOYSTK(0):B=JOYSTK(1)
340 IFPEEK(65280)<>126ANDPEEK(65280)<>254GOTO220
350 S=S+1:SOUND50,2
360 LINE(64,192)-(128,96),PSET:LINE(192,192)-(128,96),PSET
370 LINE(64,192)-(128,96),PRESET:LINE(192,192)-(128,96),PRESET
380 IFX>-10ANDX<10ANDY>-5ANDY<5GOTO400
390 GOTO220
400 FORI=15TO30STEP5:CIRCLE(128,96),I,4,.4:NEXTI
410 FORI=15TO30STEP5:SOUND(200-I*2),1:CIRCLE(128,96),I,1,.4:NEXT
I
420 H=H+1
430 FORTM=1TO500:NEXTM
440 PCLS
450 CLS
460 PRINTTAB(6)"AFTER ";R;"AIRPLANES":PRINT
470 PRINTTAB(5)"SHOTS      = ";S
480 PRINTTAB(5)"HITS      = ";H
490 IFT<=84GOTO510
500 PRINT"TOO MUCH TIME. HE GOT AWAY!":G=G+1
510 PRINTTAB(5)"GOT AWAY = ";G
520 TT=TT+T:PRINTTAB(5)"SCORE      = ";INT((250*R-TT)*SQR(TT/250*
R)*SQR(H/(S+1)))
530 IFT>1008GOTO640
540 PRINT:PRINTTAB(5)"TIME REMAINING"
550 PRINT"MINUTES";TAB(16);"SECONDS":M=INT((1008-TT)/168):SC=INT
((1008-TT)-M*168)/2.8)
560 PRINTTAB(2);M;TAB(18);SC:PRINT
570 PRINT:PRINT"PRESS THE FIRING BUTTON TO CONT."
580 M=PEEK(65280):IFM<>126ANDM<>254GOTO580
590 PMODE3,1
600 PCLS
610 SCREEN1,1
620 T=0:R=R+1
630 GOTOL90
640 PRINT"TIME HAS EXPIRED":END
650 CLS
660 PRINT:PRINT:PRINTTAB(10)"WORLD WAR I":PRINT:PRINT
670 PRINTTAB(11)"FLYING ACE"
680 FORTM=1TO1500:NEXTM
690 CLS
700 PRINTTAB(10)"instructions":PRINT
710 PRINT"THE OBJECT OF THE GAME IS TO"
720 PRINT"SHOOT AS MANY AIRPLANES AS YOU"
730 PRINT"CAN IN THE TIME THAT IS GIVEN."
740 PRINT"YOU WILL BE ALLOWED 30 SECONDS"
750 PRINT"PER AIRPLANE AND A TOTAL OF 6"
760 PRINT"MINUTES OF FLYING TIME. YOUR"
770 PRINT"SCORE WILL BE BASED ON NO. OF":PRINT"PLANES SHOT DOWN
AND ACCURACY."
780 PRINT:INPUT"  PRESS <ENTER> TO CONT";Z$
790 GOTO20

```

Program Listing

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Partially Disabled Break

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dangerously near the backspace and dash keys, a careless finger could accidentally terminate a program during input. Even though you can continue the program with the CONT command, you cannot recover a carefully formatted video display destroyed by the break.

For this reason, many polished and well-designed programs can benefit from having the Break key disabled. This is possible because whenever that key is pressed, the ROM interpreter momentarily sends program control to an address in random-access memory. That address, for Model I Level II Basic, is 16396.

If you instruct the computer to PRINT PEEK (16396) when the computer has been initialized

normally, you will find the value 201, which in machine language is an instruction to return to ROM. This sends program control back to where it started. If you PEEK at the next two addresses, you will find zeroes.

The statement POKE 16396,7 disables the Break key. When the Break key is hit after that, the instruction is no longer a return, but one which changes the information in the CPU's accumulator register. Program execution then passes through the zeroes in the next two bytes (do-nothing values), and then finds another return instruction at 16399. The result is that the computer "forgets" the Break key has been pressed, and so hitting the key does not interrupt your program. The statement POKE 16396,201 puts things back to normal.

POKEing a 7 (or several other serviceable values which affect the accumulator) is the best known way of disabling the Break key. This technique does not allow you to break out of a program even if you want to. You can press the reset button, but you cannot continue unless you know where to reenter the program. This technique also gives you a dead key on a keyboard which is already somewhat deficient in control keys. A better way to disable Break is to bring it under program control

like the rest of the keyboard.

Set up a program which will use a controlled Break key with the following series of POKES:

```
POKE 16396,195:POKE 16397,45:
POKE 16398,1
```

This reroutes program execution in ROM to a routine which sets up an L3 or Disk Basic Only error code. This works even if you are running Level II Basic under a disk system because the ROM routine assumes that the error has been correctly evaluated. Now if you press Break, you will get an L3 ERROR? message on the screen.

To use this modification creatively, you must write an appropriate error-trapping routine into the Basic program. Do this after the program is well along in development and thoroughly debugged; otherwise a real L3 error could foul things up. Set the On Error GOTO statement early in the program to direct control to the error-trap routine. There, in addition to any other error-handling statements needed, evaluate the ERR code for an L3 error. If ERR = 44, it means that

The TRS-80's Break key is a swift executioner. Its primary purpose is to put an end to a running program and return the computer to the command mode. That is a powerful feature when you need it, but sometimes this executioner is too easy to invoke unintentionally. Since the Break key is located

```
10 POKE 16397,45:POKE 16398,1
20 ON ERROR GOTO 1000
30 REM * MENU OF 5 ITEMS IS HERE
40 PRINT "SELECTION #1"
50 PRINT "SELECTION #2"
.
.
.
80 INPUT "SELECT 1-5";S
90 POKE 16396,195
100 ON S GOTO 200,300,400,500,600
.
.
.
1000 IF ERR = 44 THEN RESUME 30
1010 POKE 16397,201:ON ERROR GOTO 0
```

Program Listing 1

The Key Box

Model I or III
16K RAM
Cassette or Disk Basic

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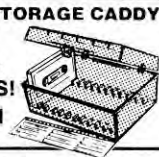
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the Break key has been pressed, and you can handle it as your program requires. The ERL function is available to tell you the program line under execution when the Break key was hit, so the break-handling routine can perform different operations for different parts of the program.

One useful application of this technique is to return you to the beginning of a program, or to a menu of options. You may have made an incorrect menu selection, or realize you have entered bad data, and want to restart your procedure. Coding these operator conveniences is cumbersome, and usually overlooked. By using this method, you can get out of an operation at any point, and redirect the program to a more desirable restart position.

The program skeleton in Listing 1 shows how this might be done. Line 10 sets up most of the disabling code, but leaves the first critical byte (16397) intact. Execution can still be broken normally through the menu selection. Line 20 defines

the error-trap routine. Lines 30-80 display the menu and solicit input. After that, the POKE in line 90 takes over the Break key, so that any subsequent break will be interpreted as an L3 error and cause a jump to the error-handling routine at line 1000.

If the test there indicates that the Break key has been pressed, the program resumes at the menu again. If all the error traps fall through, line 1010 restores the normal status of the Break key vector by POKEing the return instruction back into 16397. Then the On Error GOTO 0 turns off the error trap and ends the program.

The Break key can be toggled on and off as you wish in a program. For instance, if you replace line 30 by POKE 16397,201, it allows you to quit the program during menu selection. But at any other point in the program, after line 90, Break would first return control to the menu. ■

Technical note: All disk I/O will return an L3 or Disk Basic Only error message.



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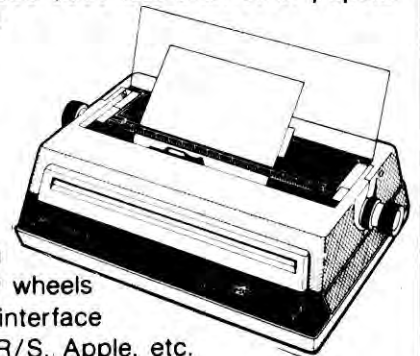
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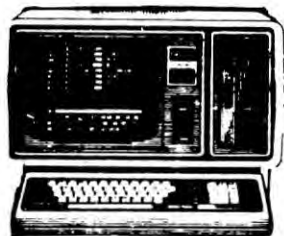
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I will never forget the day the May 1980 issue of *80 Micro* arrived. I had purchased a Line Printer II and was considering Michael Shroyer Software's Electric Pencil or Radio Shack's Scripsit. Instead I found Delmer D. Hinrichs' "Basic Word Processor" on page 50.

The Basic Word Processor was written for a 16K Model I TRS-80 with cassette file

text storage and a Comprint 912 printer using roll paper. I have a 32K Model I TRS-80, one disk drive, and the Line Printer II. I modified the program to take advantage of my system's expanded capabilities.

I added two commands to allow disk storage of text files and a command to allow form-letter printing. I expanded the Print command to allow continuous printing of linked text files, automatic paging for 9 1/2 by 11 fan-fold paper, and single-sheet printing for specialized 8 1/2 by 11 letterheads.

New Commands

When the Basic word processor displays Command?, enter the following additional, single-letter commands:

G	Get	Get a text file from disk.
W	Write	Write a text file to disk.
N	Notice	Continuously print text file as a form letter. Names and addresses are obtained from disk-based PIMs files.

Get, similar to Load, loads a previously written text file from disk. You are directed to enter the file name and extension. You have time to switch disks if your text file is on a different one. After the text file is loaded you return to the command mode.

Write, similar to Save, puts the present text file onto your disk. You will be directed to enter the file name and extension. You

have time to switch disks if you want to save the text file on a disk other than the one you have loaded. After the text file is written to disk you return to the command mode.

If you have converted SCELBI Publications' Personal Information Management System to use disk files (*80 Micro*, February 1980, page 80, "Floppy PIMS," by Morris Herman), Notice enables you to produce form letters. Enter the file name and extension of your label file. You have time to switch disks if your PIMS file is located on a different disk. As the computer reads each label record, the inside address and greeting are printed. A call to the Print routine prints the letter in the text buffer. The next label record is read and the process repeats until a form letter is produced for each label record on the PIMS file. After all letters are printed, you will return to the command mode.

Expanded Print Command

When a text file contains more than 125 lines of text response time slows to an intolerable rate. If you need more lines for your manuscript write the current text file to disk and start a new one keeping the format parameters constant. Repeat this procedure until your manuscript is finished.

The Key Box

Model I
Disk Basic
32K RAM
One disk drive
Line Printer II

70 A = ASC(A\$) - 64:IFA<0ONAGOTO90,480,510,760,790,1220,1990,1320,1350,1390,1510,1520,1580,80,80,1640,80,1750,1770,80,80,1830,2080,1970

1330 PRINT "A ADD", "B BLANK", "C COMPILE", "D DELETE", "E EDIT",
"F FORMAT", "G GET", "H HELP", "I INSERT", "J JUSTIFY", "K KILL",
"L LOAD", "M MOVE", "P PRINT", "R REPLACE", "S SAVE", "V VIDEO",
"W WRITE", "X EXIT"

Figure 1

MT\$	Multiple text file indicator (Y/N).
NA\$	Disk text file name and extension.
SS\$	Single-sheet forms feed indicator (Y/N).
AP	Number of lines already printed.
EF	End of PIMS file indicator.
EP	End of page.
G	Physical number of lines per page.
PR	PIMS record number.
TL	Current text line number for Print command.

Table 1. New Program Variables



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When you are ready to print the entire manuscript, Get the first text file and request the Print command.

The computer will display MULTIPLE TEXT FILES(Y/N)?; enter Y. After the file currently in memory finishes printing enter the

file name and extension of the next text file. You have time to switch disks if your next file is on a different one. When you are ready to continue, press Enter and the procedure will repeat. After the last text file, enter End in response to the file name prompt to return to the command mode.

Structure Definition	Example
1: NAME,A	Mr. John Q. Doe
2: ADD1,A	123 House Lane
3: ADD2,A	Somewhere, ST 99999
4: ADD3,A	
5: ADD4,A	
6: DEAR,A	John
7: SORT,A	Doe, JQ

Figure 2

In addition to linked text files, the Print command automatically skips to the beginning of the next page after printing the specified number of lines per page at an end-of-page character (ASCII 17). Line 1740 uses the LPRINT "" statement for automatic paging. Paging is dependent on your response to the page size parameter. The default value is 66, the number of lines on a page of 9 1/2 by 11 fan-fold paper.

Finally, the Print command permits print-

Program Listing 1

```

1|#####5 CMD"T" ' DISABLE TIMER FOR CASSETTE I/O
10 CLS:PRINTTAB(20)"BASIC WORD PROCESSOR"
20 '(C) BY D.D.HINRICHS 1979
30 DEFINT A-Z: CLEAR 10000: NL=200: DIMA$(NL), X$(3), S(20), T(20)
40 B$=CHR$(30): C$=CHR$(143): F$="### ": N$="Y": PN$="N": PL$="Y": SS$="N": G=66
50 SS$=" ": H$=S$: LA=-1: P=1: FP=1: PL=15: LL=60: LM=10: U=32: OUT254,1
60 L=LA: IT=0: R=0: A$="": PRINT: INPUT"COMMAND"; A$: IFA$="" GOTO 80
70 A=ASC(A$)-64: IFA>0 GOTO 90, 480, 510, 760, 790, 1220, 1990, 1320, 1350, 1390, 1510, 1520, 1580, 2190, 80, 1640, 80, 1750, 1770, 80, 80, 1830, 2080, 1970
80 PRINT"*** ENTRY ERROR ***": GOTO 60
90 CLS: D=0: N$="Y": IFLA<0 THEN L=0: GOTO 130 ' ADD
100 IFLA=LA+1 THEN 210 ELSE IFLA>FL+12 THEN B=L-12 ELSE B=FL
110 FOR I=BTOL: X=LEN(A$(I)): D=D+INT((X+4)/64-.01)
120 GOSUB 1910: NEXT I: L=L+1
130 C=(L-FL+D)*64: IFC>896 PRINT: PRINT: C=896
140 PRINT@C, USING F$; L;: PRINT A$(L);: P=LEN(A$(L))+1: C=C+P+3: K=L+1
150 PRINT@C, C$;: A$=INKEY$: PRINT@C, S$;: IFA$="" GOTO 150
160 GOSUB 290: ONA-7 GOTO 360, 410, 310
170 IFA=13 THEN A$=S$: GOTO 210 ELSE IFA=24 THEN 380 ELSE IFA=31 GOTO 460
180 IFA=25 THEN 430 ELSE IFA=26 THEN 330
190 IFA=96 IFLA<L THEN LA=L: GOTO 60 ELSE 60
200 PRINT@C, A$;: A$(L)=A$(L)+A$: IFF<=LL THEN P=P+1: C=C+1: GOTO 150
210 IFRGOTO 60 ELSE IFLN<K PRINT: PRINT"FILE FULL": LA=NL-1: GOTO 60
220 IFLN(A$(K)) THEN L=K: GOSUB 1360
230 IFC>L THEN LA=K
240 IFA$=S$ GOTO 280
250 FORM=LL+1 TO 2STEP-1: A$=MID$(A$(L), M, 1): IFA$<S$ NEXT M: GOTO 280
260 A$(K)=RIGHT$(A$(L), LL-M+1): A$(L)=LEFT$(A$(L), M-1)
270 PRINT@C-LL+M-1, B$;: L=K: GOTO 130
280 A$(L)=LEFT$(A$(L), LL): L=K: GOTO 130
290 A=ASC(A$): IFA>64 AND A<91 THEN A=A+U ELSE IFA>96 AND A<123 THEN A=A-U
300 A$=CHR$(A): RETURN
310 IFF>LL GOTO 210 ' D
320 PRINT@C, CHR$(92);: A$(L)=A$(L)+CHR$(17): A$=S$: GOTO 210
330 IFF>LL GOTO 210 ' S-D
340 C=(L-FL+D)*64+4: IFC>900 THEN C=900
350 GOSUB 1180: P=1: A$=S$: GOTO 210
360 IFF=1 GOTO 150 ' L
370 C=C-1: PRINT@C, B$;: P=P-1: A$(L)=LEFT$(A$(L), P-1): GOTO 150
380 IFF=1 GOTO 150 ' S-L
390 A$(L)="" : P=1: C=(L-FL+D)*64+4: IFC>900 THEN C=900
400 PRINT@C, B$;: GOTO 150
410 IFF>LL-6 GOTO 150 ' R
420 A$(L)=A$(L)+STRING$(5, S$): C=C+5: P=P+5: GOTO 150
430 IFF>LL GOTO 210 ' S-R
440 C=(L-FL+D)*64+4: IFC>900 THEN C=900
450 GOSUB 1200: P=1: A$=S$: GOTO 210
460 IFF>LL GOTO 210 ' CL
470 PRINT@C, CHR$(93);: A$(L)=A$(L)+CHR$(20): A$=S$: GOTO 210
480 CLS: PRINT"DELETING BLANK LINES": FOR J=LATO 0 STEP-1 ' BLANK
490 IFA$(J)="" FOR I=J TO LA: A$(I)=A$(I+1): NEXT I: A$(LA)="" : LA=LA-1
500 NEXT J: IFR THEN RETURN ELSE 1830
510 INPUT"FIRST LINE TO COMPILE"; F: IFF<0 THEN F=0 ' COMPILE
520 INPUT"LAST LINE TO COMPILE"; Z: IF Z>L THEN Z=L
530 IFF>Z THEN 80 ELSE CLS: PRINT"COMPILING": FOR L=F TO Z-1: K=L+1
540 X=LEN(A$(L)): X$="" : IFC<2 THEN 620 ELSE IFC<=LL GOTO 600
550 FOR I=X TO 1 STEP-1: A$=MID$(A$(L), I, 1)
560 IFA$<S$ THEN X$=A$+X$: NEXT I: GOTO 600 ELSE IFC$="" NEXT I

```

Listing 1 continues

DRIVE A HARD BARGAIN



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LDOS

MICRO REVIEW

Volume 1 No. 1



SPECIAL EDITION



December 1, 1982



You'll think you've made the DOS strike of the decade when you turn your micro on to LDOS. You'll find a bonanza of features like full keyboard type-ahead; a true background spooler; file backup by date, class, and between different drive types; hard disk support; data transportability between Model I and III; and a complete communications utility including disk file send and receive. Support for Radio Shack's Doubler and selected others is also provided.

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LDOS is available worldwide through thousands of dealers for just \$129.

The BASIC Answer

The BASIC Answer is a BASIC text processing utility. It is designed to allow the BASIC programmer to build code in a structured manner. "Source" code is written with a word processor or text editor which allows the user to exploit the powerful editing and movement features characteristic to those types of editors. Source code can even be created by your own BASIC interpreter. **The BASIC Answer** is then used to process these files into normal interpretive BASIC code.

Free Yourself from Line Numbers

The BASIC Answer allows substitution of labels for **line numbers!** This means that your BASIC code now can read like a novel. Instead of the typically un-descriptive "GOSUB 1000", a label such as "GOSUB @Search.Name" is used. Imagine yourself reading code filled with such descriptive branches and understanding it at a glance, even years later. This feature even allows totally relocatable BASIC routines without the renumbering problems.

TRS-80 is a trademark of Tandy Corporation. LDOS is available for the TRS-80 Model-I and Model-III. Prices and specifications subject to change without notice. LDOS and The BASIC ANSWER are products of Logical Systems, Inc.

```
ORLP!=2TOHA!PRINT@32,"primes found
FHA!/LP!=INT(HA!/LP!)THE NGOTO48"CH
EXTLP!:IFVAL(FAS)=LO!THENFAS="* Pr
R!(COX)=LO! on this scan"USING##,
RS(COX)=FAS LEN(FAS)-1)FORLO!=ST!T
OX=COX:PSX=PSX+1ELSEFAS=LEFTS(FAS,
ORLP!=@TOI@PRINT@0,"factoring "US
RINT@64*LP!+192,PR!(LOX),PRS(LOX):
OX=LOX-INPUT"ORIGIN OF SCAN":INS@
FLOX=-1IFVAL(INS):2THENING###,##
EXTLP! ST!=INT(VAL(INS))##:PSX:RS
OX=COX+INPUT" END OF SCAN":INS@
FCOX=11EN!=INT(VAL(INS))IMPR!(LO),
FHA!/LP!=INT(HA!/LP!)THE NGOTO48"CH
EXTLP!:IFVAL(FAS)=LO!THENFAS="* Pr
R!(COX)=LO! on this scan"USING##,
RS(COX)=FAS LEN(FAS)-1)FORLO!=ST!T
OX=COX:PSX=PSX+1ELSEFAS=LEFTS(FAS,
ORLP!=@TOI@PRINT@0,"factoring "US
RINT@64*LP!+192,PR!(LOX),PRS(LOX):
OX=LOX-INPUT"ORIGIN OF SCAN":INS@
FLOX=-1IFVAL(INS):2THENING###,##
EXTLP! ST!=INT(VAL(INS))##:PSX:RS
OX=COX+INPUT" END OF SCAN":INS@
ORLP!=2TOHA!PRINT@32,"primes found
FHA!/LP!=INT(HA!/LP!)THE NGOTO48"CH
```

A New Concept in Variable Usage

The BASIC Answer allows variable names to be as long as 14 characters and ALL 14 are significant. Imagine reading:

```
"IF ACCNT.OVERDUE #>
0 THEN GOSUB
@PRINT.DUN"
rather than
"IFAO#>0THEN
GOSUB52130"
```

Which would you rather read? It also introduces to BASIC the concept of Global and Local variables. This feature circumvents the tedious problem of variable tracking because a Local variable is only viable in its own subroutine!

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End the Multiple Machine Hassle

The BASIC Answer introduces the concept of "Conditional Translation." This feature allows the programmer to place different "machine dependent" code simultaneously into the same Source Code.

The BASIC Answer can be "switched" when processing to ignore the unwanted or include extra code! No more multiple master programs to confuse maintenance. All the masters could now be rolled into the same program. Modify the one master and you've modified them all. Process the same code with different switches set, and get two or more versions from the same source.

The BASIC Answer combines the self-documenting power of COBOL with the relative ease of BASIC together with the power of a word processor.

The BASIC Answer is available for just \$69.00.

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Mequon, WI 53092
(414) 241-3066

~251

```

570 A=ASC(RIGHT$(X$,1)):IFA=33ORA=46ORA=58ORA=63THENX$=X$+"
580 A$(L)=LEFT$(A$(L),I-1):IFLEN(A$(K))=0THENA$(K)=X$:GOTO540
590 A$(K)=X$+S$+A$(L):GOTO540
600 X=LEN(A$(L)):IFX<2THEN620ELSEFORI=XTO2STEP-1
610 IFRIGHT$(A$(L),1)=S$THENA$(L)=LEFT$(A$(L),I-1):NEXTI
620 NEXTL:FORL=FTOZ-1:K=L+1
630 X=LEN(A$(L)):Y=LEN(A$(K)):X$="" :IFX=0ORY=0GOTO750
640 A=ASC(RIGHT$(A$(L),1))
650 IFA=33ORA=46ORA=58ORA=63THENA$(L)=A$(L)+" " :X=X+2
660 FORI=1TOY:A$=MID$(A$(K),I,1)
670 IFA$<>S$THENX$=X$+A$:NEXTIELSEIFX$=""NEXTI
680 IPLL-X<IGOTO710
690 Y=Y-I:IFY<0THENY=0
700 A$(L)=A$(L)+S$+X$:A$(K)=RIGHT$(A$(K),Y):GOTO630
710 X=LEN(A$(L)):IFX<2THEN730ELSEFORI=XTO2STEP-1
720 IFRIGHT$(A$(L),1)=S$THENA$(L)=LEFT$(A$(L),I-1):NEXTI
730 IFY<2THEN750ELSEFORI=YTO2STEP-1
740 ILEFT$(A$(K),1)=S$THENA$(K)=RIGHT$(A$(K),I-1):NEXTI
750 NEXTL:X=LEN(A$(Z)):GOTO900
760 INPUT"FIRST LINE TO DELETE";F:IFF<0THENF=0 ' DELETE
770 INPUT"LAST LINE TO DELETE";Z:IFZ>LATHENZ=LA
780 IFF>ZTHEN800ELSEFORI=FTOZ:A$(I)="" :NEXTI:GOTO1830
790 INPUT"EDIT LINE";L:IFL<0ORL>LAORA$(L)=""GOTO800 ' EDIT
800 C=4:P=1:X$(0)=A$(L):N$="Y"
810 CLS:I=L:GOSUB1910:N=1:Q$=""
820 GOSUB910:IFA>47ANDA<58THENQ$=Q$+A$:N=VAL(Q$):GOTO820
830 M=0:IFA=8THENY=-1:GOSUB940ELSEIFA=9ORA=UTHENY=1:GOSUB940
840 IFA=97THENA$(L)=X$(0):GOTO800 ' A
850 IFLEN(A$(L))>=LLGOTO870
860 IFA=25GOSUB1200ELSEIFA=26GOSUB1180
870 IFA>98ONA-98GOSUB960,1000,1960,1960,1020,1030
880 IFA=115GOSUB1120ELSEIFA=120GOSUB1170ELSEIFA=108GOTO800
890 IFM=1THENN=1:Q$="" :GOTO820ELSEIFRPRINT0320,;ELSE810
900 IPLL<XPRINT"LINE",L;"HAS",X;"CHARACTERS":GOTO60ELSE60
910 X$=MID$(A$(L),P,1)
920 PRINT@C,C$;A$=INKEY$:PRINT@C,X$;IFA$=""GOTO920
930 GOSUB290:X=LEN(A$(L)):IFA=13ORA=96THENR=1:RETURNELSERETURN
940 M=1:FORI=1TON:P=P+Y:IFP>XTHENP=X:RETURN
950 IFP<1THENP=1:RETURNELSEC=C+Y:NEXTI:RETURN
960 Q=P:D=C:FORI=1TON:GOSUB910:IFRORA=27THENP=Q:C=D:RETURN ' C
970 PRINT@C,A$;GOSUB1100:P=P+1:GOSUB1110:A$(L)=L$+A$+R$
980 A=U:C=C+1:IFP<=XNEXTI
990 P=Q:C=D:RETURN
1000 IFP+N-1>XTHENN=X-P+1 ' D
1010 GOSUB1100:Q=P:P=P+N:GOSUB1110:A$(L)=L$+R$:P=Q:RETURN
1020 GOSUB1100:A$(L)=L$+S$:PRINT@C,B$ ' H
1030 GOSUB910:IFRORA=27RETURN ' I
1040 IFA=10THENA$(L)=A$(L)+CHR$(17):R=1:RETURN
1050 IFA=31THENA$(L)=A$(L)+CHR$(20):R=1:RETURN
1060 PRINT@C,A$;IFA=8THENY=-1:GOSUB940:GOTO1030
1070 IFA=9THENY=1:GOSUB940:GOTO1030ELSEIFP>XTHENX=P
1080 GOSUB1100:GOSUB1110:A$(L)=L$+A$+R$:PRINT@C,B$;A$+R$
1090 C=C+1:P=P+1:GOTO1030
1100 L$="" :IFP<2RETURNELSEL$=LEFT$(A$(L),P-1):RETURN
1110 R$="" :IFP>XRETURNELSER$=RIGHT$(A$(L),X-P+1):RETURN
1120 GOSUB910:Q=P:D=C ' S
1130 FORI=1TON:F=0:FORJ=Q+1TOX:D=D+1
1140 IFMID$(A$(L),J,1)=A$THENF=1:Q=J:J=X
1150 NEXTJ:NEXTI:IFPTHENP=Q:C=D
1160 A=U:RETURN
1170 A$(L)=A$(L)+S$:P=X+1:C=P+3:GOTO1030 ' X
1180 A$(L)=STRING$(LL-LEN(A$(L)),2,32)+A$(L)+CHR$(20) ' S-D
1190 PRINT@C,B$;A$(L);CHR$(93);:RETURN
1200 A$(L)=STRING$(LL-LEN(A$(L)),32)+A$(L) ' S-R
1210 PRINT@C,B$;A$(L);:RETURN
1220 CLS:PRINT"LINE LENGTH =";LL,:INPUT"NEW "":LL ' FORMAT
1230 PRINT"LINE SPACES =";S,:INPUT"NEW "":S
1240 PRINT"LINE NOS. =";N$;"" :INPUT"NEW (Y/N)":N$
1250 PRINT"FIRST LINE =";FL,:INPUT"NEW "":FL
1260 PRINT"LEFT MARGIN =";LM,:INPUT"NEW "":LM
1270 PRINT"PAGE LENGTH =";PL,:INPUT"NEW "":PL
1280 PRINT"PAGE NOS. =";PN$;"" :INPUT"NEW (Y/N)":PN$
1290 PRINT"FIRST PAGE =";FP,:INPUT"NEW "":FP
1300 PRINT"PAGE 1 NO. =";P1$;"" :INPUT"NEW (Y/N)":P1$
1310 PRINT"HEADING =";H$;"" :INPUT"NEW "":H$
1315 PRINT"SINGLE SHEET FEED =";SS$;"" :INPUT"NEW=":SS$
1317 PRINT"PAGE SIZE =";G$;"" :INPUT"NEW "":G:GOTO60
1320 CLS:PRINT"LEGAL COMMANDS ARE:" ' HELP
1330 PRINT"A ADD","B BLANK","C COMPILE","D DELETE","E EDIT",
" F FORMAT","G GET","H HELP","I INSERT","J JUSTIFY","K
KILL","L LOAD","M MOVE","N NOTICE","P PRINT","R REPLACE",
" S SAVE","V VIDEO","W WRITE","X EXIT"
1340 PRINT"KEY 'SHIFT-@' TWICE TO RETURN FROM A,E,I,R TO COMMAND
MODE":GOTO60
1350 INPUT"INSERT AT LINE";L:IFL<0ORL>LAGOTO800 ' INSERT
1360 IFNL=LA+1PRINT"FILE FULL":GOTO60ELSEIFRGOTO60
1370 FORI=LATOLSTEP-1:A$(I+1)=A$(I):NEXTI
1380 A$(L)="" :LA=LA+1:L=L-1:IFITRETURNELSEIT=1:GOTO90

```

Listing 1 continues

ing single sheets of typing paper or letterheads. When the Print command encounters an end-of-page you can remove the sheet just printed, load and align the next sheet, and hit Enter to continue printing.

Disk Storage

Disk Storage of text files brings speed and reliability to your word processing activities. To install the disk storage changes, alter lines 70 and 1330 as in Fig. 1.

Add line 5, lines 1990-2180, and change line 1780 (see Program Listing 1).

Load each of your cassette text files and write them to disk. If you also wish to keep a copy on tape, resave each file at this time.

Change line 30 and line 1530 as shown in Program Listing 1.

Notice Command

The Notice command enables you to send short form letters to any list for which you have PIMS records for printing labels. To install the Notice changes alter line 70 and line 1330, and add lines 2190-2370 as shown in Program Listing 1.

Follow the instructions for installing the Expanded Print command (see below). The form letter (Notice) command depends on these changes.

Create a PIMS file with the structure definition in Fig. 2.

Notice requires the first five fields of a PIMS record for the name and address. Any blank lines will not be printed. The sixth field contains the name to appear in the greeting. The seventh field is optional, and only suggested if you wish to produce sorted label files from PIMS. The inside address produced from the label record above is as follows:

Mr. John Q. Doe
123 House Lane
Somewhere, ST 99999

Dear John:

If you have a PIMS label file without the sixth field as shown, use the first line of the name and address in the greeting. Make the following change to line 2320:

```
2320 J=J+(S+1):LPRINTTAB(LM)"DEAR ";BS(I-5);"" :
IFSLPRINT STRING$(S,138)
```

Expanded Print Command

The Expanded Print command enables you to print form letters, multiple text files and single sheets of typing paper. To take advantage of the Expanded Print command, change line 40, line 1310 and add lines 1315-1317. Replace lines 1640-1740 with lines 1640-1748 (see Listing 1).

For Cassette Files

If you have more than 16K memory, but no disk storage capabilities, make the following changes to install the Notice and Expanded Print commands.

```

1390 CLS:PRINT"JUSTIFYING":FORL=0TOLA:X=LEN(A$(L)) 'JUSTIFY
1400 IFX<2GOTO1500ELSEFORI=XTO2STEP-1:A=ASC(RIGHT$(A$(L),1))
1410 IFA=UTHEA$(L)=LEFT$(A$(L),I-1):X=X-1:NEXTI
1420 IFX>=LORA=17ORA=20THEN1500ELSEJ=0:K=1:FORI=1TOX
1430 IFMID$(A$(L),I,1)<>S$THENK=0ELSEIFK=0THENK=1:S(J)=I:J=J+1
1440 NEXTI:IFJ=0GOTO1500
1450 K=RND(J)-1:IFINT(J/2)=J/2ORJ=1THENN=1ELSEN=2
1460 FORI=1TOLL-X:T(K)=T(K)+1:K=K+N:IFK>J-1THENK=K-J
1470 NEXTI:FORL=J-1TO0STEP-1:A$=STRING$(T(I),S$):T(I)=0
1480 A$(L)=LEFT$(A$(L),S(I))+A$+RIGHT$(A$(L),LEN(A$(L))-S(I))
1490 NEXTI
1500 NEXTL:GOTO1830
1510 CLS:INPUT"REALLY KILL (Y/N)";A$:IFA$="Y"THENRUNELSE60'KILL
1520 GOSUB1820:CLS:PRINT"LOADING" 'LOAD
1530 INPUT#-1,LA,LL,S,N$,FL,LM,PL,PN$,FP,PI$,H$,SS$,G
1540 FORI=0TOLASTEP4
1545 INPUT#-1,X$(0),X$(1),X$(2),X$(3)
1550 FORJ=0TO3:L=I+J:X=LEN(X$(J)):A$(L)="" :IFX<1GOTO1570
1560 FORK=1TOX:A$(L)=A$(L)+CHR$(ASC(MID$(X$(J),K,1))-128):NEXTK
1570 NEXTI:GOTO60
1580 INPUT"FIRST LINE TO MOVE";F:IFF<0THENF=0 'MOVE
1590 INPUT"LAST LINE TO MOVE";Z:IFZ>LATHENZ=LA
1600 IFF>ZTHEN80ELSEINPUT"FIRST NEW LINE";N:FORI=FTOZ
1610 IFLN(A$(N))PRINT"LINE";N;"NOT EMPTY":GOTO60
1620 A$(N)=A$(I):A$(I)="" :N=N+1:IFN>LATHENZ=N
1630 NEXTI:GOTO1830
1640 IFR=2THEN1647ELSEIFPEEK(14312)=>128THENINPUT"PRINTER NOT RE
ADY. ABORT (Y/N)";A$:IFA$="Y"THEN60ELSE1640 'PRINT
1645 R=1:MT$="" :INPUT"MULTIPLE TEXT FILES (Y/N)";MT$:IFMT$<>"Y"AN
DMT$<>"N"GOTO1645
1647 EP=PL*(S+1)
1650 GOSUB480:CLS:PRINT"PRINTING"
1660 X=FP:TL=FL:IFR<>2THENAP=0
1670 IFAP<>0GOTO1700
1680 IFPN$<>"Y"OR(P1$="N"ANDX=1)THENLPRINT" "ELSELPRINTTAB(LM)H$
;STRING$(LL-LEN(H$)-7," ");"Page";USING"###";X
1690 LPRINT" " :AP=AP+2
1700 LPRINTTAB(LM);:IFN$="Y"THENLPRINTUSINGF$;TL;
1705 LPRINTA$(TL)
1710 IFSLPRINTSTRING$(S,138)
1720 AP=AP+(S+1):TL=TL+1
    
```

Listing 1 continues

Change line 70, line 1330, lines 2170-2180, lines 2195-2220 and lines 2230-2390 as in Program Listing 2.

Create a PIMS file as in Fig. 2. Change line 40, lines 1640-1748, line 1780, and lines 1310-1317 as in Program Listing 2.

Load and resave all of your Basic Word Processor cassette text files. If this step is omitted the modified Load command will not work properly.

Change lines 1520, 1530, and 1570 of the Load command and add line 1525 as in Program Listing 2.

To re-emphasize a point made by Mr. Hinrichs in his original article, "Speed is the most noticeable problem, but is inherent in Basic strings." You will find speed less of a problem in the Expanded Print command. By splitting your manuscript into smaller segments you are less affected by the pauses associated with Basic string reassignment. You can still print it as one continuous manuscript. Disk storage and retrieval of text files will greatly reduce the time required for your word processing needs.

Mr. Hinrichs warns that added program features will cause you to exceed 16K memory. My system has 32K memory; your system should also exceed 16K memory to add the above modifications. ■

Duane and his family have recently moved to Spain. Since then, he is unable to use his disk drive or cassette recorder because the power is 220V, 50 Hz.



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Listing 1 continued

```

1730 IFAP<=EPANDASC(RIGHT$(A$(TL-1),1))<>17GOTO1744
1740 FORI=1TO(G-AP):LPRINT" ":NEXT:X=X+1:AP=0
1742 IFSS$="Y"THENINPUT"FEED NEXT SHEET, HIT ENTER";A$
1744 IPTL<=LAGOTO1670
1746 IFMT$="Y"GOSUB1990:IFLEFT$(NA$,3)<>"END"THENTL=FL:GOTO1670:
ELSEMT$="N"
1747 IFAP<>0THEN1740
1748 IFR=2THENRETURNELSER=0:GOTO60
1750 INPUT"REPLACE LINE";L:IFL<0ORL>LAGOTO80 ' REPLACE
1760 R=1:A$(L)="":L=L-1:GOTO90
1770 GOSUB1820:CLS:PRINT"SAVING" ' SAVE
1780 PRINT#-1,LA,LL,S,CHR$(34)+N$+CHR$(34),FL,LM,PL,CHR$(34)+PN$
+CHR$(34),FP,CHR$(34)+P1$+CHR$(34),CHR$(34)+H$+CHR$(34),CHR$(34)
+SS$+CHR$(34),G:FORL=0TOLASTEP4
1790 FORJ=0TO3:I=L+J:X=LEN(A$(I)):X$(J)="":IFX<1GOTO1810
1800 FORK=1TOX:X$(J)=X$(J)+CHR$(ASC(MID$(A$(I),K,1))+128):NEXTK
1810 NEXTJ:PRINT#-1,X$(0),X$(1),X$(2),X$(3):NEXTL:GOTO60
1820 INPUT"READY CASSETTE, THEN PRESS ENTER";A$:RETURN
1830 CLS:X=FP-1:FORM=FLTOLASTEPPL:X=X+1 ' VIDEO
1840 IFP1$="N"ANDX=1GOTO1860
1850 IFPN$="Y"PRINTH$;TAB(LL-7)"Page";USING"###";X:PRINT
1860 FORI=MTOM+PL-1:IFI>LAGOTO1890
1870 IFSPRINTSTRING$(S-1,10)
1880 GOSUB1910
1890 NEXTI:A$="":IFI<=LAINPUT"PRESS ENTER";A$:IFA$<>"M=LA
1900 NEXTM:L=LA:GOTO60
1910 Y=LEN(A$(I)):IFYTHENA=ASC(RIGHT$(A$(I),1))ELSEA=0
1920 IFN$="Y"PRINTUSINGF$;I;
1930 PRINTA$(I);:IFA=17PRINTCHR$(92);
1940 IFA=20PRINTCHR$(93);ELSEIFA=UPRINTCHR$(95);
1950 IFN$<>"Y"ORY<>60PRINT
1960 RETURN
1970 CLS:INPUT"REALLY EXIT (Y/N)";A$:IFA$<>"Y"GOTO60 ' EXIT
1980 CLS:CLEAR50:OUT254,0:END
1990 GOSUB2170:GOSUB2180:PRINT"GETTING TEXT FROM DISK" ' GET
1995 IFLEFT$(NA$,3)="END"THENRETURN
2000 OPEN"1",1,NA$
2010 INPUT#1,LA,LL,S,N$,FL,LM,PL,PN$,FP,P1$,H$,SS$,G
2020 FORI=0TOLA
2025 IF EOF(1)THEN2060
2030 LINE INPUT#1,A$(I)

```

Listing 1 continues

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Listing 1 continued

```
2060 NEXTI
2070 CLOSE 1:IFRTHENRETURNELSEGOTO60
2080 GOSUB2170:GOSUB2180:PRINT"WRITING TEXT TO DISK" ' WRITE
2090 OPEN"O",1,NA$
2100 PRINT#1,LA,LL,S;CHR$(34);N$;CHR$(34);FL;LM;PL;CHR$(34);PN$;
CHR$(34);FP;CHR$(34);P1$;CHR$(34);CHR$(34);H$;CHR$(34);CHR$(34);
SS$;CHR$(34);G
2110 FORI=0TOLA
2120 X=LEN(A$(I)):IFX<1GOTO2150
2140 PRINT#1,A$(I)
2150 NEXTI
2160 CLOSE 1:GOTO60
2170 CLS:INPUT"ENTER FILE NAME";NA$:RETURN
2180 INPUT"READY DISK, THEN PRESS ENTER";A$:RETURN
2190 IFPEEK(14312)=>128THENINPUT"PRINTER NOT READY. ABORT(Y/N)";
A$:IFA$="Y"THEN60ELSE2190 ' NOTICE
2195 GOSUB2170:GOSUB2180:PRINT"READING PIMS FILE";OPEN"I",2,NA$
2200 PR=-1:EF=0
2210 IFEFTHEN2340ELSEPR=PR+1:LINEINPUT#2,T$
2220 IFEF(2) THENEF=1
2230 IFPR<>0THEN2240ELSE2210
2240 T1$=CHR$(126):GOSUB2350
2250 J=0
2255 LPRINT" ":LPRINT" ":J=J+2
2260 FORI=1TO5
2270 ILEFT$(B$(I),1)<>"ANDLEFT$(B$(I),1)<>"THENLPRINTTAB(LM)
B$(I):J=J+(S+1):IFSLPRINTSTRING$(S,138)
2300 NEXTI
2310 J=J+(S+1):LPRINT" ":IFSLPRINTSTRING$(S,138)
2320 J=J+(S+1):LPRINTTAB(LM)"Dear ";B$(I);":":IFSLPRINTSTRING$(S,138)
2325 J=J+(S+1):LPRINT" ":IFSLPRINTSTRING$(S,138)
2330 AP=J:R=2:GOSUB1640:GOTO2210
2340 CLOSE2:R=0:GOTO60
2350 J=-1 ' UNPARSE LABELS
2360 I=INSTR(T$,T1$):IFI=0THENRETURN
2370 J=J+1:B$(J)=LEFT$(T$,I-1):T$=MID$(T$,I+1):GOTO2360
```

Program Listing 2

```
10 CLS:PRINTTAB(20)"BASIC WORD PROCESSOR"
20 '(C) BY D.D.HINRICHS 1979
30 DEFINITA-Z:CLEAR10000:NL=200:DIMA$(NL),X$(3),S(20),T(20)
40 B$=CHR$(30):C$=CHR$(143):F$="###":N$="Y":PN$="N":P1$="Y":SS$="N":G=66
50 SS$="":H$=S$:LA=-1:P=1:FP=1:PL=15:LL=60:LM=10:U=32:OUT254,1
60 L=LA:IT=0:R=0:A$="":PRINT:INPUT"COMMAND";A$:IFA$=""GOTO80
70 A=ASC(A$)-64:IFA>0ONAGOTO90,480,510,760,790,1220,80,1320,1350,1390,1510,1520,1580,2190,80,1640,80,1750,1770,80,80,1830,80,1970
80 PRINT"*** ENTRY ERROR ***":GOTO60
90 CLS:D=0:N$="Y":IFLA<0THENL=0:GOTO130 ' ADD
100 IFNL=LA+1THEN210ELSEIFL>FL+12THENB=L-12ELSEB=FL
110 FORI=BTOL:X=LEN(A$(I)):D=D+INT((X+4)/64-.01)
120 GOSUB1910:NEXTI:L=L+1
130 C=(L-FL+D)*64:IFC>896PRINT:PRINT:C=896
140 PRINT@C,USINGF$;L;:PRINTA$(L);:P=LEN(A$(L))+1:C=C+P+3:K=L+1
150 PRINT@C,C$;A$=INKEY$:PRINT@C,S$;IFA$=""GOTO150
160 GOSUB290:ONA-7GOTO360,410,310
170 IFA=13THENAS=S$:GOTO210ELSEIFA=24THEN380ELSEIFA=31GOTO460
180 IFA=25THEN430ELSEIFA=26THEN330
190 IFA=96IFLA<LTHENLA=L:GOTO60ELSE60
200 PRINT@C,A$;A$(L)=A$(L)+A$:IFP<=LLTHENP=P+1:C=C+1:GOTO150
210 IFRGOTO60ELSEIFNL<=KPRINT:PRINT"FILE FULL":LA=NL-1:GOTO60
220 IFLN(A$(K))THENL=K:GOSUB1360
230 IFK>LATHENLA=K
240 IFA$=SS$GOTO280
250 FORM=LL+1TO2STEP-1:A$=MID$(A$(L),M,1):IFA$<>S$NEXTM:GOTO280
260 A$(K)=RIGHT$(A$(L),LL-M+1):A$(L)=LEFT$(A$(L),M-1)
270 PRINT@C-LL+M-1,B$;L=K:GOTO130
280 A$(L)=LEFT$(A$(L),LL):L=K:GOTO130
290 A=ASC(A$):IFA>64ANDA<91THENA=A+UELSEIFA>96ANDA<123THENA=A-U
300 A$=CHR$(A):RETURN
310 IFP>LLGOTO210 ' D
320 PRINT@C,CHR$(92);:A$(L)=A$(L)+CHR$(17):A$=S$:GOTO210
330 IFP>LLGOTO210 ' S-D
340 C=(L-FL+D)*64+4:IFC>900THENC=900
350 GOSUB1180:P=1:A$=S$:GOTO210
360 IFP=1GOTO150 ' L
370 C=C-1:PRINT@C,B$;:P=P-1:A$(L)=LEFT$(A$(L),P-1):GOTO150
380 IFP=1GOTO150 ' S-L
390 A$(L)=""P=1:C=(L-FL+D)*64+4:IFC>900THENC=900
```

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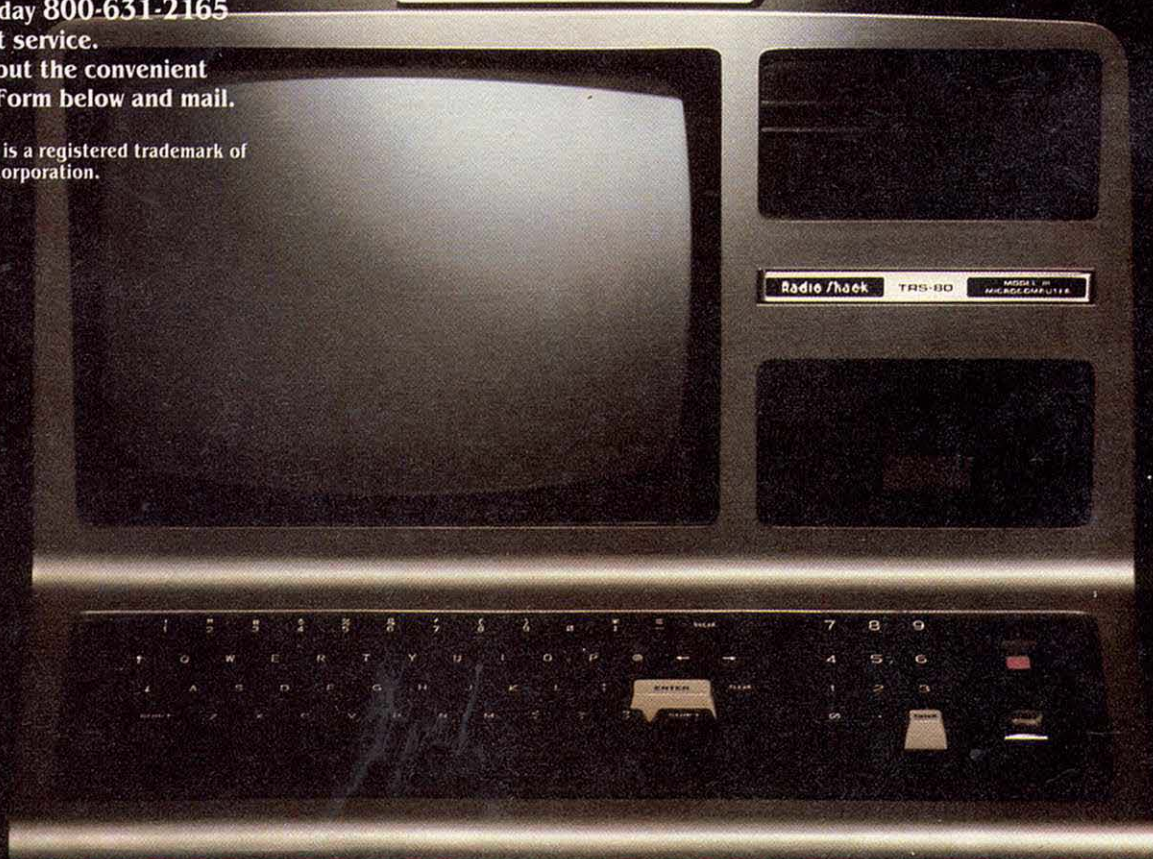
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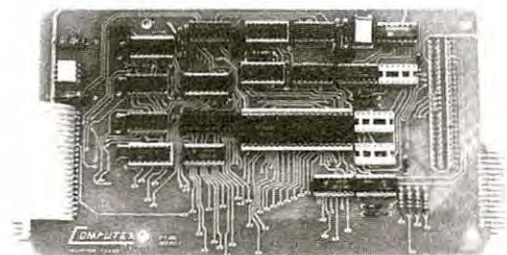


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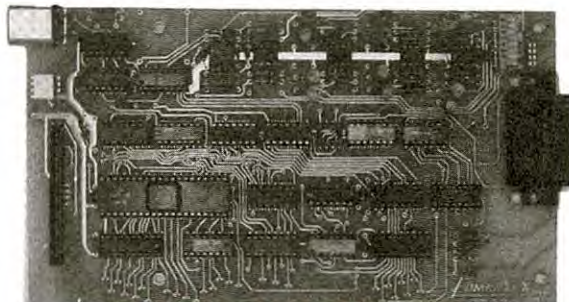
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✓149

Tried and Proven:

LOG

THE ELECTRONIC NOTEBOOK
PROGRAM BY KSoft

LOG Documentation	PAGE 2	08 02 81	18 04 00 P
CONTENTS			
Cursor positioning commands	pages 7-8		
Page positioning commands	pages 1-7		
Write commands	page 11		
Lineprinter commands	page 12		
Special commands	pages 13, 14		
Search commands	pages 15, 20		
New page creation	page 21		
Entry options	pages 22, 26		
Exit	page 27		
Technical information	pages 28, 31		
Suggestions for use	pages 18, 31		

One year old and a proven success! LOG for the TRS-80 (R) is still the only program on the market that addresses one very obvious problem: Despite data-base managers, word processors, and a dozen brands of spreadsheets, the fact is that most of the information people handle on a day-to-day basis just won't fit into fields, files, and codes.

LOG, on the other hand, is a program that 'thinks' like you do! LOG turns your video screen into a one page of a large notebook. Thumb slowly or search like lightning through your previous entries; modify, update, or erase as you desire with the built-in text editor. Append new pages with a single keystroke, up to 170 individual pages on a Model III diskette! Keep a separate LOG notebook on any diskette in any drive.

Yes! LOG supports hardcopy to your lineprinter.

Yes! All commands are single keystroke (no modes to remember).

Yes! You can access LOG while BASIC is running.

Yes! It really works!

People are using LOG to store address lists, programming notes, diaries, personnel files, recipes, record collections, and a hundred other uses. Think up your own applications. You'll probably use it every day.

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```

400 PRINT@C,B$;:GOTO150
410 IFP>LL-6GOTO150 ' R
420 A$(L)=A$(L)+STRING$(5,S$):C=C+5:P=P+5:GOTO150
430 IFP>LLGOTO210 ' S-R
440 C=(L-FL+D)*64+4:IFC>900THENC=900
450 GOSUB1200:P=1:A$=S$:GOTO210
460 IFP>LLGOTO210 ' CL
470 PRINT@C,CHR$(93);:A$(L)=A$(L)+CHR$(20):A$=S$:GOTO210
480 CLS:PRINT"DELETING BLANK LINES":FORJ=LATO0STEP-1 ' BLANK
490 IFA$(J)="FORJ=JTOA:A$(I)=A$(I+1):NEXTI:A$(LA)="" :LA=LA-1
500 NEXTJ:IFRTHENRETURNELSE1830
510 INPUT"FIRST LINE TO COMPILE",F:IFF<0THENF=0 ' COMPILE
520 INPUT"LAST LINE TO COMPILE",Z:IFZ>LATHENZ=LA
530 IFF>ZTHEN80ELSECLS:PRINT"COMPILING":FORL=F+1TOZ-1:K=L+1
540 X=LEN(A$(L)):X$="" :IFX<2THEN620ELSEIFX<LLGOTO600
550 FORI=XTO1STEP-1:A$=MID$(A$(L),I,1)
560 IFA$<>S$THENX$=A$+X$:NEXTI:GOTO600ELSEIFX$=""NEXTI
570 A=ASC(RIGHT$(X$,1)):IFA=33ORA=46ORA=58ORA=63THENX$=X$+" "
580 A$(L)=LEFT$(A$(L),I-1):IFLEN(A$(K))=0THENA$(K)=X$:GOTO540
590 A$(K)=X$+S$+A$(K):GOTO540
600 X=LEN(A$(L)):IFX<2THEN620ELSEFORI=XTO2STEP-1
610 IFRIGHT$(A$(L),1)=S$THENA$(L)=LEFT$(A$(L),I-1):NEXTI
620 NEXTL:FORL=F+1TOZ-1:K=L+1
630 X=LEN(A$(L)):Y=LEN(A$(K)):X$="" :IFX=0ORY=0GOTO750
640 A=ASC(RIGHT$(A$(L),1))
650 IFA=33ORA=46ORA=58ORA=63THENA$(L)=A$(L)+" " :X=X+2
660 FORI=1TOY:A$=MID$(A$(K),I,1)
670 IFA$<>S$THENX$=X$+A$:NEXTIELSEIFX$=""NEXTI
680 IFLL-X<IGOTO710
690 Y=Y-1:IFY<0THENY=0
700 A$(L)=A$(L)+S$+X$:A$(K)=RIGHT$(A$(K),Y):GOTO630
710 X=LEN(A$(L)):IFX<2THEN730ELSEFORI=XTO2STEP-1
720 IFRIGHT$(A$(L),1)=S$THENA$(L)=LEFT$(A$(L),I-1):NEXTI
730 IFY<2THEN750ELSEFORI=YTO2STEP-1
740 IFLEFT$(A$(K),1)=S$THENA$(K)=RIGHT$(A$(K),I-1):NEXTI
750 NEXTL:X=LEN(A$(Z)):GOTO900
760 INPUT"FIRST LINE TO DELETE",F:IFF<0THENF=0 ' DELETE
770 INPUT"LAST LINE TO DELETE",Z:IFZ>LATHENZ=LA
780 IFF>ZTHEN80ELSEFORI=F+1TOZ:A$(I)="" :NEXTI:GOTO1830
790 INPUT"EDIT LINE",L:IFL<0ORL>LAORA$(L)=""GOTO80 ' EDIT
800 C=4:P=1:X$(0)=A$(L):N$="Y"
810 CLS:I=L:GOSUB1910:N=1:Q$=""
820 GOSUB910:IFA>47ANDA<58THENQ$=Q$+A$:N=VAL(Q$):GOTO820
830 M=0:IFA=8THENY=-1:GOSUB940ELSEIFA=9ORA=UTHENY=1:GOSUB940
840 IFA=97THENA$(L)=X$(0):GOTO800 ' A
850 IFLEN(A$(L))>LLGOTO870
860 IFA=25GOSUB1200ELSEIFA=26GOSUB1180
870 IFA>98ONA-98GOSUB960,1000,1960,1960,1960,1020,1030
880 IFA=115GOSUB1120ELSEIFA=120GOSUB1170ELSEIFA=108GOTO800
890 IFM=1THENN=1:Q$="" :GOTO820ELSEIFRPRINT0320;:ELSE810
900 IFLL<XPRINT"LINE";L;"HAS";X;"CHARACTERS":GOTO60ELSE60
910 X$=MID$(A$(L),P,1)
920 PRINT@C,C$;:A$=INKEY$:PRINT@C,X$;:IFA$=""GOTO920
930 GOSUB290:X=LEN(A$(L)):IFA=13ORA=96THENR=1:RETURNELSERETURN
940 M=1:FORI=1TON:P=P+Y:IFP>XTHENP=X:RETURN
950 IFF<1THENP=1:RETURNELSEC=C+Y:NEXTI:RETURN
960 Q=P:D=C:FORI=1TON:GOSUB910:IFRORA=27THENP=Q:C=D:RETURN ' C
970 PRINT@C,A$;:GOSUB1100:P=P+1:GOSUB1110:A$(L)=L$+A$+R$
980 A=U:C=C+1:IFP<=XNEXTI
990 P=Q:C=D:RETURN
1000 IFP+N-1>XTHENN=X-P+1 ' D
1010 GOSUB1100:Q=P:P=P+N:GOSUB1110:A$(L)=L$+R$:P=Q:RETURN
1020 GOSUB1100:A$(L)=L$+S$:PRINT@C,B$ ' H
1030 GOSUB910:IFRORA=27RETURN ' I
1040 IFA=10THENA$(L)=A$(L)+CHR$(17):R=1:RETURN
1050 IFA=31THENA$(L)=A$(L)+CHR$(20):R=1:RETURN
1060 PRINT@C,A$;:IFA=8THENY=-1:GOSUB940:GOTO1030
1070 IFA=9THENY=1:GOSUB940:GOTO1030ELSEIFP>XTHENX=P
1080 GOSUB1100:GOSUB1110:A$(L)=L$+A$+R$:PRINT@C,B$;A$+R$
1090 C=C+1:P=P+1:GOTO1030
1100 L$="" :IFP<2RETURNELSEL$=LEFT$(A$(L),P-1):RETURN
1110 R$="" :IFP>XRETURNELSER$=RIGHT$(A$(L),X-P+1):RETURN
1120 GOSUB910:Q=P:D=C ' S
1130 FORI=1TON:F=0:FORJ=Q+1TOX:D=D+1
1140 IFMID$(A$(L),J,1)=A$THENF=1:Q=J:J=X
1150 NEXTJ:NEXTI:IFFTHENP=Q:C=D
1160 A=U:RETURN
1170 A$(L)=A$(L)+S$:P=X+1:C=P+3:GOTO1030 ' X
1180 A$(L)=STRING$(LL-LEN(A$(L)))/2,32)+A$(L)+CHR$(20) ' S-D
1190 PRINT@C,B$;A$(L);CHR$(93);:RETURN
1200 A$(L)=STRING$(LL-LEN(A$(L)),32)+A$(L) ' S-R
1210 PRINT@C,B$;A$(L);:RETURN
1220 CLS:PRINT"LINE LENGTH =",LL,:INPUT"NEW "=:LL ' FORMAT
1230 PRINT"LINE SPACES =",S,:INPUT"NEW "=:S
1240 PRINT"LINE NOS. = "":N$;"":INPUT"NEW (Y/N)";N$
1250 PRINT"FIRST LINE = "":FL,:INPUT"NEW "=:FL
1260 PRINT"LEFT MARGIN = "":LM,:INPUT"NEW "=:LM

```

Listing 2 continues

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Listing 2 continued

```

1270 PRINT"PAGE LENGTH =",PL,:INPUT"NEW =",PL
1280 PRINT"PAGE NOS. = ",PN$:,"",:INPUT"NEW (Y/N)",PN$
1290 PRINT"FIRST PAGE = ",FP,:INPUT"NEW =",FP
1300 PRINT"PAGE 1 NO. = ",P1$:,"",:INPUT"NEW (Y/N)",P1$
1310 PRINT"HEADING = ",H$:,"",:INPUT"NEW =",H$
1315 PRINT"SINGLE SHEET FEED = ",SS$:,"",:INPUT"NEW=",SS$
1317 PRINT"PAGE SIZE = ",G:,"",:INPUT"NEW =",G:GOTO600
1320 CLS:PRINT"LEGAL COMMANDS ARE:" ' HELP
1330 PRINT"A ADD","B BLANK","C COMPILE","D DELETE","E EDIT"
      "F FORMAT","H HELP","I INSERT","J JUSTIFY","K KILL","L
L LOAD","M MOVE","N NOTICE","P PRINT","R REPLACE","S SAVE"
      "V VIDEO","X EXIT"
1340 PRINT"KEY 'SHIFT-@' TWICE TO RETURN FROM A,E,I,R TO COMMAND
MODE":GOTO600
1350 INPUT"INSERT AT LINE":L:IFL<@ORL>LAGOTO800 ' INSERT
1360 IFNL=LA+1PRINT"FILE FULL":GOTO600ELSEIFRGOTO600
1370 FORI=LATOLSTEP-1:A$(I+1)=A$(I):NEXTI
1380 A$(L)="" :LA=LA+1:L=L-1:IFITRETURNELSEIT=1:GOTO900
1390 CLS:PRINT"JUSTIFYING":FORL=@TOLA:X=LEN(A$(L)) 'JUSTIFY
1400 IFX<2GOTO1500ELSEFORI=XTO2STEP-1:A=ASC(RIGHT$(A$(L),1))
1410 IFA=UTHENAS$(L)=LEFT$(A$(L),I-1):X=X-1:NEXTI
1420 IFX>LORA=17ORA=20THEN1500ELSEJ=0:K=1:FORI=1TOX
1430 IFMID$(A$(L),I,1)<>SS$THENK=@ELSEIFK=@THENK=1:S(J)=I:J=J+1
1440 NEXTI:IFJ=@GOTO1500
1450 K=RND(J)-1:IFINT(J/2)=J/2ORJ=1THENN=1ELSEN=2
1460 FORI=1TOLL-X:T(K)=T(K)+1:K=K+N:IFK>J-1THENK=K-J
1470 NEXTI:FORI=J-1TO0STEP-1:A$=STRING$(T(I),SS):T(I)=0
1480 A$(L)=LEFT$(A$(L),S(I))+A$+RIGHT$(A$(L),LEN(A$(L))-S(I))
1490 NEXTI
1500 NEXTL:GOTO1830
1510 CLS:INPUT"REALLY KILL (Y/N)":A$:IFA$="Y"THENRUNELSE600'KILL
1520 NA$="":IFMT$="Y"THENINPUT"IF ALL TEXT FILES READ, ENTER 'EN
D', ELSE HIT ENTER":NA$ ' LOAD
1525 IFLEFT$(NA$,3)="END"THENRETURNELSEGOSUB1820:CLS:PRINT"LOADI
NG"
1530 INPUT#-1,LA,LL,S,N$,FL,LM,PL,PN$,FP,P1$,H$,SS$,G
1540 FORI=@TOLASTEP4
1545 INPUT#-1,X$(0),X$(1),X$(2),X$(3)
1550 FORJ=@TO3:L=I+J:X=LEN(X$(J)):A$(L)="" :IFX<1GOTO1570
1560 FORK=1TOX:A$(L)=A$(L)+CHR$(ASC(MID$(X$(J),K,1))-128):NEXTK
1570 NEXTJ:NEXTI:IFRTHENRETURNELSEGOTO600
1580 INPUT"FIRST LINE TO MOVE":F:IFF<@THENF=@ ' MOVE
1590 INPUT"LAST LINE TO MOVE":Z:IFZ>LATHENZ=LA
1600 IFF>ZTHEN800ELSEINPUT"FIRST NEW LINE":N:FORI=PTOZ
1610 IFLEN(A$(N))PRINT"LINE":N:"NOT EMPTY":GOTO600
1620 A$(N)=A$(I):A$(I)="" :N=N+1:IFN>LATHENZ=N
1630 NEXTI:GOTO1830
1640 IFR=2THEN1647ELSEIFPEEK(14312)=>128THENINPUT"PRINTER NOT RE
ADY. ABORT (Y/N)":A$:IFA$="Y"THEN600ELSE1640 ' PRINT
1645 R=1:MT$="" :INPUT"MULTIPLE TEXT FILES (Y/N)":MT$:IFMT$<>"Y"AN
DMT$<>"N"GOTO1645
1647 EP=PL*(S+1)
1650 GOSUB480:CLS:PRINT"PRINTING"
1660 X=FP:TL=FL:IFR<>2THENAP=@
1670 IFAP<@GOTO1700
1680 IFPN$<>"Y"OR(P1$="N"ANDX=1)THENLPRINT" "ELSELPRINTTAB(LM)H$
;STRING$(LL-LEN(H$)-7," ");"Page";USING"###",X
1690 LPRINT" ":AP=AP+2
1700 LPRINTTAB(LM);:IFN$="Y"THENLPRINTUSINGF$;TL;
1705 LPRINTA$(TL)
1710 IFSLPRINTSTRING$(S,138)
1720 AP=AP+(S+1):TL=TL+1
1730 IFAP<=EPANDASC(RIGHT$(A$(TL-1),1))<>17GOTO1744
1740 FORI=1TO(G-AP):LPRINT" ":NEXT:X=X+1:AP=@
1742 IFSS$="Y"THENINPUT"FEED NEXT SHEET, HIT ENTER":A$
1744 IFTL<=LAGOTO1670
1746 IFMT$="Y"THENPR=X:GOSUB1520:X=PR:IFLEFT$(NA$,3)<>"END"THEN
L=FL:GOTO1670:ELSEMT$="N"
1747 IFAP<>@THEN1740
1748 IFR=2THENRETURNLSE=0:GOTO600
1750 INPUT"REPLACE LINE":L:IFL<@ORL>LAGOTO800 ' REPLACE
1760 R=1:A$(L)="" :L=L-1:GOTO900
1770 GOSUB1820:CLS:PRINT"SAVING" ' SAVE
1780 PRINT#-1,LA,LL,S,N$,FL,LM,PL,PN$,FP,P1$,H$,SS$,G:FORL=@TOLA
STEP4
1790 FORJ=@TO3:I=L+J:X=LEN(A$(I)):X$(J)="" :IFX<1GOTO1810
1800 FORK=1TOX:X$(J)=X$(J)+CHR$(ASC(MID$(A$(I),K,1))+128):NEXTK
1810 NEXTJ:PRINT#-1,X$(0),X$(1),X$(2),X$(3):NEXTL:GOTO600
1820 INPUT"READY CASSETTE, THEN PRESS ENTER":A$:RETURN
1830 CLS:X=FP-1:FORM=FLTOLASTEPPL:X=X+1 ' VIDEO
1840 IFP1$="N"ANDX=1GOTO1860
1850 IFPN$="Y"PRINTH$:TAB(LL-7)"Page";USING"###",X:PRINT
1860 FORI=MTOM+PL-1:IFI>LAGOTO1890
1870 IFSPRINTSTRING$(S-1,10)
1880 GOSUB1910
1890 NEXTI:A$="" :IFI<=LAINPUT"PRESS ENTER":A$:IFA$<>"M=LA
1900 NEXTM:L=LA:GOTO600

```

Listing 2 continues

```

1910 Y=LEN(A$(I)):IFYTHENA=ASC(RIGHT$(A$(I),1))ELSEA=0
1920 IFN$="Y"PRINTUSINGF$,I;
1930 PRINTA$(I);:IFA=17PRINTCHR$(92);
1940 IFA=20PRINTCHR$(93);ELSEIFA=UPRINTCHR$(95);
1950 IFN$<"Y"ORY<>60PRINT
1960 RETURN
1970 CLS:INPUT"REALLY EXIT (Y/N)";A$:IFA$<"Y"GOTO60 ' EXIT
1980 CLS:CLEAR50:OUT254,0:END
2170 CLS:INPUT"ENTER FILE NAME";NA$:RETURN
2180 INPUT"READY CASSETTE, HIT ENTER";A$:RETURN
2190 IFPEEK(14312)=>128THENINPUT"PRINTER NOT READY. ABORT(Y/N)";
A$:IFA$="Y"THEN60ELSE2190 ' NOTICE
2195 GOSUB2170:GOSUB2180:INPUT#-1,T$
2196 IFT$=NA$THEN2200
2197 PRINT"FOUND FILE: ";T$:INPUT"CONTINUE SEARCH (Y/N)";T$:IFT$
="N"THEN60
2198 INPUT#-1,T$:IFT$<"EOF"THEN2198ELSE2196
2200 PR=-1
2210 PR=PR+1:INPUT#-1,T$
2220 IFT$="EOF"THEN2340
2230 IFPR<>0THEN2240ELSE2210
2240 T1$=CHR$(126):GOSUB2350
2250 J=0
2255 LPRINT" ":LPRINT" ":J=J+2
2260 FORI=1TO5
2270 IFLEFT$(B$(I),1)<" "ANDLEFT$(B$(I),1)<" "THENLPRINTTAB(LM)
B$(I):J=J+(S+1):IFSLPRINTSTRING$(S,138)
2300 NEXTI
2310 J=J+(S+1):LPRINT" ":IFSLPRINTSTRING$(S,138)
2320 J=J+(S+1):LPRINTTAB(LM)"Dear ";B$(I);":":IFSLPRINTSTRING$(S
,138)
2325 J=J+(S+1):LPRINT" ":IFSLPRINTSTRING$(S,138)
2330 AP=J:R=2:GOSUB1640:GOTO2210
2340 R=0:GOTO60
2350 J=-1 ' UNPARSE LABELS
2360 FORI=1TOLEN(T$)-LEN(T1$)+1
2370 IFT1$=MID$(T$,I,LEN(T1$))THEN2390
2380 NEXTI:I=0:RETURN
2390 J=J+1:B$(J)=LEFT$(T$,I-1):T$=MID$(T$,I+1):GOTO2360

```

MODEL 3* CHARACTERS for Model 1* and LNW-80**

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Breaking through brick by brick.

Outbreak

Tom Hanson
2120 Birchmont Drive
Bemidji, MN 56601

One of my favorite arcade games is Breakout. I could spend hours playing the game if I had enough money. When I got my micro last fall, the first thing I did was write my own version of the game. I call mine Outbreak.

The rules of play are similar to the arcade game. In Outbreak, the paddle moves vertically on the left side of the screen and is controlled by the up and down arrows. The object is to knock out the blocks at the right side of the screen by hitting a ball with the paddle.

The Program

Although the program is written in Basic, the action is fairly quick. The highlight of the game's programming is the bouncing ball routine. A random starting point for the ball is determined in line 120. Ball speed

and random direction are established in line 140. A loop to follow the ball's progress begins at line 170. Lines 190 and 200 check to keep the ball in

bounds. If the ball hits the wall it bounces off in an opposite direction angle and continues on toward the blocks.

Line 220 checks to see if a

block has been hit. If one has it executes a subroutine at line 460. After hitting the blocks the ball is bounced back toward the paddle. If the ball is success-

```

100 DEFINT A-Y:CLS:GOSUB550
110 CLS:A$=CHR$(191):B$=CHR$(128)
120 X=RND(15)+10:Y=RND(10)+10:G=323:Z=G:M=1:N=1
130 L=15427:PO=0
140 A=RND(5)-3:B=RND(5)-3:IFA=0ORB=0THEN140
150 GOSUB410
160 GOS=9:GOSUB500:GOS=0
170 X=X+A:Y=Y+B
180 GOSUB 280
190 IF Y<3 OR Y>44 THEN B=-B:GOTO170
200 IF X>126 THEN A=-A:GOTO 170
210 IF X<0THEN A=-A:GOTO170
220 IF X>15 AND POINT (X,Y)=-1THEN 460
230 IF X<0 AND POINT (X,Y)=-1THEN A=-A:GOTO170
240 IF X<3 AND POINT (X,Y)<>-1THEN 350
250 RESET(M,N):SET(X,Y):M=X:N=Y
260 GOTO170
280 R=PEEK(14420)
290 IFR=0RETURN
300 G=L
310 IF R=8 THEN L=L-64:IF L<15427 L=L+64:JK=1
320 IF R=16 L=L+64:IF L>16319 L=L-64:JK=1
330 POKE L,191:IF JK=1THEN JK=0:RETURN
340 POKEG,32:RETURN
350 PO=PO+1:IF PO>5 THEN 400
360 X=RND(10)+25:Y=RND(10)+25
370 FOR YO=1TO1000:NEXT
380 PRINT@251,PO+1;
390 A=RND(2)-3:B=RND(2)-3:IFA=0ORB=0THEN390ELSE 170
400 PRINT:PRINT" OUT OF BALLS " :END
410 FOR O=1 TO 14:FOR T=30 TO 50 STEP 2
420 POKE (O*64+T)+15360,191:NEXT T,O
430 FOR R=1TO127:SET(R,45):SET(R,2):NEXT
440 FOR F=2 TO 45:SET(127,F):NEXT
450 RETURN
460 A=-A
470 P=INT(X/2)+INT(Y/3)*64
480 PRINT@P,B$;
490 LO=LO+1
495 IF LO=154 THENCLS:PRINT" YOU HAVE SUCCESSIVLY CLEARED THE BOARD":PRINT"C
ONGRADULATIONS I ":END
500 PRINT@48,"BLOCKS OUT";
510 PRINT@187,"BALL#";
520 PRINT@251,PO+1;
530 PRINT@119,LO;
540 IF GOS=9THEN RETURN ELSE 170
550 PRINTCHR$(23)
560 PRINT" BREAKOUT.....BY TOM HANSON"
570 FORZX=1 TO 1000:NEXT:
580 REM TOM HANSON
590 REM 2120 BIRCHMONT DR.
600 REM BEMIDJI MN,56601

```

Program Listing 1

The Key Box

Basic Level II
Model I or III
16K RAM
Optional amplifier

fully hit by the paddle, line 230 reverses the ball's direction back toward the blocks. If you miss the ball, line 250 serves a new one.

The status of the paddles is checked by lines 280-340. Lines 350-400 count how many balls you have been served and loop back if you have more serves left. The playing field is drawn at

lines 410-450, the score is kept by lines 460-540 and lines 540-570 display the title.

To add sound to the game type in the lines in Program Listing 2. ■

Tom Hanson is an 11th grade student who enjoys computer programming, skiing and biking.

```

105 GOSUB 700
190 IF Y<3 OR Y>44 THEN
    B = -B:JJ = USR(12):GOTO 170
200 IF X>126 THEN
    A = -A:JJ = USR(12):
    GOTO 170
210 IF X<0 THEN
    A = -A:JJ = USR(12):
    GOTO 170
230 IF X<10 AND POINT(X,Y) = -1
    THEN A = -A:
    JJ = USR(12):GOTO 170
480 PRINT @P,B$;JJ = USR(12)
700 Z1 = 127:POKE 16526,235:POKE
    16527,Z1:Z = 256*Z1 + 235
710 READ B:IF B>0 POKE Z,B:Z = Z + 1:
    GOTO 710
720 DATA 205,127,10,62,5,211,255,69,16,
    254,62,4,211,255,69,16,254,37,20
    239,201,-1
730 RETURN
  
```

Program Listing 2. Sound Modification

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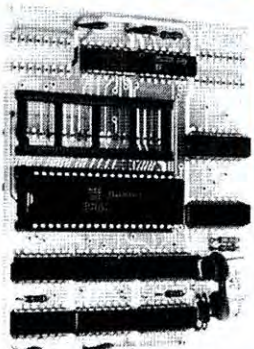
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I knew my TRS-80 could do the job better.

For the next several weeks I set about designing an interface circuit. Here are the results of my effort.

Interface Circuit

The interface circuit connects directly to the expansion edge connector on the keyboard or to the screen printer port on the expansion interface. (Do not use the RS-232C port on the expansion interface, as it is keyed differently.)

Photo 1 shows the interface unit itself. The cabinet is an experimenter's box (Radio Shack #220-224). The schematic diagram is shown in Fig. 1. Figure 2 is the schematic of the power supply.

Under static conditions the ambient light striking the photo resistors (PR-1 through PR-4) reduces their resistance to about 100 ohms. This causes one leg of each AND gate (IC-3) to go low. Address lines A1-A4 hold the other leg of each gate high.

The low on each photo resistor is applied to the input of IC1 and IC2. When the TRS-80 inputs data from the data bus these lows

are applied to data lines D1-D4. Data lines D0 and D5-D7 are not used. Therefore, they are held low by permanent grounds on the inputs to IC1 and IC2. The low signals on the data lines represent static conditions (decimal 0).

Let's assume a car crosses over the photo resistor in lane 1. The car prevents light from striking the photo resistor, causing the resistance of the photo resistor to increase immediately to several thousand ohms. This increase in resistance replaces the low signal on IC1 pin 1 with a high signal. Pin 2 is already high, so the high on pin 1 is passed by IC3 to IC1 pin 14.

When the program directs the TRS-80 to

The Key Box

Model I
16K, 32K RAM
Cassette or Disk Basic
Electronic components

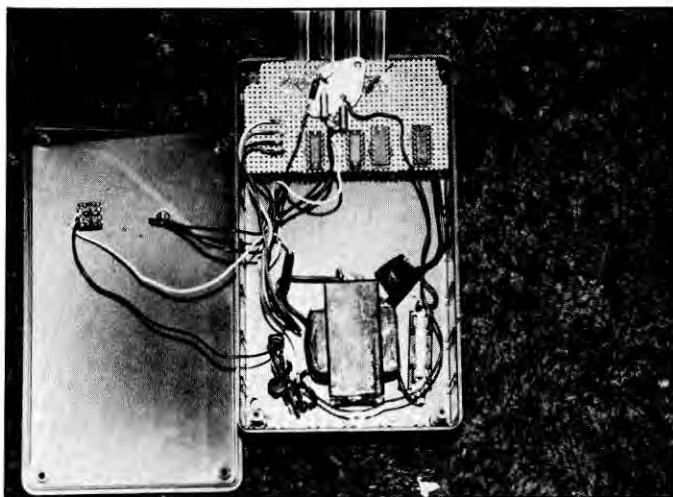


Photo 1. Closeup of interface board. Wiring is not critical.

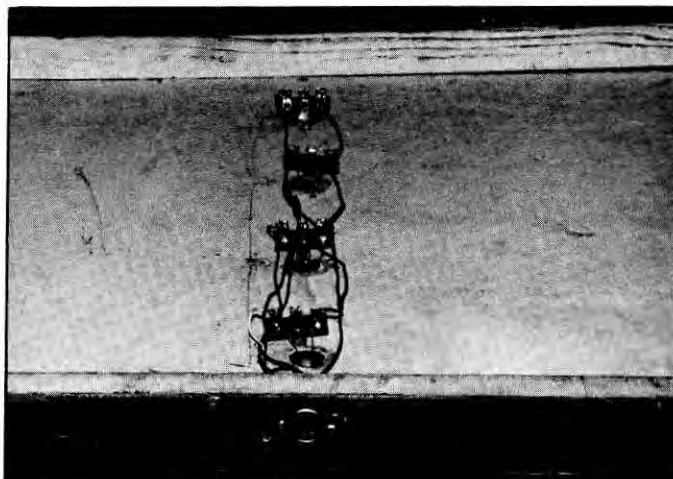


Photo 2. Bottom of the race track showing wiring of the photo resistors. J2 is mounted on the side of the track.

input data from the expansion port the (IN) signal line (pin 19 of the edge connector) goes low enabling IC1 and IC2 (74LS367s). IC1 applies the high from pin 14 to the TRS-80 data bus line D1.

Construction

Photo 1 shows the circuit board and power-supply components. Photo 2 shows the photo resistor installation in the end of the track. (I used Radio Shack #276-116 resistors.)

One word of caution here: The resistors come in two case styles. The black plastic case makes installation easier—just drill a hole in the center of each lane of the track and glue the resistors in with epoxy or white glue. The other case style is metal with a lip around the lower rim. This lip must be ground off so the resistor will fit snug in the hole. You must be extremely careful when grinding or the resistor will be damaged. J1 and J2 (Fig. 1) are Radio Shack DIN connectors (#274-005). P1 and P2 are the matching plugs (#274-003).

Software

The Basic program is shown in the Listing. Line 260 checks to see if the interface power is turned on. Lines 270 and 280 allow four inputs, one for each lane of the track.

Lines 290-370, the heart of the program, determine the position in which each car finishes. For example, line 290 looks at port 1 for input, and assigns any non-zero value to variable E1. (An input of zero represents static conditions; therefore, the TRS-80 continues to look at port 1 until it sees a non-zero value.)

Line 300 prints a non-zero value on the screen. (Printing the value of E1 normally has no use since during a race the values of all four tracks are printed and erased by the print routine of line 410 before you can read them. I put this feature into the program to be sure I wired the cable between the inter-

face and track correctly.)

Line 310 checks to be sure the interface power is on.

Once a car has been detected, line 320 looks to the expansion port for an input, but instead of looking at port 1 it looks at a port whose value is determined by the value of E1.

Let's continue with our assumption that a car had crossed in lane 1. Data line D1 is high as a result of the increase in the resistance of the photo resistor (PR1). A high on data line D2 represents a decimal value of two to the TRS-80; therefore, if E1 equals two line 310 looks at port 2 for its input. As a result, address line A1 goes high to address port 2.

Address/Data line	Decimal value
A7/D7	128
A6/D6	64
A5/D5	32
A4/D4	16
A3/D3	8
A2/D2	4
A1/D1	2
A0/D0	1

Table 1. Decimal values seen by the computer can be determined by adding the decimal values of any lines with highs on them.

When A1 goes high the high is applied to the input of an inverter (IC4). The low from the inverter is applied to one leg of IC3, blocking any further input from lane 1.

The purpose is to prevent the computer from printing erroneous race results. For example, suppose the car in lane 1 leads a car in lane 3 by only a quarter of an inch. If the input is not turned off as soon as the computer detects it, the computer would see both cars at the same time. By removing the input from lane 1 as soon as the computer sees car 1, the computer only sees car 3 when it crosses.

When car 3 crosses, the signal flow from the photo resistor is the same as previously discussed for lane 1 except data line D3 is now high. A high on D3 represents decimal eight, so variable E2 is assigned the value eight.

Table 1 shows how to calculate the decimal value from a high on an address or data line. Line 330 prints the eight on the screen, adds E1 to E2 (two plus eight), and assigns the total (10) to E5. Line 330 also checks to see if all four lanes have been blocked (all cars in). If so, control jumps to line 410, the print routine.

Line 340 looks at the expansion port again, using the value of E5 (decimal 10) to determine the port number. Referring to Table 1 we can see that address lines A1 and A3 must be high to enable port 10. As be-

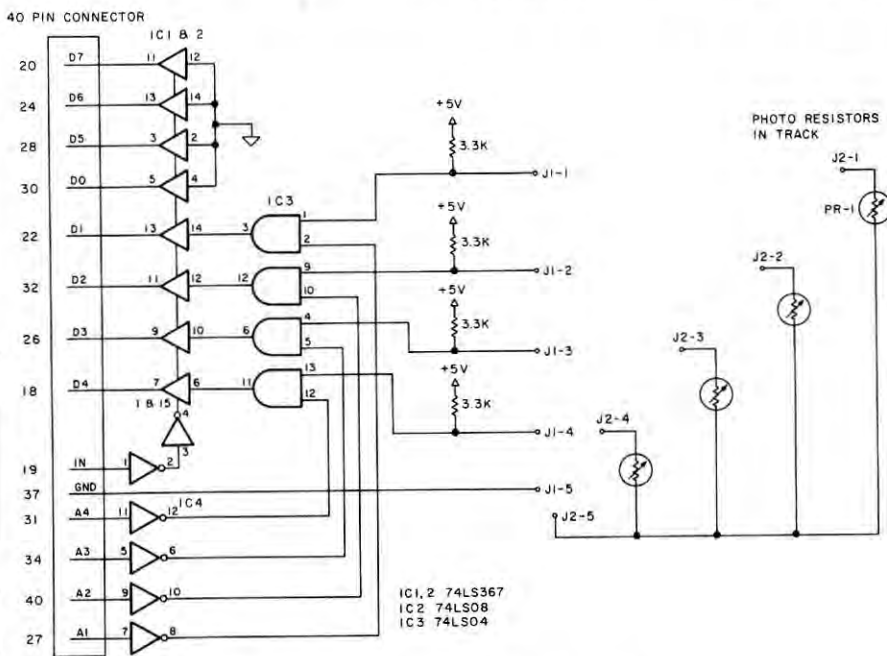


Fig. 1. Schematic Diagram of Interface Unit

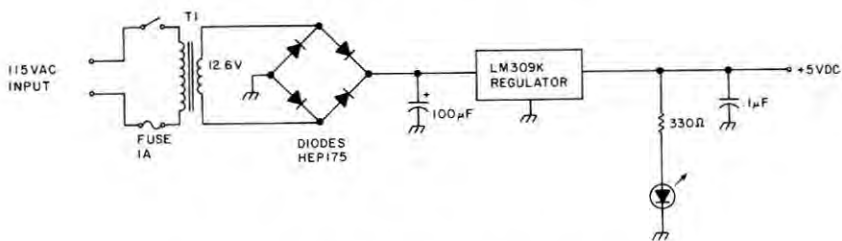


Fig. 2. Schematic Diagram of Power Supply

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fore, these lines are inverted by IC4 blocking any further input from lanes 1 and 3.

Let's now assume that the last two cars tie for third. A high on lanes 2 and 4 sends data lines D2 and D4 high. The TRS-80 sees a decimal 20 (4 plus 16), and assigns this value to E3. Line 350 prints the value (20) on the screen and assigns E6 the total value of E3 plus E5 (10 plus 20). Since 30 represents all cars, control jumps to the video print routine starting in line 410.

The video print routine is contained in

lines 410-880, and the line-printer routine in lines 950-1390.

Lines 1400-1460 draw a line of equal signs after each fourth heat to separate the races. Each car runs in a different lane in each heat, giving each car an equal opportunity.

Conclusion

My TRS-80 has performed perfectly in two races. It is accurate in even the closest finish! ■

Program Listing

```

10 CLEAR100
20 B$="
30 CLS:POKE16553,255:FORI=0TO63:POKE15360+I,191:POKE16320+I,191:
NEXTI
40 FORI=0TO15:POKE(15360+I*64),191:POKE(15423+I*64),191:NEXTI
50 GOSUB180:GOSUB140:GOSUB100
60 PRINT@856,"FEBURARY 1979";
70 PRINT@207,"B Y S T U A R T A. C O L E ";
80 GOSUB170:GOSUB170
90 CLS:GOTO220
100 READA$:PRINT@401,A$;
110 READA$:PRINT@535,A$;
120 READA$:PRINT@728,A$;
130 RETURN
140 PRINT@386,B$;
150 PRINT@514,B$;
160 RETURN
170 FORI=1TO1000:NEXTI:RETURN
180 FORI=1TO250:NEXTI:RETURN
190 DATA" P I N E W O O D D E R B Y "
200 DATA" J U D G E 8 0 "
210 DATA" 16K LEVEL II "
220 CLS:H=1
230 INPUT"ENTER TODAY'S DATE(FEB/26/1979)";D$
240 CLS:N=1
250 PRINT"HEAT #";H:PRINT
260 E=INP(0):IF E=255 THEN PRINT"TURN INTERFACE POWER ON"
270 PRINT"ENTER CAR# FOR LANE";N;:INPUTA(N)
280 N=N+1:IFN<5THEN270
290 E1=INP(1):IF E1=0 THEN 290
300 PRINT E1:IF E1=30 THEN410
310 IF E1=255 THEN 380
320 E2=INP(E1):IF E2=0 THEN 320
330 PRINT E2:E5=E1+E2:IFE5=30THEN410
340 E3=INP(E5):IFE3=0THEN340
350 PRINTE3:E6=E5+E3:IFE6=30THEN410
360 E4=INP(E6):IF E4=0 THEN 360
370 PRINT E4:GOTO410
380 CLS:FOR IE=1TO 10:PRINT@460,"T U R N I N T E R F A C E P
O W E R O N !":FOR K=1TO100:NEXT K
390 PRINT@460,"
FOR K=1 TO 100:NEXTK,IE
400 E=INP(0):IF E=255 THEN 380 ELSE 290
410 CLS:PRINT@79,"THE OFFICIAL PACK 304 PINEWOOD DERBY HEAT RESU
LTS"
420 PRINT@143,"FOR HEAT #";H;TAB(54);D$
430 A$="CAR #":B$="TIE BETWEEN CARS":C$="TIE BETWEEN ALL CARS FO
R FIRST"
440 P1$="FIRST":P2$="SECOND":P3$="THIRD":P4$="FOURTH"
450 IFE1=16PRINT@256,A$;A(4);P1$:GOTO490
460 IFE2=16PRINT@384,A$;A(4);P2$:GOTO490
470 IFE3=16PRINT@512,A$;A(4);P3$:GOTO490
480 IFE4=16PRINT@640,A$;A(4);P4$
490 IFE1=8PRINT@256,A$;A(3);P1$:GOTO530
500 IFE2=8PRINT@384,A$;A(3);P2$:GOTO530
510 IFE3=8PRINT@512,A$;A(3);P3$:GOTO530
520 IFE4=8PRINT@640,A$;A(3);P4$
530 IFE1=4PRINT@256,A$;A(2);P1$:GOTO570
540 IFE2=4PRINT@384,A$;A(2);P2$:GOTO570
550 IFE3=4PRINT@512,A$;A(2);P3$:GOTO570
560 IFE4=4PRINT@640,A$;A(2);P4$
570 IFE1=2PRINT@256,A$;A(1);P1$:GOTO610
580 IFE2=2PRINT@384,A$;A(1);P2$:GOTO610
590 IFE3=2PRINT@512,A$;A(1);P3$:GOTO610
600 IFE4=2PRINT@640,A$;A(1);P4$
610 IFE1=6PRINT@256,B$;A(1);"AND";A(2);"FOR ";P1$:GOTO640
620 IFE2=6PRINT@384,B$;A(1);"AND";A(2);"FOR ";P2$:GOTO640
630 IFE3=6PRINT@512,B$;A(1);"AND";A(2);"FOR ";P3$

```

Listing continues

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The COMMunications part is the smart terminal software to compliment the HAYES SMARTMODEM in ease of use and overall efficiency. A thorough and easy to use MENU enables verification of all program features without being unclear or confusing as to the intent. A quickscan MINI-MANUAL is always available (on the screen) for further reference or clarification. An AUTO-DIAL/LOGON feature allows the kind of use the SMARTMODEM was made for. There is also a 38 K CAPTURE BUFFER and DOS commands and a FILE EDITOR feature. SPECIAL characters can be generated from the keyboard as well as full control of the transmitting speed rate. A zero ELAPSED TIME clock will keep you informed as will the VIEW STATUS feature and the quickscan of a HELP file. Printer, RS-232 and ECHO toggles plus a WARM RESTART will keep you in control of all the capabilities COMMCOMP is currently running under TRSDOS, NEWDOS-80 and DOSPLUS commands, and together with the SMARTMODEM makes an unbeatable combination.

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Listing continued

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640 IFE1=10PRINT@256,B$,A(1);"AND";A(3);"FOR ";P1$:GOTO670
650 IFE2=10PRINT@384,B$,A(1);"AND";A(3);"FOR ";P2$:GOTO670
660 IFE3=10PRINT@512,B$,A(1);"AND";A(3);"FOR ";P3$
670 IFE1=18PRINT@256,B$,A(1);"AND";A(4);"FOR ";P1$:GOTO700
680 IFE2=18PRINT@384,B$,A(1);"AND";A(4);"FOR ";P2$:GOTO700
690 IFE3=18PRINT@512,B$,A(1);"AND";A(4);"FOR ";P3$
700 IFE1=12PRINT@256,B$,A(2);"AND";A(3);"FOR ";P1$:GOTO730
710 IFE2=12PRINT@384,B$,A(2);"AND";A(3);"FOR ";P2$:GOTO730
720 IFE3=12PRINT@512,B$,A(2);"AND";A(3);"FOR ";P3$
730 IFE1=20PRINT@256,B$,A(2);"AND";A(4);"FOR ";P1$:GOTO760
740 IFE2=20PRINT@384,B$,A(2);"AND";A(4);"FOR ";P2$:GOTO760
750 IFE3=20PRINT@512,B$,A(2);"AND";A(4);"FOR ";P3$
760 IFE1=24PRINT@256,B$,A(3);"AND";A(4);"FOR ";P1$:GOTO790
770 IFE2=24PRINT@384,B$,A(3);"AND";A(4);"FOR ";P2$:GOTO790
780 IFE3=24PRINT@512,B$,A(3);"AND";A(4);"FOR ";P3$
790 IFE1=14PRINT@256,B$,A(1);",";A(2);"AND";A(3);"FOR ";P1$:GOTO
810
800 IFE2=14PRINT@384,B$,A(1);",";A(2);"AND";A(3);"FOR ";P2$
810 IFE1=28PRINT@256,B$,A(2);",";A(3);"AND";A(4);"FOR ";P1$:GOTO
830
820 IFE2=28PRINT@384,B$,A(2);",";A(3);"AND";A(4);"FOR ";P2$
830 IFE1=22PRINT@256,B$,A(1);",";A(2);"AND";A(4);"FOR ";P1$:GOTO
850
840 IFE2=22PRINT@384,B$,A(1);",";A(2);"AND";A(4);"FOR ";P2$
850 IFE1=26PRINT@256,B$,A(1);",";A(3);"AND";A(4);"FOR ";P1$:GOTO
870
860 IFE2=26PRINT@384,B$,A(1);",";A(3);"AND";A(4);"FOR ";P2$
870 IFE1=30PRINT@256,C$
880 PRINT@768,"DO YOU WANT A HARD COPY?"
890 I$=INKEY$:IFI$=""THEN890
900 IFI$="N"THEN930
910 IFI$<>"Y"THEN930
920 IFPEEK(14312)<128GOSUB950 ELSE880
930 PRINT@768,"PRESS ENTER WHEN READY FOR NEXT HEAT"
940 INPUTR:CLS:H=H+1:GOTO240
950 IFH=1LPRINTCHR$(15)CHR$(14)"THE OFFICIAL PACK 304 PINWOOD D
ERBY HEAT RESULTS":LPRINTCHR$(18):LPRINTTAB(29);D$
960 IFH=1LPRINT:LPRINT
970 LPRINTTAB(30);"HEAT #";H
980 LPRINT:LPRINT
990 IFE1=30LPRINTC$:GOTO1430
1000 IFE1=16LPRINTA$:A(4);P1$:GOTO1130
1010 IFE1=8LPRINTA$:A(3);P1$:GOTO1130
1020 IFE1=4LPRINTA$:A(2);P1$:GOTO1130
1030 IFE1=2LPRINTA$:A(1);P1$:GOTO1130
1040 IFE1=6LPRINTB$:A(1);"AND";A(2);"FOR ";P1$:GOTO1130
1050 IFE1=10LPRINTB$:A(1);"AND";A(3);"FOR ";P1$:GOTO1130
1060 IFE1=18LPRINTB$:A(1);"AND";A(4);"FOR ";P1$:GOTO1130
1070 IFE1=12LPRINTB$:A(2);"AND";A(3);"FOR ";P1$:GOTO1130
1080 IFE1=20LPRINTB$:A(2);"AND";A(4);"FOR ";P1$:GOTO1130
1090 IFE1=24LPRINTB$:A(3);"AND";A(4);"FOR ";P1$:GOTO1130
1100 IFE1=14LPRINTB$:A(1);",";A(2)"AND"A(3);"FOR ";P1$:GOTO1130
1110 IFE1=28LPRINTB$:A(2);",";A(3)"AND"A(4);"FOR ";P1$:GOTO1130
1120 IFE1=26LPRINTB$:A(1);",";A(3)"AND"A(4);"FOR ";P1$
1130 IFE2=16LPRINTA$:A(4);P2$:GOTO1260
1140 IFE2=8LPRINTA$:A(3);P2$:GOTO1260
1150 IFE2=4LPRINTA$:A(2);P2$:GOTO1260
1160 IFE2=2LPRINTA$:A(1);P2$:GOTO1260
1170 IFE2=6LPRINTB$:A(1);"AND";A(2);"FOR ";P2$:GOTO1260
1180 IFE2=10LPRINTB$:A(1);"AND";A(3);"FOR ";P2$:GOTO1260
1190 IFE2=18LPRINTB$:A(1);"AND";A(4);"FOR ";P2$:GOTO1260
1200 IFE2=12LPRINTB$:A(2);"AND";A(3);"FOR ";P2$:GOTO1260
1210 IFE2=20LPRINTB$:A(2);"AND";A(4);"FOR ";P2$:GOTO1260
1220 IFE2=24LPRINTB$:A(3);"AND";A(4);"FOR ";P2$:GOTO1260
1230 IFE2=14LPRINTB$:A(1);",";A(2)"AND"A(3)"FOR ";P2$:GOTO1260
1240 IFE2=28LPRINTB$:A(2);",";A(3)"AND"A(4)"FOR ";P2$:GOTO1260
1250 IFE2=26LPRINTB$:A(1);",";A(3)"AND"A(4)"FOR ";P2$
1260 IFE3=16LPRINTA$:A(4);P3$:GOTO1360
1270 IFE3=8LPRINTA$:A(3);P3$:GOTO1360
1280 IFE3=4LPRINTA$:A(2);P3$:GOTO1360
1290 IFE3=2LPRINTA$:A(1);P3$:GOTO1360
1300 IFE3=6LPRINTB$:A(1);"AND";A(2);"FOR ";P3$:GOTO1360
1310 IFE3=10LPRINTB$:A(1);"AND";A(3);"FOR ";P3$:GOTO1360
1320 IFE3=18LPRINTB$:A(1);"AND";A(4);"FOR ";P3$:GOTO1360
1330 IFE3=12LPRINTB$:A(2);"AND";A(3);"FOR ";P3$:GOTO1360
1340 IFE3=20LPRINTB$:A(2);"AND";A(4);"FOR ";P3$:GOTO1360
1350 IFE3=24LPRINTB$:A(3);"AND";A(4);"FOR ";P3$
1360 IFE4=16LPRINTA$:A(4);P4$:GOTO1400
1370 IFE4=8LPRINTA$:A(3);P4$:GOTO1400
1380 IFE4=4LPRINTA$:A(2);P4$:GOTO1400
1390 IFE4=2LPRINTA$:A(1);P4$:GOTO1400
1400 FORX=4TOL00STEP4
1410 IFX=HLPRINT:LPRINTSTRING$(64,"="):GOTO1430
1420 NEXTX
1430 LPRINTCHR$(27)"C"CHR$(10);
1440 LPRINTCHR$(27)"B"CHR$(133)CHR$(128);
1450 LPRINTCHR$(139)
1460 RETURN
    
```


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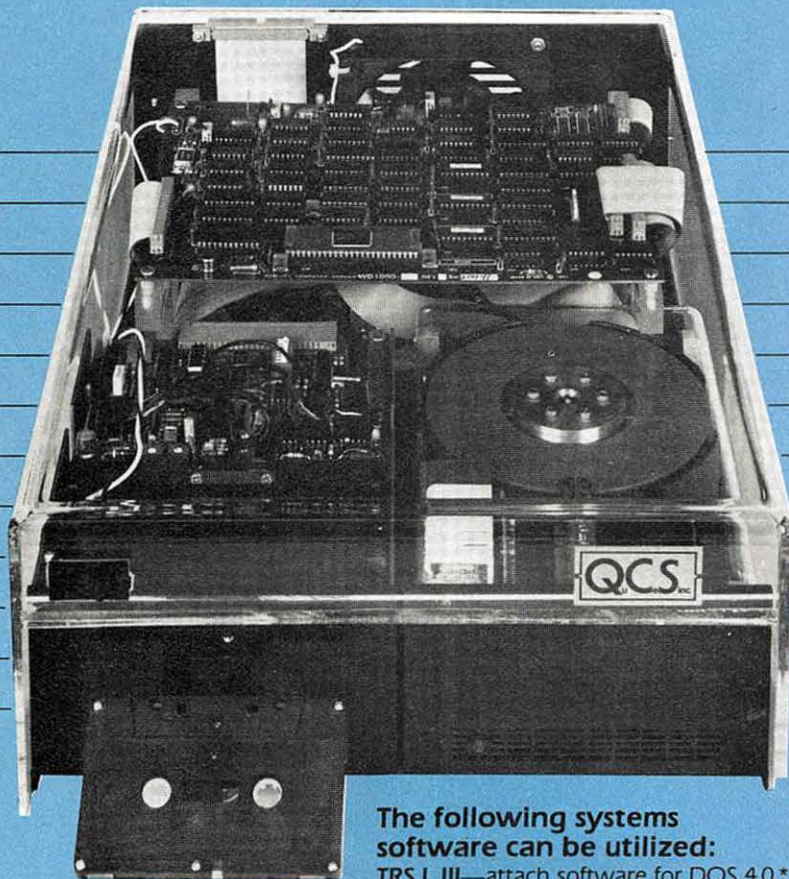
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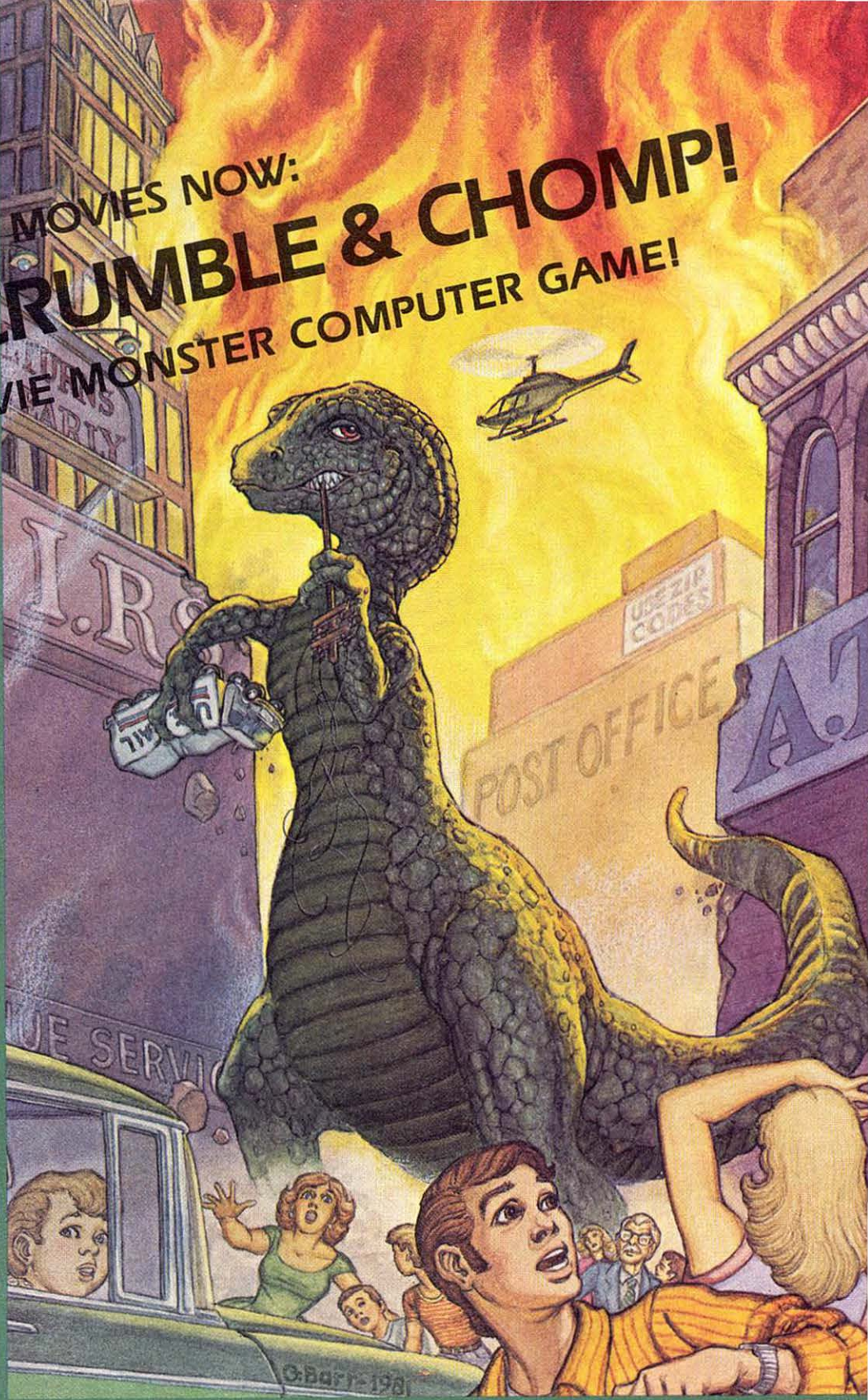
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Recently I was asked to serve as treasurer of my

church. One of my tasks is to prepare a detailed monthly summary of income and expenses. After I worked out an acceptable format with the financial committee members I wrote a program for my 16K Color Computer.

While this specific program (see Program Listing) is directly applicable only to our church you can easily adapt it to other situations. This program also illustrates some of the Extended Color Basic's more powerful features.

Program Listing

```

10 REM CHURCH FINANCIAL STATEMENT
20 CLEAR 1000
30 DA=6:DB=25
40 DIMCS(DA),D1(DA),D2(DA),D3(DA),ES(DA,5),E(DA,5),F(DA)
50 DIMGS(DB),H$(DB),R$(DB),S(DB),T$(DB,5),U(DB,5),DD(DA)
60 CLS
70 PRINT "BEGIN BY GETTING THE CHECK BOOK AND OTHER FINANCIAL RE
CORDS. THE PROGRAM WILL ASK FOR INPUT DATA."
80 LINE INPUT "DATE OF SUMMARY?";AS$
90 LINE INPUT "BEGINNING BALANCE?";BS:B=VAL(BS)
100 PRINT "INPUT INCOME DATA"
110 N=1
120 LINE INPUT "DATE OF DEPOSIT?";CS(N)
130 IPCS(N)=" GOTO 240
140 LINE INPUT "RECEIVED ON PLEDGE?";DS:D1(N)=VAL(DS)
150 LINE INPUT "OTHER CASH?";DS:D2(N)=VAL(DS)
160 LINE INPUT "CHURCH SCHOOL?";DS:D3(N)=VAL(DS)
170 K=1
180 LINE INPUT "SPECIAL-SOURCE?";ES(N,K)
190 IF ES(N,K)=" GOTO 220
200 LINE INPUT "SPECIAL-AMOUNT?";DS:E(N,K)=VAL(DS)
210 K=K+1:GOTO 180
220 LINE INPUT "CONFERENCE?";DS:F(N)=VAL(DS)
230 N=N+1:GOTO 120
240 LINE INPUT "PLEGGED FOR MONTH?";PS:P=VAL(PS):CLS
250 M=1
260 PRINT "INPUT CHECKS. USE FOLLOWING ACCOUNTS: <S>ALARY <R>
ENT <A>DVERTISING <O>FFICE SUPPLIES <E>QUIPMENT <T>ELEPHON
E <ED>UCATION <Y>OUTH <C>ONFERENCE<S1> SPECIAL 1 ETC."
270 LINE INPUT "CHECK NUMBER?";GS(M)
280 IF GS(M)=" GOTO 420
290 LINE INPUT "CHECK DATE?";H$(M)
300 LINE INPUT "PAYEE?";R$(M)
310 LINE INPUT "AMOUNT?";SS:S(M)=VAL(SS)
320 K=1
330 LINE INPUT "ACCOUNT #?";T$(M,K)
340 IF K>1 GOTO 380
350 LINE INPUT "ALL TO ACCOUNT:Y OR N?";XS
360 IF XS="N" GOTO 380
370 U(M,K)=S(M):GOTO 410
380 IPTS(M,K)=" GOTO 410
390 LINE INPUT "AMOUNT TO ACCOUNT?";US:U(M,K)=VAL(US)
400 K=K+1:GOTO 330
410 M=M+1:CLS:GOTO 260
420 N=N-1:M=M-1
430 FOR I=1:TON:D1=D1+D1(I):D2=D2+D2(I):D3=D3+D3(I):F=F+F(I):NEXT
440 FOR I=1:TON:S=S+S(I):NEXT
450 CLS
460 PRINT "ENTER PREVIOUS SPENDING"
470 LINE INPUT "SALARY?";XS:X1=VAL(XS)
480 LINE INPUT "RENT?";XS:X2=VAL(XS)
490 LINE INPUT "ADVERTISING?";XS:X3=VAL(XS)
500 LINE INPUT "OFFICE SUPPLIES?";XS:X4=VAL(XS)
510 LINE INPUT "EQUIPMENT?";XS:X5=VAL(XS)
520 LINE INPUT "TELEPHONE?";XS:X6=VAL(XS)
530 LINE INPUT "EDUCATION?";XS:X7=VAL(XS)
540 LINE INPUT "YOUTH?";XS:X8=VAL(XS)
550 LINE INPUT "CONFERENCE?";XS:Y1=VAL(XS)
560 LINE INPUT "SPECIAL 1?";XS:Y2=VAL(XS)
570 LINE INPUT "SPECIAL 2?";XS:Y3=VAL(XS)
580 LINE INPUT "SPECIAL 3?";XS:Y4=VAL(XS)
590 E=0
600 FOR I=1:TON:K=1:E=E+E(I,K)
610 K=K+1
620 IF ES(I,K)=" GOTO 630 E=E+E(I,K):GOTO 610
630 NEXT
640 D=D1+D2+D3+E+F
650 FOR I=1:TON
660 K=1
670 IPTS(I,K)="S"THEN V1=V1+U(I,K)
680 IPTS(I,K)="R"THEN V2=V2+U(I,K)
690 IPTS(I,K)="A"THEN V3=V3+U(I,K)
700 IPTS(I,K)="O"THEN V4=V4+U(I,K)
710 IPTS(I,K)="E"THEN V5=V5+U(I,K)
720 IPTS(I,K)="T"THEN V6=V6+U(I,K)
730 IPTS(I,K)="ED"THEN V7=V7+U(I,K)
740 IPTS(I,K)="Y"THEN V8=V8+U(I,K)
750 IPTS(I,K)="C"THEN W1=W1+U(I,K)
760 IPTS(I,K)="S1"THEN W2=W2+U(I,K)
770 IPTS(I,K)="S2"THEN W3=W3+U(I,K)
780 IPTS(I,K)="S3"THEN W4=W4+U(I,K)
790 K=K+1
800 IPTS(I,K)=" GOTO 820
810 GOTO 670
820 NEXT
830 FOR I=1:TON
840 K=1
850 DD(I)=D1(I)+D2(I)+D3(I)+F(I)
860 IPES(I,K)=" GOTO 890
870 DD(I)=DD(I)+E(I,K)
880 K=K+1:GOTO 860
890 NEXT
900 X1=X1+V1:X2=X2+V2:X3=X3+V3:X4=X4+V4:X5=X5+V5:X6=X6+V6:X7=X7+
V7:X8=X8+V8
910 Y1=Y1+W1:Y2=Y2+W2:Y3=Y3+W3:Y4=Y4+W4
920 WW=V1+V2+V3+V4+V5+V6+V7+V8+W1+W2+W3+W4
930 YY=X1+X2+X3+X4+X5+X6+X7+X8+Y1+Y2+Y3+Y4
940 CLS
950 PRINT "ARE ALL SPECIALS DESIGNATED?"
960 PRINT "TOTAL=";E
970 LINE INPUT "AMOUNT DESIGNATED?";WS;EE=VAL(WS)
980 D8=.2*(D1+D2):D9=.45*(D1+D2)

```

Listing continues

Our financial summary has several segments; an overview of each Sunday's income; comparison of expenses by category in the budget; and a summary of designated accounts. To use the program first enter income data and then enter data from the checkbook. Lastly enter data items from the previous summary. Then the program prints the financial summary (I use a Line Printer VII). You can print additional copies and produce a check list for the summary.

Before you type in the program type PCLEAR1 to clear sufficient memory.

Nuts and Bolts

In lines 10-50 variables DR and DB allow you to control memory assignment (DA is the number of deposits and DB is the number of checks).

Lines 60-240 allows entry of all income data. Income items for each deposit include pledge, other cash, church school, specials (amount and source), and conference. Pressing Enter with no entry produces the next prompt.

Lines 250-440 control entry of data from the church checkbook. Specific items include check number, check date, payee, amount, and account (a total of twelve are presently available). The user can allocate funds from one check to more than one account. To assist the user the screen contains the account designations for the entry of each check.

Lines 450-580 prompt the user to enter the spending history for the previous months using the past month's summary. To improve this program store this data in a file for input at a later date for next month's summary.

Lines 590-930 calculate various items for the final summary. For example, lines 650-820 prepare the monthly account summaries.

Lines 940-1070 prompt the user to input previous balances for three accounts (specials, benevolences and capital fund) using the past month's summary. The user can designate any special income for the month. The program automati-

cally adds a fixed percentage of income to the benevolence and capital fund accounts as a form of forced savings. The final step is to enter any distributions of these three accounts.

Lines 1080-1170 contain format statements for "PRINT#-2, USING".

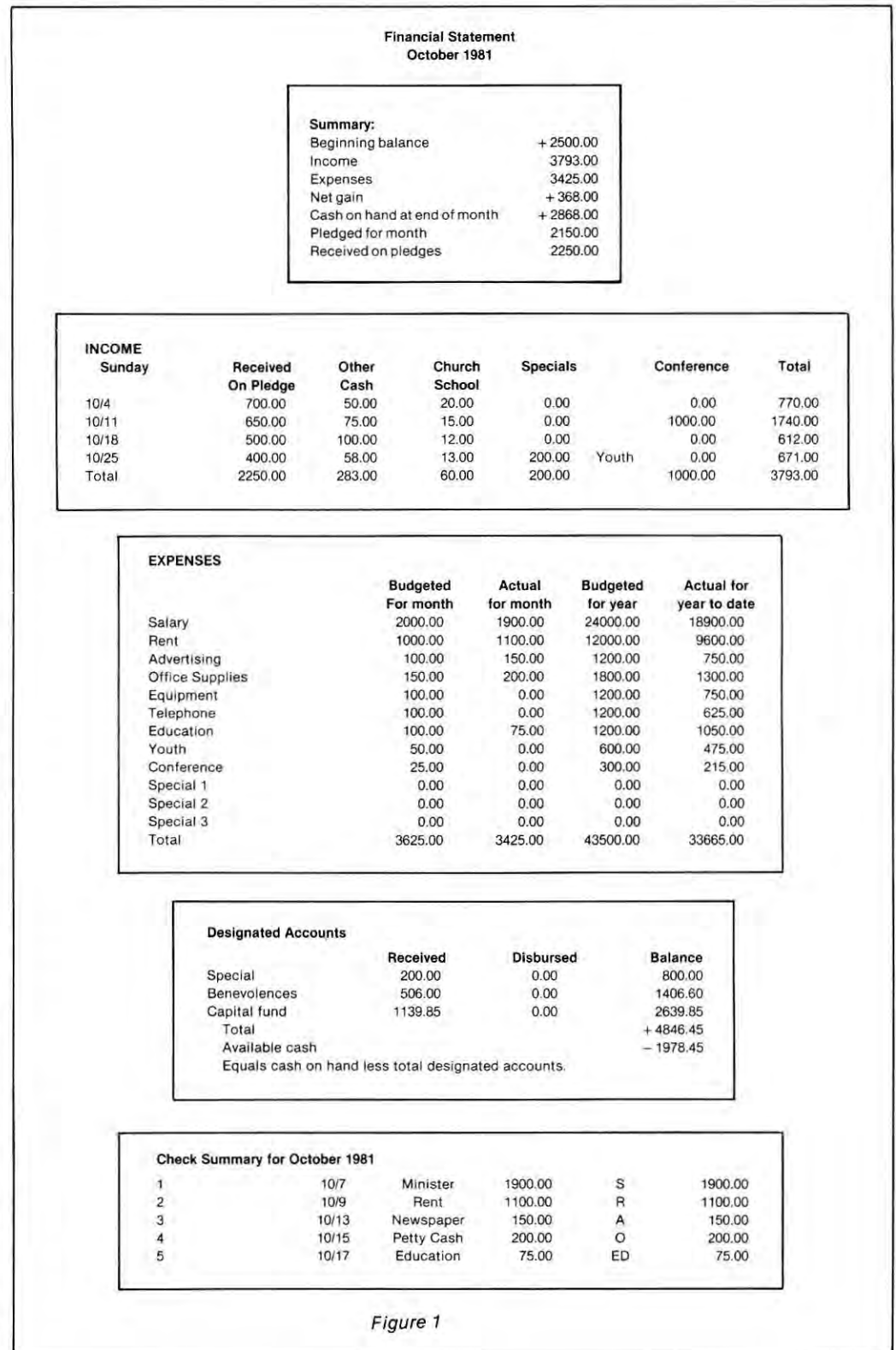
Lines 1180-1730 print the ac-

tual financial summary.

Lines 1740-1770 allow you to print an additional copy, produce a list of checks or exit the program.

Lines 1780-1880 produce a check list including check number, check date, payee, amount, account number and amount for each account. Figure 2 shows a typical output. ■

Mr. Sprouse has an MA degree in mathematics from the University of Arizona. He is an Operations Research Analyst for the U.S. Navy in San Diego. He serves as treasurer for his church and the condominium association where he lives.



Listing continues

```

990 LINE INPUT "PREVIOUS SPECIAL BAL?";WS;W5=VAL(WS)
1000 LINE INPUT "PREVIOUS BENEVOLENCES BAL?";WS;W6=VAL(WS)
1010 LINE INPUT "PREVIOUS CAPITAL FUND BAL?";WS;W7=VAL(WS)
1020 LINE INPUT "DISTRIBUTION-SPECIALS?";WS;W8=VAL(WS)
1030 W5=W5+EE-W8
1040 LINE INPUT "DISTRIBUTION-BENEVOLENCES?";WS;Y5=VAL(WS)
1050 W6=W6+D8-Y5
1060 LINE INPUT "DISTRIBUTION-CAPTIAL FUND?";WS;Y6=VAL(WS)
1070 W7=W7+D9-Y6;W9=W5+W6+W7;X=D-S;XX=B+X;XY=XX-W9
1080 AAS=" "
1090 AB$=" "
1100 ACS=" "
1110 AD$=" "
1120 AES=" "
1130 AFS=" "
1140 AG$=" "
1150 AH$=" "
1160 AIS=" "
1170 AJ$=" "
1180 LINE INPUT "POSITION PRINTER, KEY ENTER";WS
1190 PRINT#-2,TAB(10);"SCRIPPS MESA UNITED METHODIST CHURCH"
1200 PRINT#-2," "
1210 PRINT#-2,TAB(20);"FINANCIAL STATEMENT"
1220 PRINT#-2,TAB(25);A$
1230 PRINT#-2," "
1240 PRINT#-2,"SUMMARY:"
1250 PRINT#-2,USING AAS;"BEGINNING BALANCE";B
1260 PRINT#-2,USING ABS;"INCOME";D
1270 PRINT#-2,USING ABS;"EXPENSES";S
1280 IF X>0 THEN 1300
1290 PRINT#-2,USING AAS;"NET LOSS";X;GOTO 1310
1300 PRINT#-2,USING AAS;"NET GAIN";X
1310 PRINT#-2,USING AAS;"CASH ON HAND AT END OF MONTH";XX
1320 PRINT#-2," "
1330 PRINT#-2,USING ABS;"PLEGDED FOR MONTH";P
1340 PRINT#-2,USING ABS;"RECEIVED ON PLEDGES";D1
1350 PRINT#-2," "
1360 PRINT#-2,"INCOME"
1370 PRINT#-2," SUNDAY RECEIVED OTHER CHURCH SPECIALS
CONFERENCE TOTAL"
1380 PRINT#-2," ON PLEDGE CASH SCHOOL "
1390 FOR I=1TON;K=1
1400 IF ES(I,K)<>" THEN 1420
1410 E(I,K)=0

```

```

1420 PRINT#-2,USING ACS;CS(I);D1(I);D2(I);D3(I);E(I,K);ES(I,K);F
(I);DD(I)
1430 K=K+1
1440 IF ES(I,K)="" THEN 1470
1450 PRINT#-2,USING AD$;E(I,K);ES(I,K)
1460 GOTO 1430
1470 NEXT I
1480 PRINT#-2,USING AES;"TOTAL";D1;D2;D3;E;F;D
1490 PRINT#-2," "
1500 PRINT#-2,"EXPENSES"
1510 PRINT#-2,TAB(20);"BUDGETED ACTUAL BUDGETED ACTUAL FOR"
1520 PRINT#-2,TAB(20);"FOR MONTH FOR MONTH FOR YEAR YEAR TO DAT
E"
1530 PRINT#-2,USING AFS;"SALARY";2000.00;V1;24000.00;X1
1540 PRINT#-2,USING AFS;"RENT";1000.00;V2;12000.00;X2
1550 PRINT#-2,USING AFS;"ADVERTISING";100.00;V3;1200.00;X3
1560 PRINT#-2,USING AFS;"OFFICE SUPPLIES";150.00;V4;1800.00;X4
1570 PRINT#-2,USING AFS;"EQUIPMENT";100.00;V5;1200.00;X5
1580 PRINT#-2,USING AFS;"TELEPHONE";100.00;V6;1200.00;X6
1590 PRINT#-2,USING AFS;"EDUCATION";100.00;V7;1200.00;X7
1600 PRINT#-2,USING AFS;"YOUTH";50.00;V8;600.00;X8
1610 PRINT#-2,USING AFS;"CONFERENCE";25.00;V1;300.00;Y1
1620 PRINT#-2,USING AFS;"SPECIAL 1";0.00;W3;0.00;Y2
1630 PRINT#-2,USING AFS;"SPECIAL 2";0.00;W3;0.00;Y3
1640 PRINT#-2,USING AFS;"SPECIAL 3";0.00;W4;0.00;Y4
1650 PRINT#-2,USING AFS;"TOTAL";3625.00;WW;43500.00;YY
1660 PRINT#-2," "
1670 PRINT#-2," DESIGNATED ACCOUNTS:"
1680 PRINT#-2,TAB(20);"RECEIVED DISBURSED BALANCE"
1690 PRINT#-2,USING AGS;"SPECIAL";EE;W8;W5
1700 PRINT#-2,USING AGS;"BENEVOLENCES";D8;Y5;W6
1710 PRINT#-2,USING AGS;"CAPITAL FUND";D9;Y6;W7
1720 PRINT#-2,USING AHS;" TOTAL";W9
1730 PRINT#-2,USING AHS;" AVAILABLE CASH";XY
1740 PRINT#-2," EQUALS CASH ON HAND LESS TOTAL DESIGNATED ACCOUN
TS"
1750 CLS:LINE INPUT "KEY A FOR A CHECK LIST OR R TO REPEAT SUMMA
RY";WS
1760 IF WS="R" THEN 1180
1770 IF WS="" THEN END
1780 LINE INPUT "POSITION PRINTER,KEY ENTER";WS
1790 PRINT#-2," CHECK SUMMARY FOR ";A$
1800 FOR I=1TON
1810 K=1
1820 PRINT#-2,USING AIS;GS(I);HS(I);RS(I);S(I);TS(I,K);U(I,K)
1830 K=K+1
1840 IF TS(I,K)="" THEN GOTO 1870
1850 PRINT#-2,USING AJS;TS(I,K);U(I,K)
1860 GOTO 1830
1870 NEXT
1880 GOTO 1750

```

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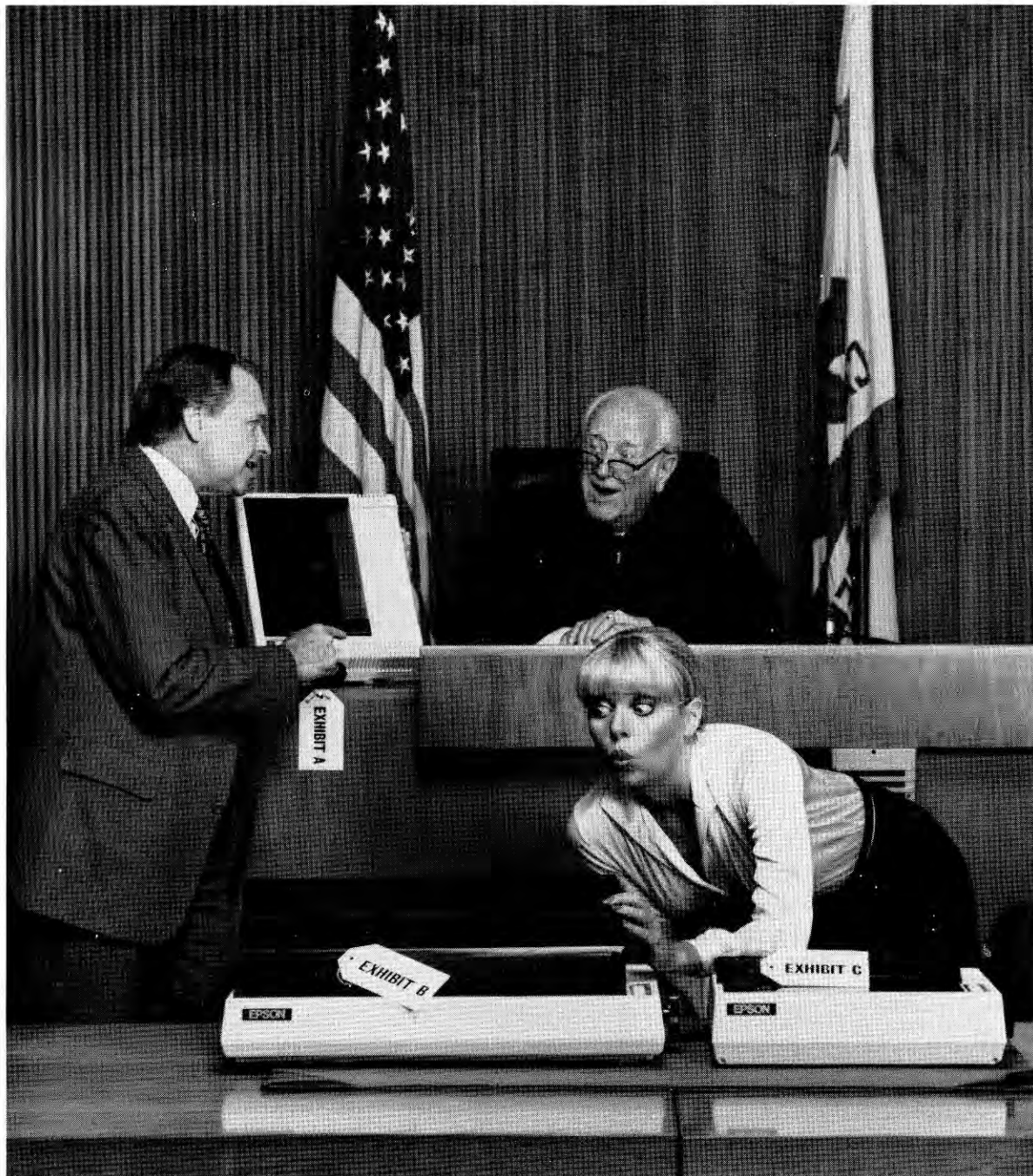
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DSAVE

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your favorite monitor program that resides in high memory.

● Using the data provided earlier by LMOFFSET, use the Write System Tape command to punch the file onto tape.

This process involves a lot of disk switching (especially for one drive users) and has some drawbacks. For example, many machine-language programs on the market reside below 7000H. Loading object files below 7000H is risky business, since some or all of DOS may be overwritten. It is interesting that many files loading around 5200H-6000H work as long as you execute that file, not load it.

When you execute your machine language file, DOS calls in and jumps to the needed load routines. But if you load the file, returning to a DOS Ready state, extra DOS routines are called in after loading to handle command processing. These routines overlap your file. Hence, never write machine language software for disk that resides below 7000H, the safe zone for disk-based systems.

The program you wish to modify or copy may reside where your monitor is, wiping it out. This often means that you will need some other version of your monitor program residing in a different portion of memory.

My Solution

DSAVE/CMD is an Assembly language program (see Program

Listing 1) that takes any machine language file on disk and punches it out on tape. Then you can load the program from cassette and it will perform like it did before. The formats of machine language software on disk

This type of loading allows any memory location to load independently of any other location (each record or "chunk" of bytes has its own starting address). This is how DOS is able to manage assembled files that may be

01 nn addr:	Load the following nn bytes starting at location address (stored in LSB, MSB format)
05 nn:	Skip the following nn bytes
02 02 addr:	Jump to location address

Table 1

01	10	00	70	(load the next 10H bytes starting at 7000H)
21	00	3C	11 01 3C 01 FF 03 36 BF ED B0 C3 0D 42	(the actual data)
02	02	00	70	(Jump to 7000H)

Table 2

Making a System tape out of any disk/CMD file is a slow and cautious process prone to human error. If you have a machine language program (let's call it SNOOPY/CMD) on disk that you wish to run on a friend's tape-based Model I, you might follow this procedure:

● Run NEWDOS LMOFFSET utility to find the starting, ending and entry points of SNOOPY/CMD.

● Load SNOOPY/CMD.

● Execute RSM2D48/CMD, or

The Key Box

Level II Basic
Model I
32K RAM
Any DOS
One disk drive
Cassette recorder

and tape differ, so I wanted DSAVE to do any conversion necessary.

Object files are not stored internally on disk. Instead, any machine language file is interspersed with control codes and data bytes necessary for DOS bookkeeping. Object files are stored on disk as follows: Loader code plus argument plus actual data plus transfer code plus execution address. Table 1 lists the codes.

Data is loaded in chunks of 256 bytes or less, meaning that the loader code/argument/data cycle is repeated until the entire file has been placed in memory.

ORGed by the assembler in more than one place. System format tapes also have this capability.

The skip code is interesting: When DOS encounters the 05 code, it skips the next nn bytes and continues processing. This allows you to embed hidden comments, copyright notices and the like within the file for informational purposes without actually changing the code loaded into memory.

The transfer code is always the last control code of any machine language file. After all has been loaded or skipped, the 0202 code tells DOS to jump to

the following address, thereby executing the program.

Program Listing 2 is a simple screen-zap routine. The actual code for this program is shown in the second column. On disk this code would be stored as shown in Table 2.

OK, that's simple enough. But if there is a hidden comment, it would look like this:

05 05 (Skip the following 5 bytes)
48 41 20 48 41 (ASCII for "HA HA")
01 10 00 70 (continue with the process as before)

Many DOS routines (notably the /SYS files) have sneaky messages. Each of these starts with code to skip over a copyright message following. Warning: The codes in Table 1 are the most common, used 99 percent of the time. However, the values of 00 and 03-1FH are also valid numbers for the skip code. The 02 02 code may have any byte after the first 02—the second byte is a place holder.

System Tapes

System format tapes are similar to the /CMD format files: Data is also recorded in 256 byte (or less) records with control codes embedded therein. The basic System format is: 255 zeroes plus A5H (leader and leader terminator) plus 55H sync byte plus six filename bytes plus 3CH record byte plus nn bytes to load plus load address plus data plus checksum plus 78H transfer code plus transfer address.

This may seem complex at first, but is really similar to the DOS format. The 255 zeroes and A5H make up the leader, whose purpose is to get the computer in tune with the tape before loading data. The 55H byte indicates the filename follows. The next six bytes make up the filename of the program, which is left justified and padded with blanks. The 3CH record byte serves the same purpose as DOS' 01H loader code, and starts off every data block. The next byte is the number of bytes to load, followed by the starting address of where to place the data (also in the same style as the DOS format). The actual data follows, followed by a one byte checksum of the data. The checksum byte is calculated by

Program Listing 1

```

00010 ;*****
00020 ;***          DSAVE          ***
00030 ;** /CMD TO SYSTEM FORMAT CONVERTER **
00040 ;** FOR DISK BASED MODEL I TRS-80'S **
00050 ;**          BY JOHN HODGSON   **
00060 ;**          COPYRIGHT (C) 1981 **
00070 ;**          TOP DOG SOFTWARE **
00080 ;**          134 LITTLEFIELD ROAD **
00090 ;**          MONTEREY, CALIF. 93940 **
00100 ;**          (408) 646-0940     **
00110 ;*****
07000 R          00120 ORG          07000H ;MEMSIZE=START-1 ; CALL WITH US

7000 31FE6F 00130 START LD          SP,START-2
7003 CDC901 00140 CALL         01C9H ;CLS
7006 215871 00150 LD          HL,HIMSG
7009 CD4671 00160 CALL         DISPLY
700C 219171 00170 DOIT LD          HL,FILMSG ;INPUT MESSAGE
700F CD4671 00180 CALL         DISPLY
7012 213672 00190 LD          HL,DCB
7015 0617 00200 LD          B,23
7017 CDD905 00210 CALL         5D9H ;INPUT
701A AF 00220 XOR          A ;TEST TO SEE IF ANY FILENAME
701B B0 00230 OR           B ;WAS ENTERED
701C 28EE 00240 JR           Z,DOIT ;GET IT RIGHT IF NOT
701E E5 00250 PUSH         HL
701F D1 00260 POP          DE ;DE NOW HAS DCB
7020 215672 00270 LD          HL,BUFFER
7023 0600 00280 LD          B,0 ;LRL=0
7025 CD2444 00290 CALL         4424H ;OPEN FILE
7028 C25071 00300 JP           NZ,ERROR1 ;DISK ERROR?
702B 115673 00310 LD          DE,STORAG ;MAIN STORAGE BUFFER
702E C5 00320 STLOOP PUSH        BC
702F D5 00330 PUSH        DE
7030 113672 00340 LD          DE,DCB
7033 CD3644 00350 CALL         4436H ;READ A SECTOR
7036 D1 00360 POP          DE ;RESTORE DESTINATION
7037 FE1C 00370 CP           1CH ;EOF?
7039 2813 00380 JR           Z,OUT
703B FE1D 00390 CP           1DH ;RECORD NOT FOUND?
703D 280F 00400 JR           Z,OUT
703F B7 00410 OR           A ;RESET FLAG
7040 C24F71 00420 JP           NZ,ERROR ;OTHERWISE, DISK ERROR
7043 215672 00430 LD          HL,BUFFER ;SOURCE BUFFER
7046 010001 00440 LD          BC,256 ;256 BYTE SECTORS
7049 EDB0 00450 LDIR         ;MOVE TO STORAGE AREA
704B C1 00460 POP          BC ;RESTORE SECTOR COUNT
704C 18E0 00470 JR           STLOOP
704E 113672 00480 OUT          LD          DE,DCB
7051 CD2844 00490 CALL         4428H ;CLOSE FILE
7054 C25071 00500 JP           NZ,ERROR1
7057 3A5673 00510 LD          A,(STORAG)
705A FE01 00520 CP           1 ;CORRECT FORMAT?
705C CA6470 00530 JP           Z,OK ;GUESS SO
705F FE05 00540 CP           5 ;SKIP CODE?
7061 C21571 00550 JP           NZ,STUPID ;WRONG FORMAT AFTER ALL

7064 213672 00560 OK          LD          HL,DCB
7067 0606 00570 LD          B,6
7069 3620 00580 CLEAR        LD          (HL),' ' ;CLEAR FILENAME
706B 23 00590 INC          HL
706C 10FB 00600 DJNZ         CLEAR
706E 21A671 00610 NOPE       LD          HL,ENTMSG ;"PRESS ENTER TO SAVE"
7071 CD4671 00620 CALL         DISPLY
7074 0606 00630 LD          B,6 ;6 BYTES MAX FOR FILENAME
7076 213672 00640 LD          HL,DCB
7079 CDD905 00650 CALL         5D9H
707C 7E 00660 LD          A,(HL) ;NO LEADING BLANKS, PLEASE
707D FE20 00670 CP           ' '
707F 28ED 00680 JR           Z,NOPE
7081 FE0D 00690 CP           0DH ;OR NULL FILENAMES
7083 28E9 00700 JR           Z,NOPE
7085 F3 00710 DI           ;NO INTERRUPTS FOR I/O
7086 AF 00720 YUP          XOR          A ;CASSETTE DRIVE 0
7087 CD1202 00730 CALL         212H
708A 3E2A 00740 LD          A,'*'
708C 323E3C 00750 LD          (3C3EH),A ;PUT ON ASTERISKS
708F 323F3C 00760 LD          (3C3FH),A
7092 CD8702 00770 CALL         287H ;WRITE LEADER & SYNC
7095 3E55 00780 LD          A,55H ;"SYSTEM" TAPE HEADER
7097 CD6402 00790 CALL         264H ;WRITE BYTE
709A 0606 00800 LD          B,6 ;6 BYTE FILENAME
709C 213672 00810 LD          HL,DCB
709F CD4371 00820 FLOOP       CALL         GETBYT
70A2 CD6402 00830 CALL         264H
70A5 10F8 00840 DJNZ         FLOOP

```

Listing 1 continues

Most Disk-Directories show only the filespecs plus some hard-to-understand superfluous information. Our

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Listing 1 continued

70A7	215673	00850		LD	HL,STORAG ;BUFFER TO DECODE
70AA	CD4371	00860	RELOOP	CALL	GETBYT ;GET LOADER CODE
70AD	FE01	00870		CP	1 ;OK TO LOAD?
70AF	280A	00880		JR	Z,NORMAL ;JUMP IF SO
70B1	FE02	00890		CP	2 ;END?
70B3	2838	00900		JR	Z,FINIS
70B5	FE05	00910		CP	5 ;SKIP?
70B7	284D	00920		JR	Z,SKIP ;SKIP X BYTES
70B9	185A	00930		JR	STUPID ;FUNNY CODE/WRONG FORMAT
70BB	3E3C	00940	NORMAL	LD	A,3CH ;START OF RECORD CODE
70BD	CD6402	00950		CALL	264H
70C0	CD4371	00960		CALL	GETBYT
70C3	3D	00970		DEC	A ;COMPENSATE FOR NOT
70C4	3D	00980		DEC	A ;COUNTING ADDRESS AS DATA
70C5	CD6402	00990		CALL	264H ;WRITE BYTE COUNT
70C8	47	01000		LD	B,A ;SET UP FOR LOOP
70C9	CD4371	01010		CALL	GETBYT ;GET LSB OF ADDRESS
70CC	5F	01020		LD	E,A
70CD	CD6402	01030		CALL	264H
70D0	CD4371	01040		CALL	GETBYT ;GET MSB
70D3	57	01050		LD	D,A
70D4	CD6402	01060		CALL	264H
70D7	83	01070		ADD	A,E
70D8	4F	01080		LD	C,A ;INITIALIZE CHECKSUM
70D9	CD4371	01090	FLOOP	CALL	GETBYT ;MAIN DATA LOOP
70DC	CD6402	01100		CALL	264H
70DF	81	01110		ADD	A,C ;COMPUTE CHECKSUM
70E0	4F	01120		LD	C,A
70E1	13	01130		INC	DE ;BUMP CHECKSUM ADDRESS
70E2	10F5	01140		DJNZ	FLOOP
70E4	79	01150		LD	A,C ;GET CHECKSUM
70E5	CD6402	01160		CALL	264H ;AND WRITE
70E8	CD2C02	01170		CALL	22CH ;BLINK *
70EB	18BD	01180		JR	RELOOP ;DO 'TIL DONE
70ED	CD4371	01190	FINIS	CALL	GETBYT ;DISCARD DUMMY BYTE
70F0	3E78	01200		LD	A,78H ;TRANSFER CODE
70F2	CD6402	01210		CALL	264H
70F5	CD4371	01220		CALL	GETBYT ;LSB OF TRANSFER ADDRESS
70F8	CD6402	01230		CALL	264H
70FB	CD4371	01240		CALL	GETBYT ;MSB OR TRANSFER
70FE	CD6402	01250		CALL	264H
7101	CDF801	01260		CALL	01F8H ;CASSETTE OFF
7104	1817	01270		JR	AGAIN ;RECOPY?
7106	CD4371	01280	SKIP	CALL	GETBYT ;GET BYTES TO SKIP
7109	47	01290		LD	B,A
710A	CD4371	01300	SKIPI	CALL	GETBYT ;& SKIP
710D	10FB	01310		DJNZ	SKIPI
710F	1899	01320		JR	RELOOP
7111	FB	01330	NOMORE	EI	;INTERRUPTS ON
7112	C32D40	01340		JP	402DH
7115	211D72	01350	STUPID	LD	HL,DUMB
7118	CD4671	01360		CALL	DISPLY
711B	18F4	01370		JR	NOMORE
711D	21C071	01380	AGAIN	LD	HL,COPMSG
7120	CD4671	01390		CALL	DISPLY
7123	CD2B00	01400	KYLOOP	CALL	2BH ;SCAN KYBD
7126	FE59	01410		CP	'Y' ;COPY AGAIN?
7128	2806	01420		JR	Z,FORSUR ;YEA, VERILY
712A	FE4E	01430		CP	'N' ;SAY THEE NAY?
712C	28E3	01440		JR	Z,NOMORE ;GUESS SO
712E	18F3	01450		JR	KYLOOP ;KEEP ON SCANNIN'
7130	CDC901	01460	FORSUR	CALL	01C9H ;CLS
7133	21DF71	01470		LD	HL,PMSG ;"PRESS ENTER"
7136	CD4671	01480		CALL	DISPLY
7139	CD2B00	01490	KYLP	CALL	2BH
713C	FE0D	01500		CP	0DH ;ENTER?
713E	20F9	01510		JR	NZ,KYLP ;WAIT 'TIL PRESSED
7140	C38670	01520		JP	YUP ;OTHERWISE, DO IT AGAIN
7143	7E	01530	GETBYT	LD	A,(HL)
7144	23	01540		INC	HL
7145	C9	01550		RET	
7146	7E	01560		LD	A,(HL)
7147	B7	01570	DISPLY	OR	A
7148	C8	01580		RET	Z
7149	CD3300	01590		CALL	33H
714C	23	01600		INC	HL
714D	18F7	01610		JR	DISPLY
714F	F1	01620	ERROR	POP	AF ;DUMMY POP
7150	21FC71	01630	ERRORI	LD	HL,ERRMSG
7153	CD4671	01640		CALL	DISPLY
7156	18B9	01650		JR	NOMORE
7158	0D	01660	HIMSG	DEFB	0DH
7159	44	01670		DEFM	'DSAVE VERSION 2.0 COPYRIGHT
					(C) 1981 T OP DOG SOFTWARE'
718E	0D0D	01680		DEFW	0D0DH
7190	00	01690		DEFB	0
7191	45	01700	FILMSG	DEFM	'ENTER FILESPEC ---> '

Listing 1 continues

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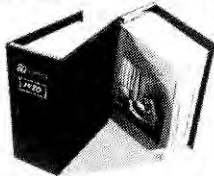
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Listing 1 continued

```

71A5 00      01710      DEFB      0
71A6 45      01720  ENTMSG  DEFM      'ENTER TAPE FILENAME ---> '
71BF 00      01730      DEFB      0
71C0 0D      01740  COPMSG  DEFB      0DH
71C1 44      01750      DEFM      'DO YOU WISH TO RECOPY? (Y/N) '
71DD 0D      01760      DEFB      0DH
71DE 00      01770      DEFB      0
71DF 50      01780  PMSG    DEFM      'PRESS =ENTER= TO WHEN READY'
71FA 0D      01790      DEFB      0DH
71FB 00      01800      DEFB      0
71FC 0D      01810  ERRMSG  DEFB      0DH
71FD 44      01820      DEFM      'DISK ERROR - FUNCTION ABORTED.'
721B 0D      01830      DEFB      0DH
721C 00      01840      DEFB      0
721D 0D      01850  DUMB    DEFB      0DH
721E 49      01860      DEFM      'INCORRECT FILE FORMAT!'
7234 0D      01870      DEFB      0DH
7235 00      01880      DEFB      0
0020      01890  DCB     DEFS      32
0100      01900  BUFFER  DEFS      256
7356      01910  STORAG  EQU       $
7000      01920      END      START
00000 TOTAL ERRORS
    
```

played next to the blinking asterisk on the screen. The record byte/data/checksum format is repeated until the entire program is loaded. DOS files of any type do not need checksum bytes, as the floppy disk controller performs error checking and checksumming. Unfortunately, Basic (CSAVE) and data tapes have none.

Just like DOS, the last code loaded is the 78H transfer code. The execution address follows, where the program is executed and the process is complete.

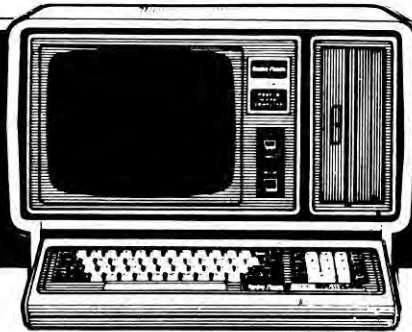
DSAVE/CMD's code has plenty of comments, so the flow of the program should become clear. DSAVE also writes /SYS files to tape, as the format for /SYS and /CMD files is basically the same. To use the program, just follow the prompts. DSAVE supports multiple copying as well as error checking for DOS errors and file format errors. Try converting a Basic or ASCII file and see what happens. Feel free to modify this program to fit your own needs. ■

```

7000      00100  START  ORG     7000H
7000  21003C  00110      LD      HL,3C00H ;VIDEO MEM LOC
7003  11013C  00120      LD      DE,3C01H ;VIDEO MEM +1
7006  01FF03  00130      LD      BC,3FFH ;BYTE COUNT
7009  36BF     00140      LD      (HL),0BFH ;WRITE A CHR$(191)
700B  EDB0     00150      LDIR   ;ZAP!!
700D  C30D42  00160      JP     402DH ;JUMP TO DOS
7000      00170  END    START
    
```

Program Listing 2

adding each data byte to the previous data byte, after initially adding the low order memory location of where it is supposed to go. This way, the computer calculates its own checksum byte from the loaded data block and compares it with the one on tape. If they differ, there has been a loading error and C is dis-



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by John L. Cranmer, Jr.

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Now you have a way to determine just how cold you will be on those frosty winter mornings.

values.

The first step in determining the equivalent temperature is the calculation of the heat loss from exposed skin due to the combined effects of wind speed and air temperature. The equation, as determined from human physiological studies, is:

$$H = ((33-T) \times (10.45 + (10 \times \sqrt{V}) - V))$$

where: H = heat loss in kcal/m²/hr

T = air temperature in degrees centigrade

V = wind speed in meters/sec

Once H has been calculated, you can calculate the equivalent temperature from the following equation:

$$ET = 33 - (H/22.034)$$

where: H = heat loss in kcal/m²/hr (from the first equation)

ET = equivalent temperature in degrees centigrade

The divisor (22.034) in the second equation has not been determined for a zero value of wind speed, but for a value of 4 mph (1.788 m/s)—the value that has been determined as the threshold value for windchill effects, and on which most published windchill charts are based.

Based upon the calculated value of H, another, more subtle evaluation of the conditions can be made. The follow-

VARIABLE	USE
A	UNITS FLAG 1: SYSTEM INTERNATIONALE 2: US SYSTEM
TF	TEMPERATURE (DEGREES FAHRENHEIT)
AT	TEMPERATURE (DEGREES CENTIGRADE)
VM	WIND VELOCITY (MILES PER HOUR)
V	WIND VELOCITY (METERS PER SECOND)
H	HEAT LOSS (kcal/m ² /hour)
TA	EQUIVALENT TEMPERATURE (DEGREES CENTIGRADE)
FT	EQUIVALENT TEMPERATURE (DEGREES FAHRENHEIT)
AS	DESCRIPTION OF OUTSIDE CONDITIONS BASED UPON HEAT LOSS RATE 'H'

Table 1

Program Listing

```

100 ' *****
110 ' *      TRS-80 MODEL III MICROCOMPUTER PROGRAM      *
120 ' *                                  TO DETERMINE      *
130 ' *      EQUIVALENT WIND CHILL TEMPERATURE          *
140 ' *      FROM WIND VELOCITY AND TEMPERATURE INPUTS  *
150 ' *
160 ' *      BY JOHN L. CRANMER, JR. P.E.                *

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Listing continues

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ing chart describes the weather conditions for the various values of H:

H	Weather Description
0-200	Hot
200-400	Pleasant
400-600	Cool
600-800	Very Cool
800-1,000	Cold
1,000-1,200	Very Cold
1,200-1,400	Bitterly Cold
1,400-2,000	Exposure Disagreeable
2,000-2,300	Exposure Dangerous
2,300-3,000	Survival Uncertain

The above descriptions are subjective evaluations and are averages for a number of subjects. Individuals will probably vary from this norm.

The program is designed for a Model III using Disk Basic, but it should also run on Level II, since none of the extra features of Disk Basic have been used. Lines 200-390 represent the input section of the program, with data being entered in either SI or US units (data entered in US units will be converted to SI for calculations). Lines 400-530 are the calculation portion of the program. Lines 540-660 are the output portion of the program and will display the output in the same units (SI or US) as entered. Line 410 represents the computer allowing for the threshold value of wind speed. The POKE command in line 200 is for the Model III only, as it controls the screen scroll protection. Table 1 lists the program variables and their corresponding units. ■

John Cranmer lives at P.O. Box 265, Van Horn, TX 79855.

Listing continued

```

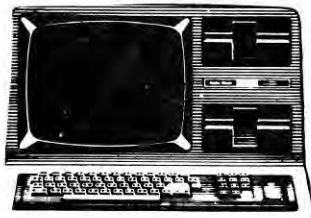
170 ' *                               VAN HORN, TEXAS                               *
180 ' *****
190 '
200 CLS:PRINT:POKE 16916,3
210 PRINT "          WIND CHILL FACTOR"
220 PRINT
230 PRINT "TEMPERATURE AND WIND VELOCITY CAN BE"
240 PRINT "ENTERED IN METRIC OR US UNITS"
250 PRINT "ENTER <1> FOR METRIC OR <2> FOR US"
260 INPUT A
270 IF A < 1 OR A > 2 THEN PRINT "TRY AGAIN":GOTO 250
280 IF A = 1 THEN GOTO 360
290 PRINT "ENTER AIR TEMPERATURE (DEGREES FAHRENHEIT)?"
300 INPUT TF
310 AT = (5 * (TF - 32))/9
320 PRINT "ENTER WIND VELOCITY (MILES PER HOUR)?"
330 INPUT VM
340 V = VM * .4470
350 GOTO 400
360 PRINT "ENTER AIR TEMPERATURE (DEGREES CENTIGRADE)?"
370 INPUT AT
380 PRINT "ENTER WIND VELOCITY (METERS PER SECOND)?"
390 INPUT V
400 H = (33 - AT)*(10.45 + (10 * SQR(V)) - V)
410 IF V <= 1.788 THEN TA = AT:GOTO 430
420 TA = 33 - (H/22.034)
430 IF A = 2 THEN FT = (9*TA/5) + 32
440 IF H > 0 AND H <= 200 THEN AS$ = "HOT"
450 IF H > 200 AND H <= 400 THEN AS$ = "PLEASANT"
460 IF H > 400 AND H <= 600 THEN AS$ = "COOL"
470 IF H > 600 AND H <= 800 THEN AS$ = "VERY COOL"
480 IF H > 800 AND H <= 1000 THEN AS$ = "COLD"
490 IF H > 1000 AND H <=1200 THEN AS$ = "VERY COLD"
500 IF H >1200 AND H <=1400 THEN AS$ = "BITTERLY COLD"
510 IF H >1400 AND H <=2000 THEN AS$ = "OUTSIDE EXPOSURE DISAGREE
ABLE"
520 IF H >2000 AND H <=2300 THEN AS$ = "OUTSIDE EXPOSURE DANGEROU
S"
530 IF H >2300 THEN AS$ = "OUTSIDE SURVIVAL UNCERTAIN"
540 CLS
550 IF A = 1 THEN GOTO 610
560 PRINT "OUTSIDE TEMPERATURE IS: ";TF;" DEGREES FAHRENHEIT"
570 PRINT "WIND VELOCITY IS: ";VM;" MILES PER HOUR"
580 PRINT
590 PRINT "EQUIVALENT OUTSIDE TEMPERATURE IS: ";:PRINT USING "##
##";FT;:PRINT " DEGREES FAHRENHEIT"
600 GOTO 650
610 PRINT "OUTSIDE TEMPERATURE IS: ";AT;" DEGREES CENTRIGRADE"
620 PRINT "WIND VELOCITY IS: ";V;" METERS PER SECOND"
630 PRINT
640 PRINT"EQUIVALENT OUTSIDE TEMPERATURE IS: ";:PRINT USING "###
#";TA;:PRINT " DEGREES CENTIGRADE"
650 PRINT "OUTSIDE CONDITIONS ARE: ";AS
660 END

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Supervisor calls and other tricks.

Getting the Most from the Model II

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Supervisor calls (SVCs), machine code subroutines hidden in inaccessible memory, are called by loading their number into the A register and performing a restart (RST 08H) instruction.

The TRS-80 Owner's Manual was little help when I tried to use these calls. Thankfully, Radio Shack shed some light on this subject by describing the use of USR commands from a Basic program and programming with SVCs in the May and August 1980 issues of *TRS-80 Micro-computer News*. The first article enabled me to selectively scroll

part of the screen and the second routine blocks the Break key, disallowing access and interruptions to my program. I have incorporated these two subroutines as well as two others into the top 84 bytes of user memory.

Break Disabler

This subroutine will disable the Break key and prevent access to the program and its disruption by accidental use. To enter, save, and call this program, follow these steps:

- After receiving the TRSDOS ready signal, type: DEBUG ON, then DEBUG.

- Enter the subcommand M A = EFEO, then press the F1 key.

- Enter the hex code into the displayed memory positions, as shown in Fig. 1.

- Press the F2 key, then S to

return to TRSDOS.

- Type: DUMP SETBRK/CIM START = EFEO, END = EFF3, TRA = EFE2, RORT = T then push Enter to save the program to disk.

- Type and enter DEBUG OFF.

- Type: BASIC —M:61100 to protect the segment of upper memory for the subroutines.

You may then test the subroutine by typing: SYSTEM "SETBRK/CIM" in a Basic program or directly in the command mode. Before invoking this routine Debug must be off or control will transfer to Debug.

The Assembly code listing for this short subroutine is Program Listing 1. In essence, it replaces the resident break-processing routine with a simple return instruction. There is currently no method to make the Break key work again using an SVC call. One must reset the computer to restore the Break key function.

Scroll Protection

Scroll protection is useful when displaying tables longer than 24 lines. Table headings remain in the USR-call-protected upper screen while the table values to scroll below.

This subroutine utilizes

SCROLL (SVC 27). The number of lines to be protected will be passed in the USR argument. The Debug hexadecimal input is shown in Fig. 2, and Program Listing 2 shows the Assembly listing. Enter:

- DEBUG ON <Enter>

- DEBUG <Enter>

- M A = EFDO

- Press F1

- Enter the hex codes shown in Fig. 2

- Press F2

- Press 'S'

- DUMP SCROLL/CIM START = EFDO, END = EFDC, RORT = R <Enter>

- BASIC —M:61100 <Enter>

The following program illustrates this utility:

```
10 SYSTEM "LOAD SCROLL/CIM"
20 DEFUSR0 = &HEFDO
30 CLS
40 X = USR0(2):REM Number of lines to
   protect = 2
50 PRINT @0, "TABLE HEADING"
```

	Page Length			Lines/Page			Width		
	Dec	Hex	ADDR	Dec	Hex	ADDR	Dec	Hex	ADDR
Form 1	66	42	EEBB	60	3C	EEBD	80	50	EEBF
Form 2	42	2A	EEC7	42	2A	EEC9	80	50	EECB
Form 3	....	....	EED3	....	....	EED5	....	....	EED7
Form 4	....	....	EEDF	....	....	EEE1	....	....	EEE3

Table 1. Parameter Definition. Values in first two formats are used as examples

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"Scroll protection is useful when displaying tables longer than 24 lines."

```
60 PRINT @ 80, STRING$(13, " = ")
70 FOR I = 1 TO 80
80 PRINT "VALUE";I
90 FOR J = 1 TO 100 : NEXT : REM
    Delay loop
100 NEXT
110 END
```

A CLS command will restore normal screen behavior.

Formatted Input

This subroutine controls operator input. It will prevent excessive input from overwriting screen directives; prevent screen format scrolling by an improper input; allow precise control of file fields by specifying length; and allow selective editing of string data.

The key to this subroutine is KBLINE (SVC 5). Its use is complicated, since it must be directed to a specific string memory storage location and must receive and return arguments to the BasicUSR statement. Program Listing 3 shows the Assembly program and Fig. 3 illustrates the Debug hexadecimal input. Enter the program into the proper memory locations as previously described. Save this program after receiving the TRSDOS ready prompt by typing: DUMP INPUT/CIM START = EF00, END = EF21, RORT = R. Again load Basic—M:61100 and test the subroutine with the following program:

```
10 SYSTEM "LOAD INPUT/CIM"
20 DEFUSR1 = &HEF00
30 CLS
40 INPUT "MAXIMUM LENGTH OF
    STRING FIELD";IL
50 INPUT "PRINT AT SCREEN LOCATION";IP
60 CLS
70 $$ = SPACES(IL)
80 PRINT @ IP,; X = USR1
    (VARPTR($$))
90 PRINT "NUMBER OF INPUT CHARACTERS,
    INCLUDING ENTER = "; X
100 PRINT "LENGTH OF STRING, INCLUDING
    TRAILING SPACES = "; LEN($$)
110 PRINT "PUSH ANY KEY TO CONTINUE";
120 IF INKEY$ = "" THEN 120
130 GOTO 30
```

Experiment with this program using the arrow keys; Control and X; Control and W; Escape; Backspace and Enter.

Unfortunately, there are a few

confining features to this subroutine. It can only be used for new data entry; a carriage return, automatically incorporated into the string, often destroys screen formats; and the control key effects go beyond the field length. To correct these limitations, the subroutine must be completely rewritten.

The Assembly program is shown in Program Listing 4 and its hex notation in Fig. 4. Carefully enter the code and save the subroutine with the TRSDOS command: DUMP INPUT2/CIM START = EF00, END = EFCC, RORT = R.

Now load Basic, again protecting memory above 61100, and enter Program Listing 5. This program will provide all the features promised above. Use the Edit function to replace single letters in the string by moving the cursor with the arrow keys; the escape key replaces the cursor to the beginning of the field. The string of periods denoting input position and length, no longer automatically printed by the subroutine (to allow for the Edit function), must be added to the Basic code (line 190).

In some applications, you may not wish to have trailing blanks. You can then use the information sent back to the USR routine in the X variable, for example: LEFT\$(S\$,X). Change line 3000 in Program Listing 5 to read: 3000 X = USR2(VARPTR(S\$)): ID\$(I) = LEFT\$(S\$,X). This modification will print a more respectable address label but will interfere with the Edit function.

The program is easily expanded to full-screen data entry by adding more data statements and increasing the final value in the For...Next loop (line 150). The INSTR function in line 240 forces proper INKEY\$ input and directs the On...GOTO command appropriately.

One cautionary note: the INPUT2/CIM subroutine will

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change string variables within the program line if they are defined as constants within quotes. To illustrate this, type in the following program:

```
10 SYSTEM "LOAD INPUT2/CIM"
20 DEFUSR2 = &HEF00
30 S$ = "MM/DD/YY"
40 CLS: PRINT @ 800, "INPUT DATE"; S$ :
   PRINT @ 811, ": X = USR2(VARPTR(S$))
50 LIST
```

Run this program a few times and note the S\$ variable in line 30 changes with different input. When the string variable is a constant, the VARPTR function points to the area of memory where the program line with the constant is stored, instead of to the string storage space in high RAM. This phenomenon allows string packing techniques in Level II. There may be beneficial uses, but in most cases it is undesirable. Now change line 30 to S\$ = CHR\$(77) + CHR\$(77) + CHR\$(47) + CHR\$(68) + CHR\$(68) + CHR\$(47) + CHR\$(89) + CHR\$(89) and rerun the program. If S\$ is set equal to SPACE\$(8), STRING\$(8,46), ..., the routines

will operate properly.

Forms Control

If you have a program using several sizes of printed forms, or if you are tired of answering the forms questions, this next subroutine is for you. Four different formats are available in the subroutine; switch from one to another by simply changing the argument in the USR command.

To construct this subroutine, first define your desired parameters (Table 1).

Next insert the hex values into the proper places of the program in Fig. 5. Enter the hex code into memory, then type: DUMP FORMS/CIM START = EEAD, END = EEF5, RORT = R. In the Basic program you must again provide for loading, identifying the entry point and USR number; for example:

```
10 SYSTEM "LOAD FORMS/CIM"
20 DEFUSR2 = &HEEAD
```

Easy changes in forms may then be made by: X = USR2(# of desired format). Of course, your

program must now prompt you to load the proper paper and adjust to top-of-form before executing the USR command. As Program Listing 6 indicates, line count and character count are reset to zero (top of form, left margin) when the USR call is executed.

Summary

If you use all these routines in a single program, combine them by following these steps:

- From TRSDOS Ready, type SETBRK/CIM and Enter.
- SCROLL/CIM and Enter.
- INPUT2/CIM and Enter.
- FORMS/CIM and Enter.
- DUMP SUBROU/CIM START

= EEAD, END = EEF5, TRA = EFE2, RORT = T and Enter.

- BASIC —M:61100 and Enter.
- Place the following at the beginning of the Basic program:

```
10 SYSTEM "SUBROU/CIM"
20 DEFUSR0 = &HEFD0
30 DEFUSR1 = &HEF00
40 DEFUSR2 = &HEEAD
```

- Use the USR commands as previously described and as required within the program. ■

La Verne Olney, a physician, is interested in medical applications of micros.

Program Listing 1. Assembly program for SETBRK/CIM.

Address	Hex Op codes	Z80 Mnemonics	Comments
EFE0	F3	F3	Stores RETurn address.
EFE1	EF	EF	
EFE2	21 00 00	LD HL,0000H	Remove prev. processing prog.
EFE5	3E 03	LD A,03H	Execute SETBRK SVC.
EFE7	CF	RST 08H	
EFE8	ED 5B E0 EF	LD DE, (EFE0H)	Store "RET" as new

Listing 1 continues

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Listing 1 continued

```

EFEC 22 E0 EF LD (EFE0H),HL BREAK-processing
EFEB EB EX DE,HL program.
EFF0 3E 03 LD A,03H Execute SETBRK SVC.
EFF2 CF RST 08H
EFF3 C9 RET Return to Basic.
  
```

```

TRS-80 Model II DEBUG Program .00.29.01.
EFEB F3 EF 21 00 00 3E 03 CF ED 5B E0 EF 22 E0 EF EB ...!..>...[""
EFF0 3E 03 CF C9 00 00 00 00 00 00 00 00 00 00 00 00 >.....
F000 23 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF #.....
F010 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF .....
F020 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF .....
F030 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF .....
F040 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
F050 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
PC SP SZHPNC AF BC DE HL IX IY AF' BC' DE' HL'
2800 21FE 000000 0000 0000 0000 0000 0000 0000 0000 0000 0000
? P
DEBUG is now ON
TRSDOS READY
DEBUG
  
```

Fig. 1. Hex code for SETBRK/CIM

```

TRS-80 Model II DEBUG Program .00.46.29.
EFD0 21 D8 EF E5 2A 03 28 E9 45 3E 1B CF C9 00 00 00 !...*(.E>.....
EFE0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
EFF0 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
F000 23 FF FF FF FF FF FF FF FF FF FF FF FF FF FF #.....
F010 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF .....
F020 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF .....
F030 FF FF FF FF FF FF FF FF FF FF FF FF FF FF FF .....
F040 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
PC SP SZHPNC AF BC DE HL IX IY AF' BC' DE' HL'
2800 21FE 000000 0000 0000 0000 0000 0000 0000 0000 0000 0000
? P
  
```

Fig. 2. Hex code for SCROLL/CIM

ADDRESS	HEX OP CODES	Z-80 MNEMONICS	COMMENTS
EFD0	21 D8 EF	LD HL,EFD8H	Save continuation
EFD3	E5	PUSH HL	address
EFD4	2A 03 28	LD HL,(2803H)	Convert USR argument
EFD7	E9	JP (HL)	to integer.
EFD8	45	LD B:L	# lines to protect.
EFD9	3E 1B	LD A,1BH	Execute SCROLL SVC.
EFD8	CF	RST 08H	
EFD8	C9	RET	Return to BASIC.

Program Listing 2. Assembly program for SCROLL/CIM

```

TRS-80 Model II DEBUG Program .01.02.19.
EF00 21 08 EF E5 2A 03 28 E9 46 23 5E 23 56 E8 3E 05 !...*(.F##V.>
EF10 CF 00 00 78 32 20 EF 2A 20 EF E5 2A 05 28 E3 C9 ...K2.*..*(.
EF20 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
EF30 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
EF40 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
EF50 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
EF60 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
EF70 00 00 00 00 00 00 00 00 00 00 00 00 00 00 .....
PC SP SZHPNC AF BC DE HL IX IY AF' BC' DE' HL'
2800 21FE 000000 0000 0000 0000 0000 0000 0000 0000 0000 0000
? P
  
```

Fig. 3. Hex code for INPUT/CIM

Program Listing 3. Assembly program for INPUT/CIM

ADDRESS	HEX OP CODES	Z-80 MNEMONICS	COMMENTS
EF00	21 08 EF	LD HL,EF08H	Save continuation
EF03	E5	PUSH HL	address.
EF04	2A 03 28	LD HL,(2803H)	Convert USR argument to

Listing 3 continues



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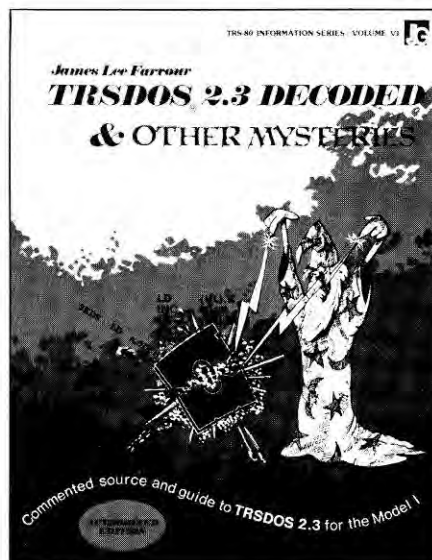
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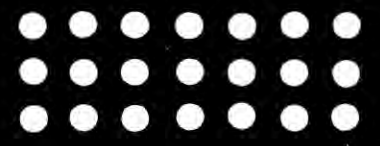
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Listing 3 Continued

EF07	E9	JP (HL)	integer.
EF08	46	LD B,(HL)	B = string length.
EF09	23	INC HL	Find memory location
EF0A	5E	LD E,(HL)	of string and put
EF0B	23	INC HL	address in HL.
EF0C	56	LD D,(HL)	
EF0D	EB	EX DE,HL	
EF0E	3E 05	LD A ,05H	KBLINE supervisor call.
EF10	CF	RST 08H	Do line input routine.
EF11	00	NOP	
EF12	00	NOP	
EF13	7B	LD A,B	Convert argument from
EF14	32 20 EF	LD (EF20H),A	routine to integer;
EF17	2A 20 EF	LD HL,(EF20H)	HL = # characters
EF1A	E5	PUSH HL	that were input.
EF1B	2A 05 28	LD HL,(2805H)	
EF1E	E3	EX (SP),HL	
EF1F	C9	RET	Return to BASIC.
EF20	00	NOP	Data storage.
EF21	00	NOP	

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```

TRS-80 Model II DEBUG Program                               .01.21.02.
EF00  21 08 EF E5 2A 03 28 E9  46 23 5E 23 56 EB C5 D5  !...*(.F##V...
EF10  E5 AF 8B 20 09 3E 03 B7  E1 D1 C1 C3 B1 EF 3E 01  ...>.....>
EF20  CF 48 C5 F5 01 FC 0E ED  41 DB FD F6 F8 57 04 ED  .H.....A...W..
EF30  41 DB FD 5F F1 C1 ED 53  88 EF 16 00 48 3E 04 CF  A...5...H>..
EF40  20 FB 78 FE 20 38 0D 3E  08 CF 70 23 14 0D 20 ED  .X. B.>...P#...
EF50  06 0D 18 04 FE 0D 20 03  42 18 51 FE 08 20 12 CD  .....B.Q...
EF60  BA EF 28 D9 06 2E 70 3E  08 CF 06 1C 3E 08 CF 18  ..(...P>...>
EF70  CC FE 1C 20 05 CD BA EF  18 C3 FE 1D 20 05 3E 08  .....>
PC  SP SZHPNC AF BC DE HL IX IY AF' BC' DE' HL'
2800 21FE 000000 0000 0000 0000 0000 0000 0000 0000 0000 0000 0000
? P
TRS-80 Model II DEBUG Program                               .01.42.51.
EF80  CF 18 C8 FE 18 20 1D 11  AA FD C5 F5 01 FC 0E 7A  ....>.....2
EF90  E6 07 ED 41 D3 FD 04 7B  ED 41 D3 FD F1 C1 E1 D1  ...A...I.A.....
EFA0  C1 C3 0E EF 70 06 7F 3E  08 CF 18 9F E1 D1 33 33  ...P>...>33
EFB0  AF 26 00 68 E5 2A 05 28  E3 C9 32 CB EF 7A B7 2B  .&.h.#.(.2..z.(
EFC0  09 0C 15 28 06 1C 3E 08  CF B0 3E 1C C9 00 00 00  ...+...>.....
EFD0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  .....
EFE0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  .....
EFF0  00 00 00 00 00 00 00 00  00 00 00 00 00 00 00 00  .....
PC  SP SZHPNC AF BC DE HL IX IY AF' BC' DE' HL'
2800 21FE 000000 0000 0000 0000 0000 0000 0000 0000 0000 0000
? P

```

Fig. 4. Hex code for INPUT2/CIM

```

TRS-80 Model II DEBUG Program
EEAD  21 B5 EE E5 2A 03 28 E9  7D FE 01 20 08 06 42 0E  !..*(.)...B.
EEBD  3C 16 50 18 22 FE 02 20  08 06 2A 0E 2A 16 50 18  <.P.'...'.*'.P.
EECD  16 FE 03 20 08 06 00 0E  00 16 00 18 0A FE 04 20  .....>.....>
EEDD  17 06 00 0E 00 16 00 3E  11 CF 06 03 0E 00 3E 5F  .....>.....>
EEED  CF 06 04 0E 00 3E 5F CF  C9 00 00 00 00 00 00 00  ...>.....
EEFD  00 00 00 74 FF FF FF FF  FF FF FF FF FF FF FF FF  ..t.....
EF0D  FF FF FF FF FF FF FF FF  FF FF FF FF FF FF FF FF  .....
EF1D  FF FF FF FF FF FF FF FF  FF FF FF FF FF FF FF FF  .....
PC  SP SZHPNC AF BC DE HL IX IY  AF' BC' DE' HL'
2800 21FE 000000 0000 0000 0000 0000 0000 0000 0000 0000 0000
? P
DEBUG is now ON
TRSDOS READY
DEBUG

```

Fig. 5. Hex code for FORMS/CIM. Boldface addresses are user-supplied values

Program Listing 4. Assembly program for INPUT2/CIM

ADDRESS	HEX OP CODES	Z-80 MNEMONICS	COMMENTS
EF00	21 08 EF	LD HL,EF08H	Save continuation
EF03	E5	PUSH HL	address.
EF04	2A 03 28	LD HL,(2803H)	Convert USR argument
EF07	E9	JP (HL)	to integer.
EF08	46	LD B,(HL)	B = string length.
EF09	23	INC HL	Find memory location of
EF0A	5E	LD E,(HL)	string and put
EF0B	23	INC HL	address in HL.
EF0C	56	LD D,(HL)	
EF0D	EB	EX DE,HL	

Listing 4 Continues

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EF0E	C5	PUSH BC	Save registers.
EF0F	D5	PUSH DE	
EF10	E5	PUSH HL	
EF11	AF	XOR A	Zero accumulator.
EF12	8B	CP B	Is string length 0?
EF13	20 09	JR NZ,EF1EH	If not, go to EF1E.
EF15	3E 03	LD A,03H	
EF17	B7	OR A	
EF18	E1	POP HL	Restore registers.
EF19	D1	POP DE	
EF1A	C1	POP BC	
EF1B	C3 81 EF	JP EFB1H	Go to exit routine.
EF1E	3E 01	LD A,01H	Initialize keyboard.
EF20	CF	RST 08H	Put string length in C.
EF21	4B	LD C,B	Initialize video buffer.
EF22	C5	PUSH BC	
EF23	F5	PUSH AF	
EF24	01 FC 0E	LD BC,0EFCH	
EF27	ED 41	OUT (C),B	
EF29	DB FD	IN A,(FDH)	
EF2B	F6 FB	OR FBH	
EF2D	57	LD D,A	
EF2E	04	INC B	
EF2F	ED 41	OUT (C),B	
EF31	DB FD	IN A,(FDH)	
EF33	5F	LD E,A	
EF34	F1	POP AF	
EF35	C1	POP BC	
EF36	ED 53 8B EF	LD (EF8BH),DE	Save cursor position.
EF3A	16 00	LD D,00H	Initialize char. counter.
EF3C	4B	LD C,B	Put string length in C.
EF3D	3E 04	LD A,04H	KBCHAR SVC
EF3F	CF	RST 08H	Get char. from keyboard.
EF40	20 FB	JR NZ,EF3DH	If no input go to EF3D.
EF42	7B	LD A,B	Put char. in A.
EF43	FE 20	CP 20H	Is char. a space?
EF45	3B 0D	JR C,EF54H	If not go to EF54.
EF47	3E 0B	LD A,0BH	VDCHAR SVC.
EF49	CF	RST 08H	Send char. to screen.
EF4A	70	LD (HL),B	Put char. in string.
EF4B	23	INC HL	Adv. char. position.
EF4C	14	INC D	Adv. char. count.
EF4D	0D	DEC C	Dec. # char. left.
EF4E	20 ED	JR NZ,EF3DH	If not 0, go to EF3D.
EF50	06 0D	LD B,0DH	Put ENTER in B.
EF52	1B 04	JR EF5BH	If 0 go to EF5B.
EF54	FE 0D	CP 0DH	Is char. ENTER?
EF56	20 03	JR NZ,EF5BH	If not, go to EF5B.
EF58	42	LD B,D	Put # input char. in B.
EF59	1B 51	JR EFACH	Go to END.
EF5B	FE 0B	CP 0BH	Is char. a backspace?
EF5D	20 12	JR NZ,EF71H	If not, go to EF71.
EF5F	CD BA EF	CALL EFBAH	Backspace routine.
EF62	2B D9	JR Z,EF3DH	If first char. go to EF3D.
EF64	06 2E	LD B,2EH	Put "." in string.
EF66	70	LD (HL),B	
EF67	3E 0B	LD A,0BH	VDCHAR SVC
EF69	CF	RST 08H	Send char. to screen.
EF6A	06 1C	LD B,1CH	Backspace cursor.
EF6C	3E 0B	LD A,0BH	VDCHAR SVC
EF6E	CF	RST 08H	Send info to screen.
EF6F	1B CC	JR EF3DH	If done, go to EF3D.
EF71	FE 1C	CP 1CH	Is char. a <-- ?
EF73	20 05	JR NZ,EF7AH	If not, go to EF7A.
EF75	CD BA EF	CALL EFBAH	Backspace routine.
EF7B	1B C3	JR EF3DH	Go to EF3D.
EF7A	FE 1D	CP 1DH	Is char. a --> ?
EF7C	20 05	JR NZ,EFB3H	If not, go to EFB3.
EF7E	3E 0B	LD A,0BH	VDCHAR SVC
EF80	CF	RST 08H	Send info to screen.
EF81	1B C8	JR EF4BH	If done, go to EF4B.
EF83	FE 1B	CP 1BH	Is char. ESC key?
EF85	20 1D	JR NZ,EFA4H	If not, go to EFA4.
EF87	11 AA FD	LD DE,FDAAH	Get cursor position.
EF8A	C5	PUSH BC	Clear video buffer.
EF8B	F5	PUSH AF	
EF8C	01 FC 0E	LD BC,0EFCH	
EF8F	7A	LD A,D	
EF90	E6 07	AND 07H	
EF92	ED 41	OUT (C),B	
EF94	D3 FD	OUT (FDH)	
EF96	04	INC B	
EF97	7B	LD B,C	
EF9B	ED 41	OUT (C),B	
EF9A	D3 FD	OUT (FDH)	
EF9C	F1	POP AF	
EF9D	C1	POP BC	
EF9E	E1	POP HL	Restore registers.
EF9F	D1	POP DE	
EFA0	C1	POP BC	
EFA1	C3 0E EF	JP EF0EH	Go to START (EF0E).
EFA4	70	LD (HL),B	Put char. in string.
EFA5	06 7F	LD B,7FH	Put "+" in B.
EFA7	3E 0B	LD A,0BH	VDCHAR SVC
EFA9	CF	RST 08H	Send info to screen.
EFAA	1B 9F	JR EF4BH	Go to EF4B.
EFAE	E1	POP HL	END
EFAF	D1	POP DE	
EFAE	33	INC SP	
EFAF	33	INC SP	
EFB0	AF	XOR A	
EFB1	26 00	LD H,00H	EXIT.

Listing 4 Continues

Listing 4 Continued

```

EFB3      68          LD L,B          Convert argument from
EFB4      E5          PUSH HL          routine to integer.
EFB5      2A 05 28    LD HL,(2805H)
EFBB      E3          EX (SP),HL      HL = # char. input.
EFB9      C9          RET             Return to BASIC.
EFBA      32 CB EF    LD (EFCBH),A    Backspace routine.
EFBD      7A          LD A,D
EFBE      B7          OR A
EFBF      2B 09      JR Z,EFCBH
EFC1      0C          INC C
EFC2      15          DEC D
EFC3      2B          INC LS
EFC4      06 1C      LD B ,+1CH
EFC6      3E 08      LD A ,08H
EFC8      CF          RST 08H
EFC9      B0          OR B
EFCA      3E 1C      LD A ,+1CH
EFCF      C9          RET
    
```



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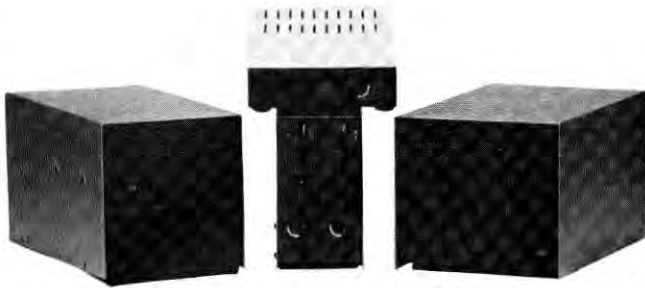
```

10  * * FORMATTED INPUT * *
20  **
30  DIRECTIVE(D#)      DIR POSITION(DP)  INPUT POSITION(IP)  LENGTH(IL)
40  **
50  DATA"LAST NAME",      160,          170,          20
60  DATA"FIRST NAME",    192,          207,          20
70  DATA"STREET",        240,          248,          18
80  DATA"CITY",          267,          273,          12
90  DATA"STATE",         287,          294,          10
100 DATA"ZIP",           306,          311,          5
110  **
120 CLEAR 1000
130 SYSTEM"INPUT2/CIM"
140 DEFUSR2=&HEF00
150 X$="N"
160 CLS
170 RESTORE
180 FOR I=1 TO 6
190  READ D$,DP,IP,IL
200  IF X$="N" THEN PRINT@DP,D$:
210  IF X$="R" THEN GOSUB 1000 ELSE IF X$="E" THEN GOSUB 2000 ELSE PRINT@IP,STRING$(IL,46)
220  NEXT
230  IF X$="N" THEN X$="R":GOTO 170
240  PRINT@1200, ID$(2):" " ID$(1):CHR$(13):ID$(3)
250  PRINT ID$(4):" " ID$(5):SPC(2):ID$(6)
260  PRINT@520,"N = NEW / E = EDIT / S = STOP":
270  X$=INKEY$:IF X$="" THEN 270
280  ON INSTR("NES",X$)GOTO 160,170,300
290  GOTO 260
300  END
310  **
1000 PRINT@IP,;S$=SPACE$(IL):GOTO 3000
2000 PRINT@IP, ID$(I):PRINT@IP,;S$=ID$(I)
3000 X=USR2(VARPTR(S$)):ID$(I)=S$
4000 RETURN
    
```

Program Listing 5

ADDRESS	HEX OP CODES	Z-80 MNEMONICS	COMMENTS
E0AD	21 B5 EE	LD HL,E0B5H	Save continuation address.
E0B0	E5	PUSH HL	
E0B1	2A 03 28	LD HL,(2803H)	Convert USR argument to integer.
E0B4	E9	JP (HL)	
E0B5	7D	LD A,L	
E0B6	FE 01	CP 01H	Form #1 ?
E0B8	20 08	JR NZ,E0C2H	If not, skip to E0C2.
E0BA	06 42	LD B ,42H	Load page length (66).
E0BC	0E 3C	LD C ,3CH	Load lines/page (60).
E0BE	16 50	LD D ,50H	Load char/line (80).
E0C0	18 22	JR EEE4H	Go to END.
E0C2	FE 02	CP 02H	Form #2 ?
E0C4	20 08	JR NZ,E0CEH	If not, skip to E0CE.
E0C6	06 2A	LD B ,2AH	Load page length (42).
E0C8	0E 2A	LD C ,2AH	Load lines/page (42).
E0CA	16 50	LD D ,50H	Load char/line (80).
E0CC	18 16	JR EEE4H	Go to END.
E0CE	FE 03	CP 03H	Form #3 ?
E0D0	20 08	JR NZ,E0DAH	If not, skip to E0DA.
E0D2	06 00	LD B ,00H	Load page length.
E0D4	0E 00	LD C ,00H	Load lines/page.
E0D6	16 00	LD D ,00H	Load char/line.
E0D8	18 0A	JR EEE4H	Go to END.
E0DA	FE 04	CP 04H	Form #4 ?
E0DC	20 17	JR NZ,E0F5H	If not, skip to E0F5.
E0DE	06 00	LD B ,00H	Load page length.
E0E0	0E 00	LD C ,00H	Load lines/page.
E0E2	16 00	LD D ,00H	Load char/line.
E0E4	3E 11	LD A ,11H	Execute PRINIT SVC
E0E6	CF	RST 08H	
E0E7	06 03	LD B ,03H	Reset line-count
E0E9	0E 00	LD C ,00H	to 0.
E0EB	3E 5F	LD A ,5FH	Execute PRCTRL SVC.
E0ED	CF	RST 08H	
E0EE	06 04	LD B ,04H	Reset character
E0F0	0E 00	LD C ,00H	count to 0.
E0F2	3E 5F	LD A ,5FH	Execute PRCTRL SVC.
E0F4	CF	RST 08H	
E0F5	C9	RET	Return to BASIC.

Program Listing 6. Assembly program for FORMS/CIM



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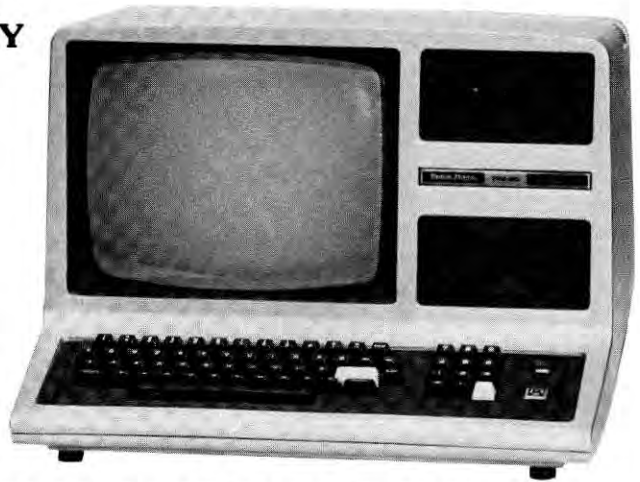
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Enter the guts of the Color Computer.

CC Monitor

Sergio Zigras
171 Arundel Road
Paramus, NJ 07652

I waited a long time for an inexpensive home computer with my favorite microprocessor, the 6809. Radio Shack finally made it with the Color Computer, and I think they did a very nice job.

First I explored the hardware. I made up schematics, increased the memory to 16K and connected my black-and-white direct video monitor. Then I started looking closely into the software.

A Basic Monitor?

It is not very easy to get into the guts of Color Basic unless you own a 6809 disassembler. Lots of PEEKs and POKEs are needed to accumulate a little information. Besides that, machine-language programs require a good number of POKEs.

All this was tiring so I decided to write a monitor program. I have written monitor programs for 6800 and 6809 machines in

Assembly language, and I am well aware of the speed of execution and tightness of the code. This time I decided to use resident Basic to do the job. Why?

- Most commands don't need to be fast.
- Implementation of Color Computer Basic routines is very easy.
- The user can easily understand and modify the procedures.
- No special cassette I/O functions or commands are needed to load and save the monitor programs.
- Since the whole program is modularized, any routine can be substituted by a corresponding machine-language routine taken from Color Basic (if the entry address is known). In this way the monitor program will eventually become smaller and faster.

MIMO, which stands for Mini-MONitor, is the name of the program (see the Listing). It is broken down into routines as in Table 1.

Some parts of the conversion routines are shared by other commands (lines 60-70 are used by the "convert decimal character to hex" routine).

MIMO's General Characteristics

MIMO's General Characteristics

MIMO, a Basic hexadecimal debugging tool, occupies approximately 2,160 bytes of memory.

I suspect that the memory of the 4K computer is not enough for the whole program. If you own the 4K model, exclude the C and V commands. Remember, Color Basic reserves half of its 4K of memory for itself. To increase available memory, play games with the Clear function. The amount of available memory depends on how many spaces you waste between statements and tokens. Color Basic has only a few cases where the spaces are necessary.

Save the MIMO program on cassette or disk before you attempt to run it. Once you have copied the program, give it a try. MIMO's command menu (M, D, F, J, C, V and E) should appear.

To call a function just type in the command's character, one space, and then input the hex

addresses or data required by the particular command. The variables used in the program are shown in Table 2.

MIMO's Commands

- M (Memory examine/modify)

Input format M XXXX enter
Output format XXXX YY Z?

XXXX is the address to be examined, YY is the contents of this location, and Z is the ASCII or graphics character of the contents (YY). The question mark is the prompt for your next action. Four things can be done at this point.

First, input H (higher) and enter to advance to the next location without changing the contents of the memory.

Second, hit L (lower) and enter to backtrack one location, leav-

Lines	Purpose
20-25	Convert a decimal character to hex
30-35	Convert a hex character to decimal
40-48	Decimal nibble (4 bits, 1 digit) to hex
50-62	Decimal address to hex
64-70	Pack a hex address (four characters)
72-110	Hex address to decimal
120-128	Pack four hex bytes
130-140	Pack eight ASCII or graphics characters
200-275	M command
300-350	D command
400-460	F command
500-545	C command
550-560	J command
600-799	Reserved space for future commands
800-850	Main routine, command's decoding
950-980	V command

Table 1. Line Functions

The Key Box

Color Computer
Color Basic
16K RAM

ing the memory unchanged.

Third, hit R (restart) and enter to get back to the command mode.

Fourth, enter as two hex characters the new contents of this location. If the memory location is writeable, the new contents will be entered and the next memory address will show up on the screen; otherwise, an error message will be delivered. (This happens when you try to write into ROM or nonexistent memory.)

• D (Dump a block of memory)

Input format D XXXX YYYY enter

XXXX is the starting (From) address and YYYY is the ending (To) address. The fourth digit of the starting address will be masked to zero. The output format consists of the block's eight-byte base address in two groups of four bytes each (remember there are two characters per byte), and eight ASCII or graphics characters corresponding to the displayed eight bytes. The lines are

shown at an approximate rate of one per second.

• F (Find a character or a string of characters within given limits)

Input format F XXXX YYYY Z.....Z enter

XXXX is again the From address, YYYY is the To address and Z.....Z is the character or string to be located. The output format consists of none, one or groups of four addresses per line, representing where the string or character under search begins.

This is the slowest of MIMO's commands. It takes approximately two minutes and fifteen seconds to search for one character over a thousand locations of memory, and about five minutes and forty seconds to search for a string of three bytes over the same amount of memory. Just for comparison, my Assembly-language monitor program takes only five seconds to search the whole 64K memory range. But remember that in MIMO you don't need assemblers and editors.

• J (Jump to a machine-language program)

Input format J XXXX enter

XXXX is the beginning address of the program to be run.

• C (Convert a number from hex to decimal and vice versa)

Input format C D HHHH enter
or C H D...D enter

The first format converts a hexadecimal number HHHH to decimal. The routine recognizes only four-digit hex numbers. If your hex number is only one, two or three digits long, just in-

- A—Temporary for conversions
- AA—Temporary for A
- B\$—ASCII form for a decimal byte
- BA\$—Beginning address (From)
- BE—Temporary decimal for BA\$
- BL\$—String concatenator for F command
- C\$—Command to be decoded
- CNT—Counter for the length of a string
- CO\$—Identifier for Convert command (H or D)
- DA, SDA—Decimal address
- DB, CDB, XDB—Decimal byte
- EAS—Ending address (To)
- ER—Error flag for illegal hex character
- FI\$—First four-byte string (D command)
- HS\$—Hex (byte or address)
- HB\$—Hex byte
- HAS\$—Hex address
- IN\$—String to be found (F command)
- LA—Last address
- MO—Flag for D or F command
- OS\$—Operation to be decoded
- P\$—Packing element
- PA\$—Pack a string of four hex bytes
- SE\$—Second four-byte string (D command)
- V, VS\$—Temporaries for conversions

Table 2. Program Variables

Program Listing 1

```

0 GOTO800
20 H$="":GOSUB60
25 HB$=H$:RETURN
30 V$=HB$:DA=0:GOSUB90
35 DB=DA:RETURN
40 ER=0
42 IFV<48ORV>70THENER=1
44 IFV<58THENV=V-48
46 IFV>63THENV=V-55
48 RETURN
50 H$="":A=DA/4096:A=INT(A)
52 GOSUB64
54 DB=DA-4096*A
56 A=DB/256:A=INT(A):GOSUB64
58 DB=DB-256*A
60 A=DB/16:A=INT(A):GOSUB64
62 A=DB-16*A
64 AA=A
66 IF A>9THEN A=A+55ELSE A=A+48
68 A$=CHR$(A):H$=H$+A$:A=AA
70 RETURN
72 HB$=HAS
74 V=ASC(HB$)
76 GOSUB40:IFER=1THEN110
78 DA=4096*V
80 V$=MID$(HB$,2,1)
82 V=ASC(V$)
84 GOSUB40:IFER=1THEN110
86 DB=256*V:DA=DA+DB
88 V$=MID$(HB$,3,1)
90 V=ASC(V$)
92 GOSUB40:IFER=1THEN110
94 DB=16*V:DA=DA+DB
96 V$=RIGHT$(HB$,1):V=ASC(V$)
98 GOSUB40:IFER=1THEN110
100 DA=DA+V

```

Listing 1 continues



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Listing 1 continued

```
105 RETURN
110 PRINT"ERROR,NOT HEX":RETURN
120 PA$=""
122 FOR X=1TO4
124 DB=PEEK(DA):GOSUB20
126 PA$=PA$+HB$:DA=DA+1:NEXT
128 RETURN
130 A$=""
132 FOR X=1TO8
134 DB=PEEK(DA):IFDB<32THENDB=46
136 P$=CHR$(DB)
138 A$=A$+P$:DA=DA+1:NEXT
140 RETURN
200 HA$=MID$(O$,3,4)
205 GOSUB72:IFER=1THEN10
210 SDA=DA
215 DB=PEEK(DA):XDB=DB:IFDB<32THENXDB=46
220 B$=CHR$(XDB):GOSUB20
225 PRINT HA$ "HB$ "B$;
230 INPUT HB$:IF HB$="H"THEN260
235 IF HB$="L"THEN275
240 IF HB$="R"THEN10
245 GOSUB30:IF ER=1THEN255ELSE POKE SDA,DB:CDB=PEEK(SDA)
250 IF CDB<>DB THEN PRINT"NO CHANGE"
255 DA=SDA
260 DA=DA+1
265 GOSUB50
270 HA$=H$:GOTO210
275 DA=DA-1:GOTO265
300 BA$=MID$(O$,3,3):BA$=BA$+"0"
305 EA$=MID$(O$,8,4)
310 HA$=EA$:GOSUB72:LA=DA:IFER=1THEN10
315 HA$=BA$:GOSUB72:IFER=1THEN10
320 IF MO=1THEN405ELSEGOSUB120
325 FI$=PA$:GOSUB120
330 SE$=PA$
335 DA=DA-8:GOSUB130
340 PRINTBA$ "FI$ "SE$ "A$
345 IF DA>=LA THEN10
350 GOSUB50:BA$=H$:GOTO320
400 PRINT:MO=1:GOTO300
405 BE=DA:MO=0:IN$=MID$(O$,13)
410 CNT=LEN(IN$)/2:CNT=INT(CNT)
415 BL$=""
420 FOR Z=1TOCNT
425 DB=PEEK(DA):GOSUB20
430 BL$=BL$+H$:DA=DA+1:NEXT
435 IF BL$=IN$THEN450
440 BE=BE+1:DA=BE:IF BE=LA THEN10
445 GOTO415
450 DA=BE:GOSUB50
455 PRINT "H$ " ";:DA=DA+CNT
460 GOTO440
500 CO$=MID$(O$,3,1)
505 IF CO$="D"THEN530
510 H$=MID$(O$,5):DA=VAL(H$)
515 IF DA>65535THENPRINT"BEYOND RANGE":GOTO10
520 GOSUB50
525 PRINT "H$:GOTO10
530 HB$=MID$(O$,5):L=LEN(HB$)
535 IF L<>4THENPRINT"4 HEX CHARS ONLY":GOTO10
540 GOSUB74
545 PRINT DA:GOTO10
550 HA$=MID$(O$,3,4):GOSUB72
555 EXEC DA
560 GOTO10
800 PRINT
805 PRINT"MIMO COMMANDS:M,D,F,C,J,V,E"
810 INPUT O$:C$=LEFT$(O$,1)
815 IFC$="M"THEN200
820 IFC$="D"THEN300
825 IFC$="F"THEN400
830 IFC$="C"THEN500
835 IFC$="J"THEN550
840 IFC$="V"THEN950
845 IFC$="E"THENEXEC40999
850 PRINT"WHAT?":GOTO10
950 X=1539:A=0
955 FOR N=X TO X+2100:B=PEEK(N)
960 A=A+B:NEXT
965 IFA=158211THENPRINT"GOOD"ELSEPRINT"BAD"
970 GOTO10
```

put the appropriate number of leading zeros followed by the hex number.

The second type converts a decimal number (0-65535) to a hex one. The message Beyond Range will be displayed in case of a limits violation.

● V (Verify the MIMO's program)

Input format V enter

Nineteen seconds later the screen will show Good or Bad. If the answer is Bad, reload MIMO because one or more locations of the program are gone.

MIMO loads from 0603 to 0E74 hex. Lines 965 and 970 are not calculated because they carry the sum which is altered when you make changes (if you include these two lines you will run into a race condition). If you change anything, even a character, the verification will always come back Bad. To fix the problem type in the following line:

962 PRINT A

The number on the screen after the V command is entered

Program Listing 2

```
10 GOTO800
20 H$="" :GOSUB60
25 HB$=H$:RETURN
30 V$=HB$:DA=0 :GOSUB90
35 DB=DA:RETURN
40 ER=0
42 IFV<48ORV>70THENER=1
44 IFV<58THENV=v-48
46 IFV>63THENV=v-55
48 RETURN
50 H$="" :A=DA/4096:A=INT(A)
52 GOSUB64
54 DB=DA-4096*A
56 A=DB/256:A=INT(A) :GOSUB64
58 DB=DB-256*A
60 A=DB/16:A=INT(A) :GOSUB64
62 A=DB-16*A
64 AA=A
66 IF A>9THEN A=A+55ELSE A=A+48
68 A$=CHR$(A):H$=H$+A$:A=AA
70 RETURN
72 HB$=HA$
74 V=ASC(HB$)
76 GOSUB40:IFER=1THEN10
78 DA=4096*V
80 V$=MID$(HB$,2,1)
82 V=ASC(V$)
84 GOSUB40:IFER=1THEN10
86 DB=256*V:DA=DA+DB
88 V$=MID$(HB$,3,1)
90 V=ASC(V$)
92 GOSUB40:IFER=1THEN10
94 DB=16*V:DA=DA+DB
96 V$=RIGHT$(HB$,1):V=ASC(V$)
98 GOSUB40:IFER=1THEN10
100 DA=DA+V
```

Listing 2 continues

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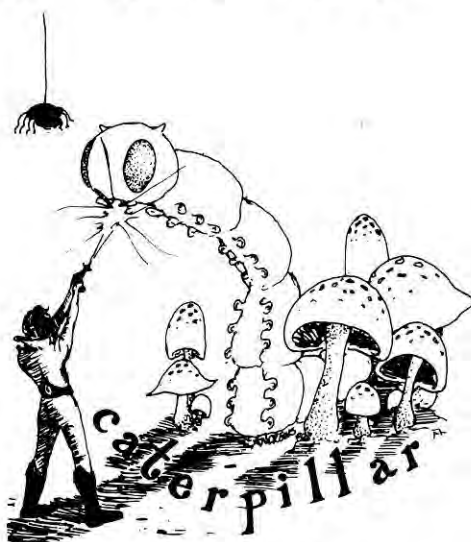
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is your new checksum. Delete line 962 and replace the old 6-digit number in line 965 with the new one. If you add or delete entire lines, recalculate the bytes taken by the program. Replace 2100 in line 955 with this number. Then do the trick with lines 962 and 965 as described before.

Note: Extended Basic loads MIMO from 1E03 to 2674 in hex. Therefore, change the Basic address in line 950 from 1539 to 7683, and the checksum in line 965 to 160953.

To add more commands, decode them at the main routine (lines 800-850), and write them in the reserved space (lines 600-799).

● E (Exit to Color Basic)

Input format E enter

This takes you back to Color Basic without pressing the break key.

Possible Improvements

Some people like sounds in their programs and some don't. If you belong to the first group, you can add sounds or single beeps in different frequencies to identify special features (for example, in case of an error message, or when you find an address in the F command, or when you display the answer in the V command). To single beep every time you display the MIMO's menu, add the line:

802 SOUND125,2

Those who have the 16K Color Computer and like challenges might try to add the following commands:

- T (Transfer a block of memory)
- K (Compare blocks of memory)
- R (Dump computer's internal registers)
- G (Go to the last jump input)
- B (Breakpoint implementation)
- O (Observe a block of memory while you run a program).

Now, if you love challenges, try writing an assembler, editor, tracer, and disassembler! ■

Sergio Zigras enjoys radio-controlled airplanes and international folk dancing.

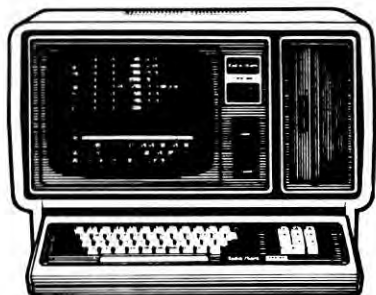
Listing 2 continued

```

105 RETURN
110 PRINT"ERROR,NOT HEX":RETURN
120 PA$=""
122 FOR X=1TO4
124 DB=PEEK(DA):GOSUB20
126 PA$=PA$+HB$:DA=DA+1:NEXT
128 RETURN
130 A$=""
132 FOR X=1TO8
134 DB=PEEK(DA):IFDB<32THENDB=46
136 P$=CHR$(DB)
138 A$=A$+P$:DA=DA+1:NEXT
140 RETURN
200 HA$=MID$(O$,3,4)
205 GOSUB72:IFER=1THEN10
210 SDA=DA
215 DB=PEEK(DA):XDB=DB:IFDB<32THENXDB=46
220 B$=CHR$(XDB):GOSUB20
225 PRINT HA$ " HB$ " B$;
230 INPUT HB$:IF HB$="H"THEN260
235 IF HB$="L"THEN275
240 IF HB$="R"THEN10
245 GOSUB30:IF ER=1THEN255ELSE POKE SDA,DB:CDB=PEEK(SDA)
250 IF CDB<>DB THEN PRINT"NO CHANGE"
255 DA=SDA
260 DA=DA+1
265 GOSUB50
270 HA$=H$:GOTO210
275 DA=DA-1:GOTO265
300 BA$=MID$(O$,3,3):BA$=BA$+"0"
305 EA$=MID$(O$,8,4)
310 HA$=EA$:GOSUB72:LA=DA:IFER=1THEN10
315 HA$=BA$:GOSUB72:IFER=1THEN10
320 IF MO=1THEN405ELSEGOSUB120
325 FI$=PA$:GOSUB120
330 SE$=PA$
335 DA=DA-8:GOSUB130
340 PRINTBA$ " FI$ " SE$ " A$
345 IF DA>=LA THEN10
350 GOSUB50:BA$=H$:GOTO320
400 PRINT:MO=1:GOTO300
405 BE=DA:MO=0:IN$=MID$(O$,13)
410 CNT=LEN(IN$)/2:CNT=INT(CNT)
415 BL$=""
420 FOR Z=1TOCNT
425 DB=PEEK(DA):GOSUB20
430 BL$=BL$+H$:DA=DA+1:NEXT
435 IF BL$=IN$THEN450
440 BE=BE+1:DA=BE:IF BE=LA THEN10
445 GOTO415
450 DA=BE:GOSUB50
455 PRINT " H$ " ";:DA=DA+CNT
460 GOTO440
500 CO$=MID$(O$,3,1)
505 IF CO$="D"THEN530
510 H$=MID$(O$,5):DA=VAL(H$)
515 IF DA>65535THENPRINT"BEYOND RANGE":GOTO10
520 GOSUB50
525 PRINT " H$:GOTO10
530 HB$=MID$(O$,5):L=LEN(HB$)
535 IF L<>4THENPRINT"4 HEX CHARS ONLY":GOTO10
540 GOSUB74
545 PRINT DA:GOTO10
550 HA$=MID$(O$,3,4):GOSUB72
555 EXEC DA
560 GOTO10
800 PRINT
805 PRINT"MIMO COMMANDS:M,D,F,C,J,V,E"
810 INPUT O$:C$=LEFT$(O$,1)
815 IFC$="M"THEN200
820 IFC$="D"THEN300
825 IFC$="F"THEN400
830 IFC$="C"THEN500
835 IFC$="J"THEN550
840 IFC$="V"THEN950
845 IFC$="E"THENEXEC40999
850 PRINT"WHAT ?":GOTO10
950 X=7683:A=0
955 FOR N=X TO X+2100:B=PEEK(N)
960 A=A+B:NEXT
965 IFA=160953THENPRINT"GOOD"ELSEPRINT"BAD"
970 GOTO10

```


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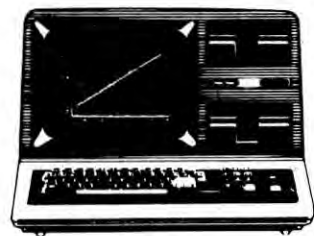
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Interrupt Your 80

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The TRS-80 was not designed for control or interrupt-driven applications. Attempting to utilize interrupts of any mode results in a Restart operation, bringing control back to the Basic interpreter.

This article explains the changes in hardware necessary for the TRS-80 to use interrupts.

In addition, it describes and explains the three interrupt modes of the Z80 microprocessor.

It is important to remind you that removing the TRS-80 keyboard cover voids Radio Shack's warranty. If service is required by the Radio Shack repair center, the cost of the repair will include returning the unit to its original electrical condition. In other words, Radio Shack will remove any modifications at your expense.

Interrupts provide an asynchronous means for an external device to signal to the CPU that it wishes to input data to, or to take data from the computer. The Z80 has three modes of maskable and one mode for non-maskable interrupts. A maskable interrupt can be ignored by the CPU by using the DI (disable interrupt) instruction, whereas the non-maskable interrupt cannot be disabled.

Non-Maskable Interrupt

This negative edge triggered input has priority over maskable interrupts. It generates an automatic Restart to location 0066H; the TRS-80 uses this input as a Reset. Therefore, without extensive modifications, this mode cannot be used for other than a Reset.

Maskable Interrupt

The programmer can selectively enable or disable the maskable interrupt (\overline{INT}). There are two internal interrupt flip-flops in the Z80. The enable interrupt instruction EI sets both IFF1 and IFF2 to a logic one, enabling the interrupt at the completion of the instruction following the EI instruction. The disable interrupts instruction DI resets IFF1 and IFF2 to a logic zero, preventing the Z80 from responding to interrupts.

Maskable Interrupt Mode Zero

Mode Zero in the Z80 is identical to the 8080-A interrupt se-

quence. The interrupting device places an instruction on the data bus for execution by the CPU. Although normally a restart (RST) instruction for simplicity, any multi-byte instruction can be used, as this mode looks for executable code.

This mode is not recommended for the TRS-80 for the following reasons. A single-byte instruction (Restart) returns control to the Basic interpreter. If a multi-byte instruction is used, the first byte is read during an interrupt acknowledge cycle. Remaining bytes of the instruction are read by normal read cycles with the program counter remaining in its preinterrupt state. The TRS-80 memory must not respond to these read sequences, requiring extensive modification to the TRS-80 hardware.

Maskable Interrupt Mode One

Mode One is very similar to an NMI interrupt except the CPU does an automatic call to location 0038H instead of 0066H. This mode is not recommended: Response to this type of interrupt also returns control to the Basic interpreter.

Maskable Interrupt Mode Two

Mode Two, the most power-

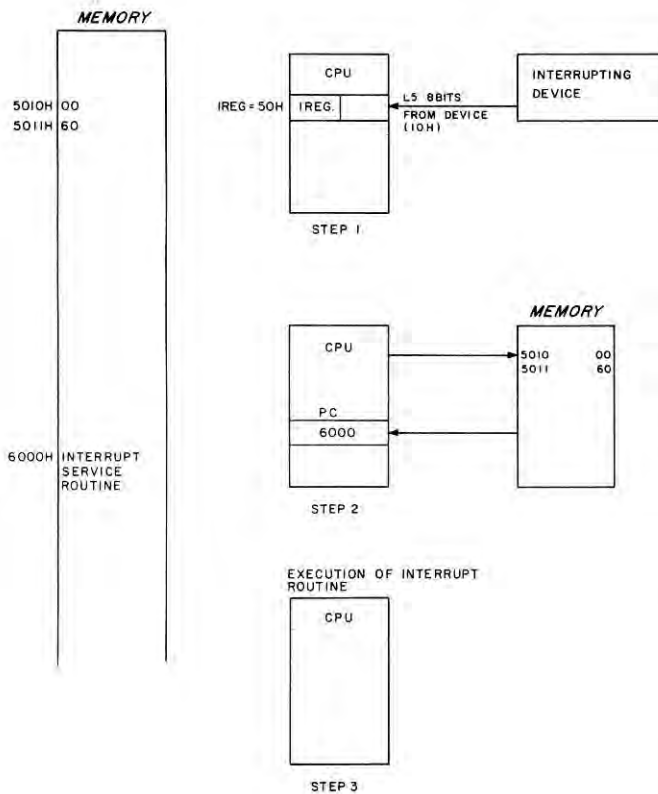


Figure 1

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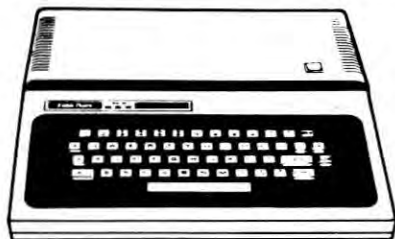
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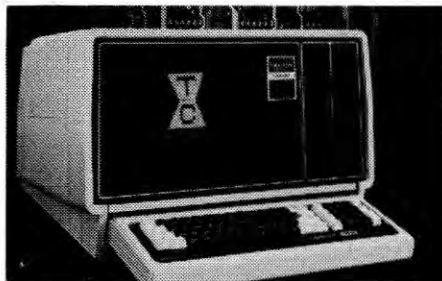
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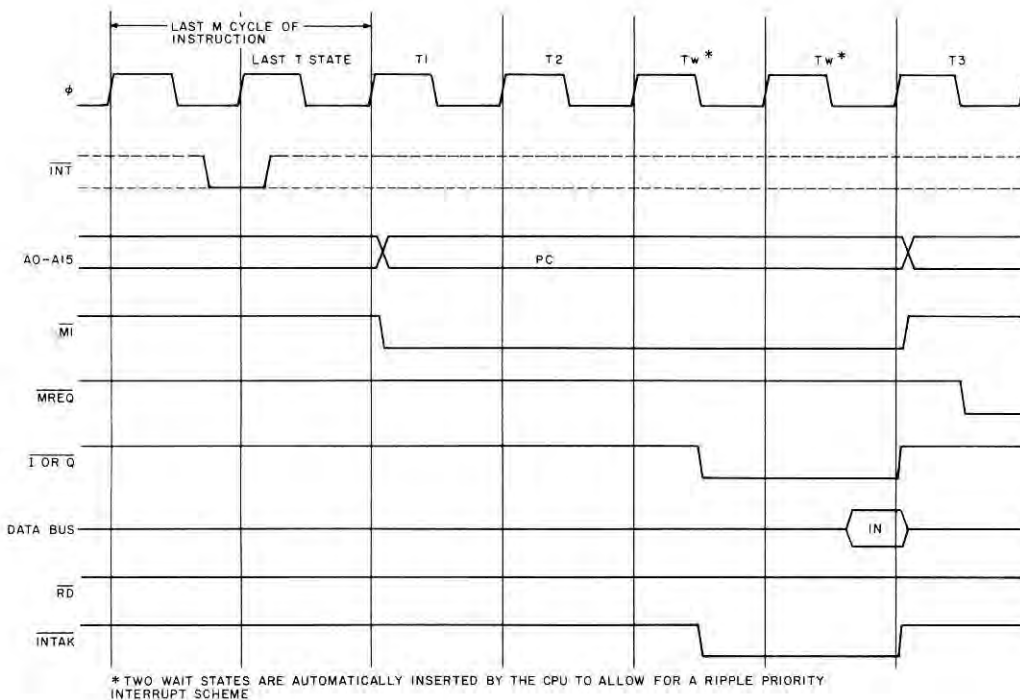


Figure 2

ful of the maskable interrupt modes, allows an indirect call to any memory location by a single 8-bit vector supplied by the

interrupting device. In this mode, the interrupting device places the vector on the data bus in response to an interrupt acknowledge. This vector becomes the least significant eight bits of a pointer; the I register contents are combined as the most significant eight bits of the pointer. This 16-bit pointer

becomes the address in a vector table containing the starting address of the interrupt routine.

Looking at Fig. 1, suppose the I register was previously loaded with the value 50H. Assume also that the interrupt service routine resides at address 6000H. In step one, the interrupting device places the value 10H on the data bus during an interrupt acknowledge cycle. The CPU then takes the value 10H, and with the contents of the I register as the most significant byte, forms a 16-bit pointer (the address of a vector table). The vector table here is at 5010H. At this point (step two), the CPU fetches the two bytes at pointer (5010H) and pointer plus one (5011H). Note: Address 5010H contains the least significant byte of the interrupt service routine's starting address. These two bytes are loaded into the program counter and the CPU begins executing the program at location 6000H (step three).

Mode Two cannot be used in the TRS-80 the way it comes from the factory; a slight modification is necessary.

Notice in Fig. 3 that data on the data bus is only enabled into the CPU during a read operation (\overline{RD}) true. The (\overline{RD}) signal never

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- Step 1: Remove all cables and connectors from the keyboard unit.
- 2: Remove the 6 screws from bottom side of keyboard unit. Note the three different lengths.
- 3: Turn unit over and remove top. A word of caution: Some units may have the main power LED mounted to the top cover instead of soldered on keyboard PCB. If so, take care not to pull wires from the LED.
- 4: Lift up the keyboard enough to remove the five rubber spacers and lay it back down.
- 5: Lift both PC boards up and remove bottom cover.
- 6: Unfold the two PC boards and lay both face down to expose printed circuit sides.
- 7: Locate the Z-53. IC's are numbered on front side of board. Cut circuit path which leads from pin five of Z-53 to feed through below pin seven of Z-53. See Fig. 5.
- 8: Fold the main PC board back over the keyboard to expose component side.
- 9: Take the IC to be soldered in (a 74LS08), and bend all the leads straight out except pins seven and 14. See Fig. 6a.
- 10: Lay the 74LS08 on top of Z-52 making sure pin 14 lays on top of pin 14 of the Z-52 and pin 7 lays on top of the pin 7 of Z-52. These are the power and ground pins, respectively. Solder pin 14 to 14 and 7 to 7. See Fig. 6b. This new IC is referred to as the piggyback chip.
- 11: Solder a small gauge wire from pin 13 of the piggyback chip to feed through just below pin seven of Z-53. See Fig. 7. Solder a wire from the piggyback chip pin 12 to Z-73 pin three. Solder a wire from the piggyback chip pin 11 to Z-53 pin five.
- 12: Check your work watching for solder shorts. Carefully reassemble the unit.

Table 1

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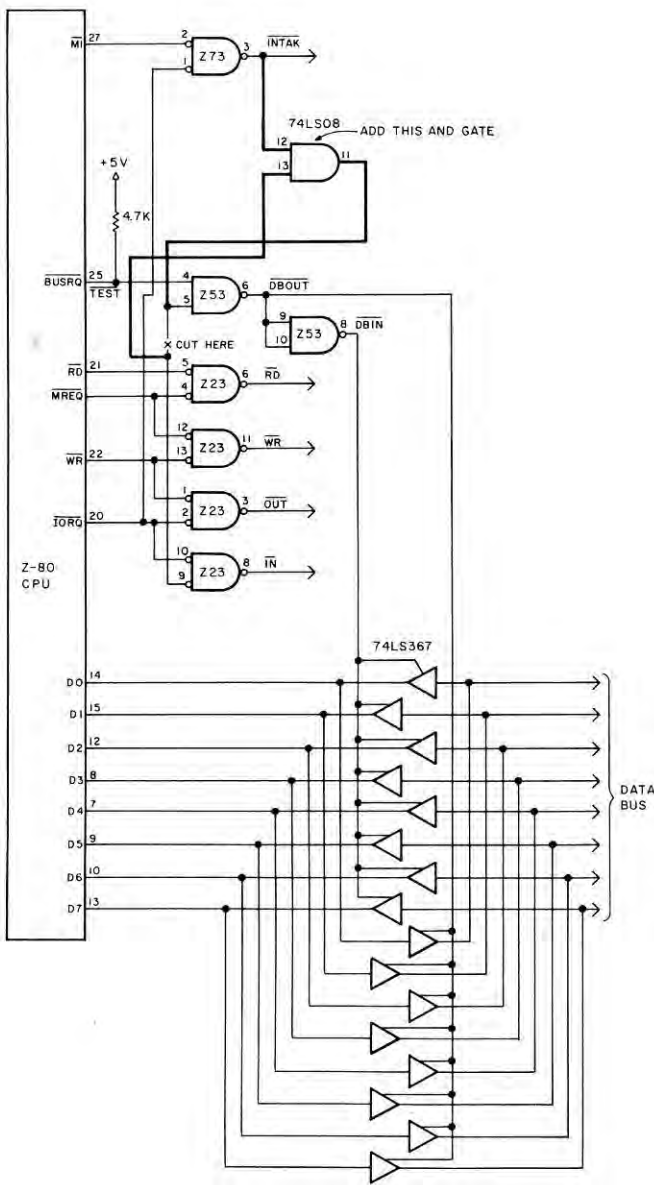


Figure 3

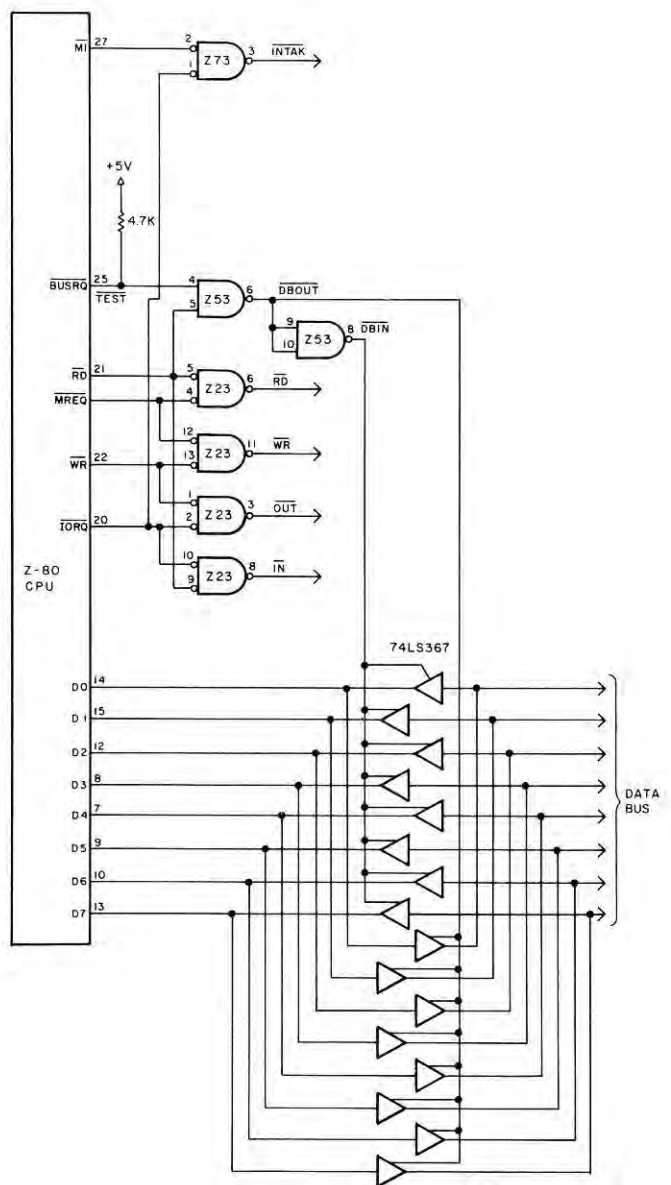


Figure 4

Address	Data	Instruction	Comments
4500H	31 FF4F	LD SP, 4FFFH	; top of memory (4k)
4503H	3E 48	LD A, 48H	; most significant byte of
4505H	ED 47	LD I, A	; interrupt vector table
4507H	ED 5E	IM 2	; set interrupt mode 2
4509H	FB	EI	; enable interrupt
450AH	00	NOP	; wait for interrupt
450BH	18 FC	JR FC	loop

Interrupt Vector Table

Address	Data
4800H	00
4801H	4C
4802H	00
4803H	4D
4804H	05
4805H	4E

Interrupt Service Routines

4C00H	3E30	LD	A,30H	; This routine puts a 0 in the center of screen.
4C02H	32203E	LD	(3D20H),A	
4C05H	ED4D	RETI		; Return from interrupt.
4D00H	3E32	LD	A,32H	; Puts a 2 in center of screen.
4D02H	C3024C	JP	4C02H	
4E05H	3E34	LD	A,34H	; Puts a 4 in center of screen.
4E07H	C3024C	JP	4C02H	

Program Listing

goes true during an interrupt acknowledge cycle. Therefore, the data must be enabled into the CPU when the interrupt acknowledge signal ($\overline{\text{INTAK}}$) goes true. This is easily accomplished by the addition of one AND gate (74LS08) (see Fig. 4). With this addition to the circuit, the data is enabled into the CPU either by the interrupt acknowledge signal or the read signal.

The steps to actually modify the TRS-80 are shown in Table 1. To test the interrupt mode, a simple interface board (which can be built on a vector board or

any prototype material) is required. A 40-pin ribbon cable and 40-pin edge connector is required to interface directly with the TRS-80 expansion interface connector.

It is important that the interface board be powered by its own 5 volts dc power supply. Do not use the power supply internal to the TRS-80. This avoids any possible damage to the TRS-80 power supply.

A schematic of the required interface board for testing the interrupt mode is shown in Fig. 8. I recommend the 40-pin ribbon cable be as short as possible to eliminate noise problems on the bus. Good grounds are also very important.

U1, a 74LS00, serves as a

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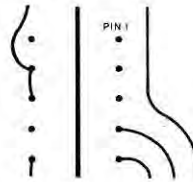


Figure 5

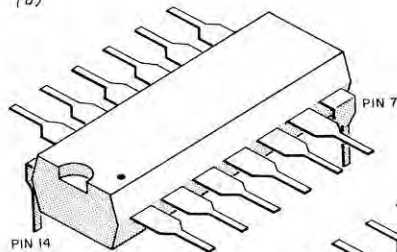
switch debounce network and a positive edge one shot. This switch generates the interrupt request (\overline{INT}) signal. U2, a 74LS244, is an octal tri-state buffer used to gate an eight-bit vector on the data bus during an interrupt acknowledge cycle (\overline{INTAK}). If a 74LS244 is not available, substitute two 74LS367 IC's. If an external 5 volts dc power supply is not available, the optional circuit is required.

The easiest way to implement the software for this test is with the T-Bug monitor. You can also use Radio Shack's Editor/Assembler. Load the Program Listing into memory.

The flow diagrams and memory map for the test routine are shown in Fig. 9. The program sets the stack pointer, loads the I register with the interrupt vector, sets the interrupt mode, enables the interrupt and waits. If all eight switches on the interface board are closed (a binary zero) and the interrupt push button is depressed, the CPU will go into the interrupt mode. This prints a zero on the screen, then returns to its wait loop. If switch two is opened and the button is pushed, a two will be printed. Switch three being opened and two closed results in a four being printed. If the computer returns to a ready, or power-up condition, something was done incorrectly. Go back and check the software and hardware.

Note: The RETI instruction resets the interrupt flip-flop so it is necessary to include the EI instruction in the main wait loop. Another approach would be to use the EI instruction in the interrupt service routine and

(a)



(b)

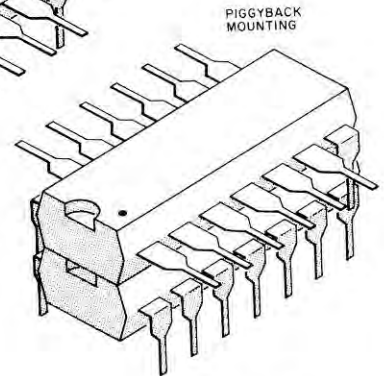


Figure 6a

Figure 6b

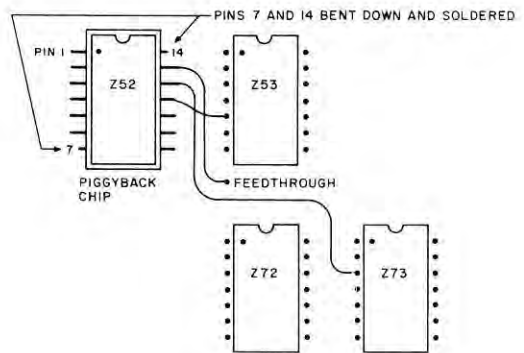


Figure 7

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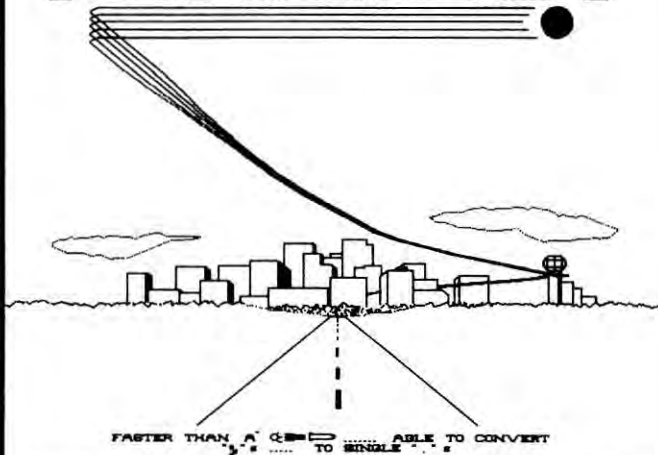
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substitute RETI with RET (return from subroutine), which has no effect on the interrupt flags.

With a clearer understanding of the Z80's three interrupt

modes and how to use them, many new doors should be opened for applications of the TRS-80. The small interface described to test the interrupt in

Mode Two also allows experiments with interrupt software to gain a clearer understanding of the possibilities of an interrupt-driven computer. ■

Douglas Fisher is a microprocessor systems design engineering supervisor for a manufacturer of computer-controlled newspaper inserting systems.

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- U1 = 74LS00
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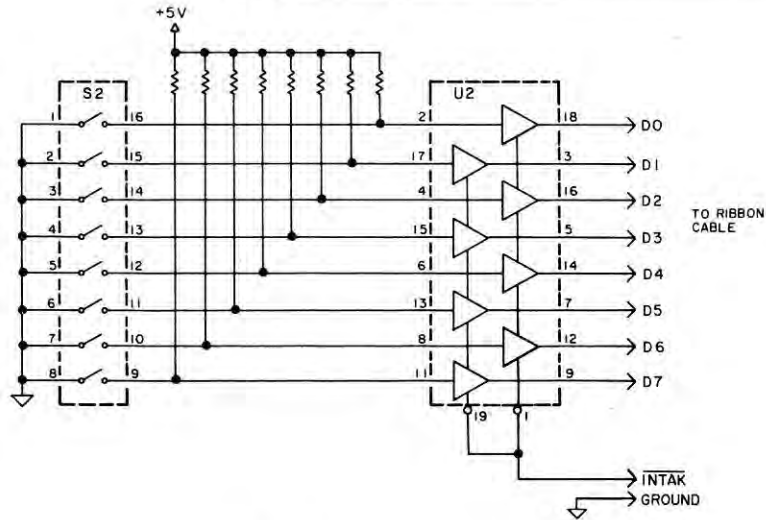
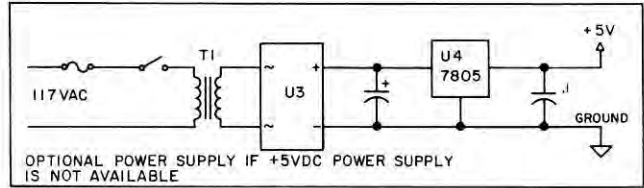
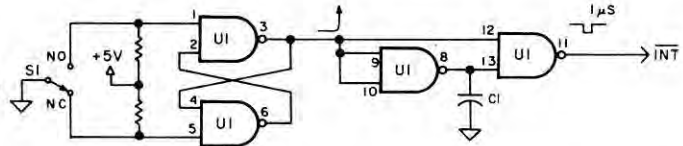


Figure 8

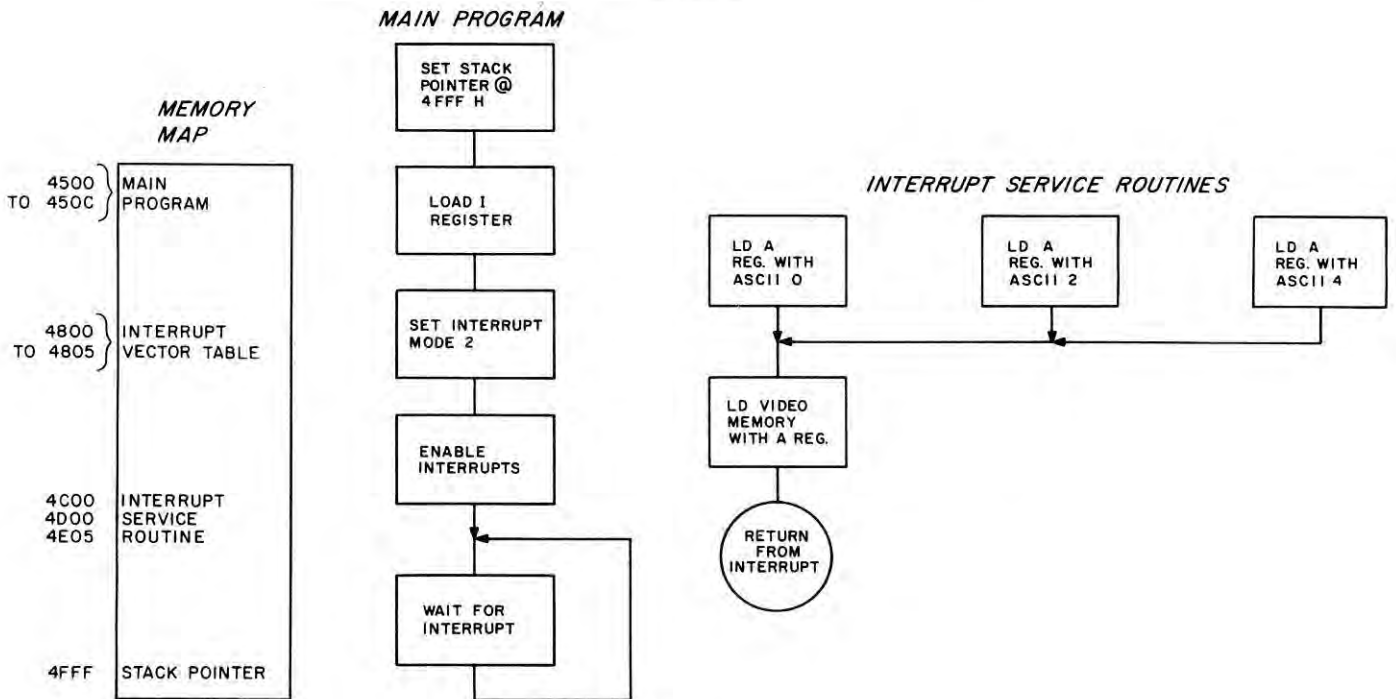


Figure 9

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Pardon me, Parson, but your parsing subroutine is rather parsimonious.

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Writing an adventure computer game can be a fas-

cinating challenge. These programs make detailed use of arrays, string commands, and decision trees. For a novice such a challenge can be a nightmare. I know of no books or

manuals that explain in detail how to write such a program.

The following article attempts to help other novices writing such a program. Specifically, I explain how to enter a two-word command into your program, such as Shoot Arrow or Take Gold, and have your computer decipher that command and act upon it.

This deciphering routine is also called a parsing subroutine. Parsing a sentence is the act of breaking it down into its grammatical parts. Our typical two-word command string is composed of a verb denoting the action, and a noun, which is the object of the action, in the order: verb-blank space-noun. When you design your adventure, you will prepare a vocabulary of verbs and nouns that the player will use to assemble commands. The size of your vocabulary will be limited by the available memory size. The number of possible commands equals the number of verbs times the number of nouns. That is, if you prepare a vocabulary of twenty verbs and thirty nouns for a game, you will present the player with 600 possible commands to choose from.

Not all such commands either make sense or are permissible within the context of your adventure. If you were to use the vocabulary listed in Table 1, the command Eat Apple would be instantly recognizable as a correct command. The command

Eat Horse would seem to be nonsense, but that need not always be so. You may require that your hero eat a horse before rescuing the princess. Any command may be valid, if you design your parsing subroutine to make it so.

A Demonstration

I have prepared a short demonstration program to illustrate the parsing subroutine. Program Listing 1 sets up the arrays that contain the verb and noun lists. Our simple vocabulary (Table 2) consists of four verbs and four nouns. This means that there are sixteen possible commands. Of the sixteen, only six are valid within the demonstration program. The valid commands are listed in Table 3. My choices are completely arbitrary; the command Read Rock could be valid if your adventure included writing carved on a stone.

The program follows a simple logic sequence. First, the verb and noun vocabulary arrays are set up. Second, the command string (CO\$) is entered. Third, the command string is broken down into its verb and noun

```

10 ' ADVENTURE GAME PARSING SUBROUTINE
20 ' DEMONSTRATION PROGRAM
30 ' BY DAN CATALDO
40 ' PART 1: SET UP ARRAYS--PRINT VERB/NOUN LISTS
50 VL=4:DIM VB$(VL)
60 VB$(1)="EAT":VB$(2)="GET":VB$(3)="READ":VB$(4)="HIT"
70 NL=4:DIM NOS(NL)
80 NOS(1)="APPLE":NOS(2)="ROCK":NOS(3)="BOOK":NOS(4)="TREE"
90 CLS
100 PRINT TAB(16) "VERBS", "NOUNS"
110 PRINT
120 PRINT TAB(16) VB$(1),NOS(1)
130 PRINT TAB(16) VB$(2),NOS(2)
140 PRINT TAB(16) VB$(3),NOS(3)
150 PRINT TAB(16) VB$(4),NOS(4)
160 PRINT
170 INPUT "WHAT SHOULD I DO";CO$
180 IF LEN(CO$)=0 GOTO 170 ELSE 190
190 ' PART 2: CO$ IS SPLIT INTO VERB AND NOUN
200 ' STEP 1: CO$ VERB COMPONENT BROKEN OFF
210 VB$(0)="":NOS(0)=" "
220 VB=0:NO=0
230 A=1:K=LEN(CO$):PRINT @ 576,"CO$ LENGTH IS ";K
240 VB$(0)=VB$(0)+MID$(CO$,A,1)
250 PRINT @ 640,"VERB IS ";VB$(0)
260 A=A+1:IF A=LEN(CO$)+1 THEN GOTO 520 ELSE 270
270 FOR N=1 TO 300: NEXT N
280 IF MID$(CO$,A,1)<>" " GOTO 240 ELSE 300
290 ' PART 2 CONTINUED
300 ' STEP 2: CO$ NOUN COMPONENT BROKEN OFF
310 IF MID$(CO$,A,1)="" THEN Q=1 ELSE Q=0
320 A=A+1
330 IF Q=1 GOTO 310 ELSE 340
340 A=A-1
350 NOS(0)=NOS(0)+MID$(CO$,A,1)
360 A=A+1
370 PRINT @ 704,"NOUN IS ";NOS(0)
380 FOR N=1 TO 300: NEXT N
390 IF A=LEN(CO$)+1 GOTO 400 ELSE 350
400 ' PART 3 : DECISION TREE
410 FOR VL=1 TO 4:IF VB$(0)=VB$(VL) THEN VB=VL ELSE NEXT VL
420 FOR NL=1 TO 4:IF NOS(0)=NOS(NL) THEN NO=NL ELSE NEXT NL
430 ON VB GOTO 450,470,490,510
440 GOTO 520
450 ON NO GOTO 540,550,550,550
460 GOTO 520
470 ON NO GOTO 540,540,540,550
480 GOTO 520
490 ON NO GOTO 550,550,540,550
500 GOTO 520
510 ON NO GOTO 550,550,550,540
520 PRINT "I DON'T KNOW WHAT ";CHR$(34);CO$;CHR$(34); " MEANS"
530 GOTO 570
540 PRINT "THE COMMAND ";CHR$(34);CO$;CHR$(34); " IS VALID":GOTO 570
550 PRINT "THE COMMAND ";CHR$(34);CO$;CHR$(34); " IS NOT VALID":GOTO 570
560 STOP
570 INPUT "TRY AGAIN";Y$
580 IF LEFT$(Y$,1)="Y" THEN GOTO 90 ELSE END

```

Program Listing 1

Verbs	Nouns
Eat	Apple
Drink	Horse
Ride	Water

Table 1

components. The verb and noun components of each command are then compared with the prepared vocabulary list. If both verb and noun are within the vocabulary, the program determines if the verb-noun combination represents a valid command.

The verb and noun vocabulary lists are set up in Part 1 of the program, which begins at line 40. The lists are single dimension string arrays of length VL and NL, respectively. To increase the size of the vocabulary, increment either value and make appropriate additions to the arrays in either line 60 or 80. Lines 100-150 print the vocabulary for easy reference during the program run.

After you enter the command string (CO\$) at line 170, the program really gets interesting. Our task is to disassemble the command string into its separate letters and blank spaces, and then reassemble it into two new strings: VB\$(0) and NO\$(0), the verb and noun respectively. You recall that to set up the array VB\$(VL), you actually set up an array with the following elements: VB\$(0), VB\$(1), VB\$(2), VB\$(3), and VB\$(4). At line 210, we initialize VB\$(0) and NO\$(0) as dummy strings of zero length. Take care not to type in a blank space between the quotation marks. Line 220 sets up the variables VB and NO, which are used in the decision tree in Part 3 of the program.

The length of the command string is determined at line 230 and the result is printed. The length of CO\$ is equal to all the letters and blank spaces typed in before you press Enter. Thus, the command "Eat Apple" has a length of nine, but " Eat Apple" has a length of 10.

Eat Apple

The dissection of the command "Eat Apple" begins at line 240. First the verb must be split off. This is done by use of the command VB(0) = VB$(0) + MID$(CO$,A,1)$. The pointer variable A had been set as equal to one in line 230. At line 240, the program breaks off a sub-string of CO\$ that is one letter in length, and which begins at the

first letter of CO\$. This substring, the letter "E", is added (i.e., concatenated) to VB\$(0). Since the string VB\$(0) was initialized as a dummy string of zero length, the concatenated VB(0) = '' + 'E' = "E"$. If VB\$(0) had been initialized with a blank space between the quotation marks, the first result of concatenation would have been " E". Any attempt to compare VB\$(0) with the other members of the VB\$(VL) array would then fail, since the other members do not have a preceding blank space between the quotation marks.

After the first concatenation the pointer A is incremented by one and points to the next letter or blank space in CO\$. At line 260, after the increment, a test is made to determine if A is equal to the length of CO\$ + 1. If the length of CO\$ were three, after the third concatenation A would be equal to four. Since this value exceeds the length of CO\$, the program would branch to line 520 and an Invalid Command statement would be printed. The reason for this is that the demonstration program is concerned only with two-word commands. There is no reason why a one-word command such as Help could not be valid in your own program.

The test at line 260 ordinarily will not be acted upon. However, if you accidentally type in "EatApple", the program will create the verb "EatApple" in VB\$(0), and then branch to line 520. The pro-

gram must see at least one blank space between verb and noun in CO\$ in order to continue. There is no point in proceeding to Part 3 of the program, the decision tree, since the program will not be able to deal with a one-word command.

As soon as the program encounters a blank space within CO\$, the first part of the disassembly is complete. VB\$(0) now contains the verb of your command. Step 2 of the disassembly begins at line 310. The program continues using the MID\$ command to examine CO\$. If more than one blank space is encountered between the verb and noun, the program will ignore all of the blank spaces before beginning the assembly of the noun at line 350.

A simple routine determines where to begin building the noun. If, at line 310 MID(CO$,A,1)$ is a blank space, A is incremented by one, and the variable Q is also set equal to one. As long as Q equals one, the program will loop back to line 310 to examine the next position in CO\$. However, when the program encounters the first letter of the noun, Q is set equal to zero and the test at line 330 fails.

The program then progresses to line 340, where A is decremented by one. Recall that A is designed to point to the next position in CO\$, and that it has been incremented at line 320 to point to the second letter in the noun. Since the first letter of the noun has not been split off from CO\$, we must back up, so that A once again points to the first letter of the noun. The process of noun assembly that follows is the same as that used for the verb. The assembly process continues until A equals the length of CO\$ + 1. Part 2 is then complete, with a verb in VB\$(0) and a noun in NO\$(0).

A Simpler Way

A simpler way of stripping the noun from CO\$ follows: For line 350, type in: $350 NO$(0) = RIGHT$(CO$,K - A + 1)$ then delete lines 360, 380 and 390. This is one technique you can use in your own parsing subrou-

tines. The longer method of the demonstration program is used for illustrative purposes only, although you might find it useful in another type of program.

Now that we have the verb and noun separated from CO\$, we can test the validity of the command itself. To perform the test, we first translate the contents of VB\$(0) and NO\$(0) into the variables VB and NO. For example, the verb Eat is VB\$(1). The noun Apple is NO\$(3). If we can set VB equal to one, and NO equal to three, we can perform logical tests to determine if the combination 1-3 is valid or invalid.

VB and NO are assigned values in lines 410 and 420. VB\$(0) and NO\$(0) are compared to the other elements in their respective arrays. If a match is found, VB or NO are assigned values that relate to the matched element's position in the array.

The validity tests themselves are then conducted in lines 430 through 510. The command $ON...GOTO$ branches to various points in the decision tree. If the verb is Eat, that is, VB = 1, the program branches from line 430 to line 450. At lines 450 through 510, a further branching is made depending on the value in NL. If the command were Eat Rock, the program would first branch from line 430 to line 450. Since the value of NO is two for the noun Rock, the program would branch from line 450 to line 550, and an Invalid Command statement would be printed.

To use this program, load and run it. In response to the prompt, enter the command Eat Tree. The program will first display the length of the command string. It will then print the verb and noun, showing the assembly of each letter by letter. Finally, a statement regarding the command's validity will appear.

You will gain a great deal of experience by altering the verb and noun arrays to your own suiting, and by redesigning the decision trees in Part 3 to reflect the new vocabulary. You should be able to develop simpler, faster methods once you understand the basics involved. ■

Verbs	Nouns
Eat	Apple
Get	Rock
Read	Book
Hit	Tree

Table 2

Valid Commands
Eat Apple
Get Apple
Get Rock
Get Book
Read Book
Hit Tree

Table 3

Make your favorite programs run faster.

Optimize Your Code

Robert W. McTernan
42 Aspinwall Road
Red Hook, NY 12571

If you are like me, you finish writing a program with mixed emotions. It's a great feeling to see your program running exactly as you planned. But you probably had a lot of fun throughout the writing process.

One way to extend the fun and improve your program at the same time is by program optimi-

zation. You can optimize the Basic programs you have written and those you purchased or found in magazines and books.

Optimization is simply the process of reviewing a completed program and modifying it to make it run faster (of major importance for Basic programs) and condensing it to save memory (for shorter CLOADs and CSAVEs).

I keep a Casio AQ-2000 calculator with stopwatch functions next to my TRS-80. Although I use it to calculate video screen POKE addresses, it is mainly for

timing various program routines. By recording the run time of each routine, the best one can be chosen for each purpose.

To accurately measure the effects of optimization on a simple program, enter Program Listing 1 just after powering your TRS-80. This ensures that no machine language program will interfere with the demonstration. You will need a timing device, such as a stopwatch with a sweep second hand. Anything more accurate than a sundial will do. You will use it to measure the running time of the program after each modification. Use the Edit function when changing lines. Enter program lines exactly as described; we will be keeping track of program bytes as we progress through the demonstration. If you have a speed-up feature on your TRS-80, set it for normal TRS-80 operational speed.

The Program

Program Listing 1 whitewashes the screen. It is simple and adequate to demonstrate the advant-

ages of program optimization. The variables in lines 10-140 simulate a group of variables normally present in a longer program. Clear0 in line 240 allows a clean byte count after a program run. Two spaces follow each line number. Spaces throughout the program provide better readability. To assist you in stopping your watch, a Last Scan warning will appear on the upper left of the screen followed by a Stop. Line 180 contains 27 spaces preceding the word Whitewash. Three spaces precede and two spaces follow the word Stop in line 240. Line 240 branches to itself to prevent pushing up the whitewashed screen; press Break to stop each run.

All set? Let's begin.

Benchmark Run

We will check our run time and program byte count before we start optimizing. Type Run, then press the Enter and stopwatch start buttons simultaneously. As the whitewash nears the bottom of the screen, watch for the Last Scan warning and stop your watch when Stop appears. Use this procedure for all subsequent runs.

The program run time should be approximately 5 minutes, 39 seconds. Enter ?MEM. The displayed number should be 15191 on a 16K TRS-80. Since our program ends with a Clear0, all re-

```

0 CLEAR 300
10 A=0
20 B=0
30 C=0
40 D=0
50 E=0
60 F=0
70 G=0
80 H=0
90 J=0
100 K=0
110 L=0
120 M=0
130 N=0
140 P=0
150 X=0
160 Y=7
170 CLS
180 PRINT"          WHITEWASH"
190 SET(X,Y):REM *** DRAW SPOT
200 IF X=127 THEN X=0:Y=Y+(200*.005) ELSE X=X+(200*.005)
210 IF PEEK(16320)=191 THEN PRINT@0,"LAST SCAN";
220 IF Y=48 THEN GOTO 240:REM *** WHITEWASH IS COMPLETE
230 GOTO 190
240 CLEAR0:PRINT@0,"  STOP  ";GOTO 240:REM *** END

```

Program Listing 1

The Key Box

Basic Level II
Model I
16K RAM



After three years of selling my Model I and Model III programs, I've earned back my development costs. So I can lower the price.

Now I'm offering my Model I and Model III programs for \$75 each.

They've been checked out by thousands of TRS-80* users, most of whom get in touch with me, Irwin Taranto. Thousands of phone calls later, these systems are completely developed, checked out, glitch-free.

When people call, we've heard all the questions and we can answer them right off. I don't have to get on the phone and work through problems like I used to.

Since I'm getting off so easy, the least I can do is drop the price—50% for General Ledger, 25% for the rest.

These are my Model I and Model III programs:
Accounts Payable It links to the General Ledger, calculates and prints checks and makes reports. It's an invoice-linked system.

Accounts Receivable It keeps track of billed and unbilled invoices, open and closed items and aging. It prints statements and links to the General Ledger.

General Ledger It keeps track of data by month, quarter, year and the previous three quarters. It even includes a Cash Journal.

Inventory Control It gives an immediate read-out on any item inquiry, including quantity and dollar total.

Invoicing It prints your detailed invoices and links to Accounts Receivable and the General Ledger.

Payroll It keeps the files, computes pay and deductions, prints forms and checks, figures taxes, overtime and piecework pay in any state tax routine, and prints the 941-A and W-2 forms.

They're all yours, for \$75 each. You also need documentation when you run our systems. The Osborne books—one for Accounts Payable and Receivable, one for General Ledger, one for Payroll—cost \$20 each. Our invoicing book costs \$10.

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70

quests to display available memory will show values subtracted from 15622. Our program now resides in 431 bytes of memory (15622 minus 15191). If the result of a Print Memory query is off by just a few numbers, you probably left out a few spaces. List the program and correct it. If the value is much lower, you probably did not enter the program after a power-on and have a machine language program resident in memory. Save the program on tape, perform a power off-on cycle and load the program.

Variables vs. Constants

Notice the values within the parentheses in line 200. The product of 200 times .005 equals 1. What a dumb way to express a one! To demonstrate the first optimization, change these lines as follows:

```
10 A = 200
20 B = .005
200 IF X = 127 THEN X = 0
    :Y = Y + (A*B) ELSE X = X + (A*B)
```

Enter Run and start the stopwatch. The run time is 4 minutes, 6 seconds, and the byte count is 426. Quite an improvement in run time, right?

This demonstrates the importance of using variables rather than constants in your programs. The TRS-80 normally operates with floating point values. It takes a lot of time to convert constants to floating point values every time they are referenced; accessing a variable which has been converted when initially defined is much faster.

Defining Variable Types

Most program variables only simulate those used in a typical program. Even though we don't use many of them, they are still placed in the variable table. Let's swap the lines in which we define our most heavily used variables with ones we use less. Change these lines as follows:

```
10 X = 0
20 Y = 7
150 A = 200
160 B = .005
```

Start the program and stopwatch. Run time has improved to about 3 minutes, 30 seconds. The byte

count remains the same. Another good improvement!

Define your most heavily used variables first in the program. When running a program, each variable is placed in a table the first time it is referenced. The first defined variable will be at the top of the table, the second defined variable will be second, and so on. When a variable is again referenced the table must be scanned, starting at the top, until the variable is found. The closer variables are to the top, the quicker they will be found.

Variable Type Definition

If a variable type is not defined in a program, the TRS-80 assumes the variable to be a single precision number.

Change this line as follows:

```
0 CLEAR 300:DEFINTX,Y,C
```

Start the program and clock it. Run time should be about 3 minutes, 22 seconds. Program byte count is 434.

This speedup is not significant in this short program. The Defint statement is significant in a larger or busier program where most numeric variables are integers. Whenever possible, use integer variables in For...Next loops.

Program Clean-up

Although extra spaces and unnecessary words make a program listing more readable, they waste memory and slow a running program. Make the following changes:

- Using the Edit function, delete the extra spaces following the line numbers and remove all spaces in the following lines: line 0, 190 (except in the REM statement), 200, 210 (except within quotes), 220 (except in REM statement), 230, 240 (except in REM statement and those within quotes);

- Change line 180 to PRINT @ 27, "WHITEWASH";

- In line 210, remove the word THEN; and

- In line 220, remove the word GOTO.

Start the program and time. Run time is about 3 minutes, 21 seconds. Program byte count is down to 364.

The biggest savings here is memory space. Eliminate all useless spaces and words since the TRS-80 is a serial byte machine and must read these unnecessary bytes during a run.

REM Blemish

Although useful in program listings, remarks have no place in a running program. Remove the REM statements in lines 190, 220 and 240. Run the demonstration and time it. Run time is now 3 minutes, 9 seconds. Byte count is 310.

Before removing REM statements, make a duplicate tape of your program for future reference and use the optimized copy for execution.

Although it is easier to key in the apostrophe abbreviation in lieu of REM when entering a program, the abbreviation uses two additional bytes. Use REM. This is not true for the ? abbreviation for Print.

POKE IT

Another optimization method is alternate routines. It is no accident that I chose a simple graphics program to demonstrate optimization. Although we get the job done with our present program, we can really get it going with POKES. Of course, we are only doing a simple whitewash. Your future graphics endeavors will not be as simple, but the principle is the same for complex routines.

Change these lines and delete line 220:

```
10 X = 15488
20 Y = 1
30 C = 16383
190 POKE X, 191
200 IF X <> C THEN X = X + 1 ELSE 240
```

Run and time it. Run time is about 21 seconds! Byte count is 289.

The POKE statement draws an area six times larger than the Set statement and consequently

whitewashes the screen much quicker. We are using ASCII code 191, but complex graphics can be drawn with combinations of ASCII codes 129-191.

We can improve the routine even more with a For...Next loop. Change these lines and delete line 200:

```
185 FOR X = X TO C
230 NEXT
```

Run time is now about 11 seconds. Byte count is 276.

Multi-Statement Lines

A lot of memory can be saved by combining statements into single lines. Make the following changes:

- Put all statements from lines 0-180 in line 0. Separate each statement with a colon;
- Delete lines 10-180;
- Put all statements from lines 185-210 in line 10—do not forget the colons; and
- Delete lines 185-210.

Run time is about the same, but the byte count has decreased to 196.

Each program line in memory has the following format. Starting in memory address 17129 (the starting address of all Basic programs), the first two bytes contain the address of the next line. The next two bytes contain the current line number. Immediately following is the statement itself. A zero byte completes the format.

When we put multiple statements in a single line, only the first statement in the line is preceded by the four bytes containing the next line address and current line number. The zero byte mentioned above is replaced by the colon (statement separator). For every line above placed in an existing line, we saved four bytes.

Print@ Graphics

A still quicker way to whitewash the screen is by using the

```
0 CLEAR300:DEFINTX,Y,C:X = 15488:Y = 1:C = 16383:D = 0:E = 0:F = 0:G
= 0:H = 0:J = 0:K = 0:L = 0:M = 0:N = 0:P = 0:A = 200:B = .005:CLS:
PRINT@27,"WHITEWASH"
10 FOR Y = 128 TO 895 STEP 179:PRINT@Y, STRING$(179,191)::NEXT:POKE
16383,191
240 CLEAR0:PRINT@0,:: STOP "":GOTO240
```

Program Listing 2



I've paid off the costs on my Model II TRSDOS* systems, too.

So now they're 50% cheaper.

A couple of months ago, I realized I'd paid off the development costs on my Model I and Model III programs. I could lower the price without cutting back one bit on my support.

The response was fantastic. Enough so that I can do the same for the TRSDOS versions of my Model II/16 programs.

These are my systems, and my new prices.

General Ledger

It gives year-to-year comparisons in dollars and percentages. It figures budgets and even has a report generator. It was \$299, it's now \$150.

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It generates purchase orders and posts the items to payable when the goods come in. It calculates and prints checks and aged ledger reports, linking fully to the General Ledger. Was \$349, now \$175.

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You can choose either an open item system or a balance forward system which works on a cash or an accrual basis. The open item system does invoicing and sales analysis by product code and

figure in salesmen's commissions. They both generate mailing lists by customer code and zip code for up to 2000 customers. Open Item/ Invoicing was \$349, it's now \$175. Balance Forward was \$399, it's now \$200.

Payroll/Job Costing

A huge capacity. It accommodates up to 300 employees in multiple departments, with any state tax routine. It also figures piecework, overtime and tips. Was \$299, now \$150. With job costing option, was \$399, now \$200.

Inventory Control

It stores up to 5000 items. It reports by vendor, tells you when you're out of stock, or when you need to reorder. It updates price or cost automatically and integrates fully with my invoicing system. Originally \$399, now \$200.

These programs all work with one, two, three or four-drive and hard disk systems. They're designed to integrate with the General Ledger, and, where it helps, with each other.

They also get what I firmly believe is the most thorough support in the microcomputer industry. If you have a problem, call us and we'll straighten it out. Even if I have to do it myself, personally, right there on the phone.

Michael Tannenbaum, the "80 Accountant" thought my systems were "a very impressive product at a very reasonable price." Even when they cost twice as much as they do now.

Just call, and take advantage of me.

70

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Print@ statement in lieu of the POKE statement.

Make the following changes and delete line 230:

```
10 FORY = 128TO895STEP179:PRINT@Y,
   STRINGS$(179,191);NEXT:POKE16383,191
```

Whew! As best as I can determine, run time is about .7 seconds. Byte count is 190.

The Print@ statement draws the same graphic symbol at consecutive video screen addresses very rapidly.

Optimization Score Card

Program Listing 2 illustrates the optimization so far. Compare it with Listing 1. Look at what our optimization has accomplished.

Program	Run Time	Byte Count
Original	5'39"	431
Optimized	0'.7"	190

The extra optimization effort is well worth it. Of course, Whitewash was set up to show the benefits of program optimization. You may not get results as dramatic as these when you op-

timize your programs, but you will greatly improve them.

Some More Tips

The power off/on cycle purges the memory of any resident machine language monitor program. These programs slow a running Basic program because they use time to spy on your program. When needed, these monitors are invaluable. When they are not needed but remain in memory, they are worse than useless. If I activate my ESF Stringy-Floppies and run the original program, time increases to over six minutes. If you are not using a monitor program for the program you are running, purge it.

Most programmers assign variable names similar to the data they represent. A row pointer may be assigned the name RP, a variable Print@ address may be called PA. This is fine if the values are saved for future use. If variable values are not saved, use the same variable names for other data.

```
0 INPUT"ENTER RESISTANCE";R
1 INPUT"ENTER CURRENT";I
2 PRINT"VOLTAGE = "I*R
3 INPUT"ENTER LENGTH";L
4 INPUT"ENTER WIDTH";W
5 PRINT"AREA = "L*W
```

Assuming the above variables are not used later in the program, the variable in line 3 could be named R, the one in line 4 could be named I, and the variables in line 5 changed correspondingly. This would shorten the variable table and table scanning time would decrease.

Many programs use the Print statement with a string constant full of spaces preceding the first word to be printed. This displays the word at a specific screen location (like we did in line 180 of Whitewash). Use the Print@ or PRINTTAB statements instead.

To decrease run time during cassette input/output operations, create larger blocks of data before writing it on tape. Do this by linking strings. If your data is numeric, convert it to strings within your concatenation loop. Monitor your con-

catenating string length and limit it to the maximum allowed, then write it on tape. When reading it back, the string must be disassembled and distributed to the proper locations. This method takes a little more programming but it saves time. You will decrease the number of records written to and read from tape.

Purchase a good line renumbering program. When your program is completed, renumber your program lines zero in increments of one. This decreases the length of referenced line numbers in your program by one or more digits. For example, look at the following routine:

```
100 A$=INKEYS:IF A$="" THEN 100
   ELSEIF A$="X" THEN 110 ELSE 120
110 B=B+C:GOTO 100
120 B=B+D:GOTO 150
```

Assuming that line 100 is the first line of a program, the routine will look like this after renumbering:

```
0 A$=INKEYS:IF A$="" THEN 0 ELSEIF A$
  ="X" THEN 1 ELSE 2
1 B=B+C:GOTO 0
2 B=B+D:GOTO 5
```



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183



Look at the bytes you saved. For multi-statement lines you may save enough so that additional statements may be moved up a line, resulting in more memory savings. Your program will run even faster.

Summary

Let's review the procedures covered to optimize a Basic program:

- Use variables instead of constants;
- Define the most heavily used variables first;
- Use the Defint statement to define all integer variables;
- Use POKE and Print@ statements in graphics routines;
- Remove REMs and unnecessary spaces from statements;
- Use For...Next loops instead of increment and test loops;
- Use multi-statement lines;
- Purge unused monitor programs before running programs;

● Use as few variable names as possible;

● Create larger blocks of data to be written on tape; and

● Renumber your programs starting in line 0 and increment by one.

One last tip to make it an even dozen: The more you program, the smarter you get. Review your earlier programs every six months or so. You will find routines that can be improved; that apply the optimization rules and keep your programs as "smart" as you are. You can almost always optimize your programs further.

There are, no doubt, many more ways to optimize your programs: Clear only the number of bytes required by your program; use subroutines for routines that are the same in different parts of your program and use the zero subscripted array variable name, to name a few. The more you optimize your program the more efficiently it will work for you. And program efficiency always pays off. ■

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Hello thayuh. This is Eben Flow, proprietor of the Fish or Cut Bait Company, buyer and seller of lobstah bait for 49 years. My hobbies are collecting linoleum samples, squashing flies and playing pac-person on my home computer.

But here on Martinicus Rock, off the coast of Maine, the power can be a tad erratic. So, to cure the brownout and blackout problems, and to keep them spikes and surges off my picture tube, I got me a **MAYDAY** Uninterruptible Power Supply from SUN RESEARCH. Them fellas fixed me up real good and real light on my pocketbook, too. Got me a **MAYDAY** for my mini-calcaputer with a voltage regulator and everything for only 325 clams. They even included the battery in a nice waterproof box. Handy out here, you know. Now, if **MAYDAY** would only keep them sea dogs out of my barrel. . .

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Electric Pencil-like editing of RAM.

PENRAM

Roxton Baker
Box 8272 APO
San Francisco, CA 96555

I recently needed a program that would allow me to quickly examine large portions of RAM and easily change what I found there, working either in ASCII or hex. This ability would allow me to edit data or text in memory, without being concerned over actual addresses. In particular, I wanted to scan and modify whole disk tracks which had been read into RAM. Tracks never read the same way twice so the locations in memory of ID packs, sector boundaries, etc. are unpredictable.

The available monitors for the TRS-80 are written with the intention of editing hex machine-language programs, in which byte locations are well defined. These monitors require specification of the addresses to be edited, and generally allow editing only in hex and scanning

only in one direction. Bi-directional scanning would improve matters, but you still must read off addresses of interest and reenter them under the edit command. The Electric Pencil's editing action not only provides true scrolling in both directions, but its blinking cursor can be positioned with the arrow keys and anything typed at the cursor location replaces what's there. The pencil, however, is not used for editing RAM. It works on its own text files.

PENRAM

PENRAM is a machine-language utility that provides editing in RAM and is similar to the Electric Pencil. Two-way scrolling is available at low or high speed and the moveable edit cursor allows direct type-in of hex bytes or ASCII characters (the mode can be toggled at a keystroke). A continuous display of the edit cursor's address is maintained as well as its displacement from a reference address that you may fix. Users of Electric Pencil should understand that PENRAM does not allow true insertion or deletion of bytes of code; it merely lets you write over what's already there. However, see the note at the end of this article concerning an upgrade to PENRAM.

PENRAM can be used alone as a utility, called from Basic via `USR` or `System`, or patched onto your favorite monitor as a re-

placement for its editing function. Instructions for appending it to `RSM-2` and `T-Bug` are given later. Furthermore, PENRAM is in the public domain. You may incorporate it into any program you write, commercial or otherwise, without royalty arrangements. Author credit is requested.

Creating the Problem

The source code for PENRAM is given in the Program Listing. By omitting most of the comments (and using tab to space right) the program will fit into a 16K machine using Radio Shack's Editor/Assembler. It may also be entered into any of the disk assemblers. To avoid the typing, contact The Alternate Source. They have kindly offered to make the un-commented source code available on tape at cost.

PENRAM may be assembled at any location by changing the `StartP` address near the beginning. Allow 1100 bytes for the code. PENRAM also uses some stack space in the program that calls it; this is normally of no concern.

Once assembled, PENRAM may be used by itself or it may be called by another program. The `StartP` address is also the entry point. When exited, PENRAM executes a Return instruction so it should be called in such a manner that this return is meaningful. This will always

be the case if PENRAM is called as a subroutine or if it is entered from DOS.

When calling PENRAM via the `System` or `USR` commands in Basic it may be preferable to jump on return to addresses `06CCH` or `0A9AH`, respectively. To achieve this, change the instruction at `RETLBL` near the beginning of the source code from `RET Z` to `JP Z,nn`, for example, where `nn` might be `06CCH`. This jump takes three bytes as opposed to the one-byte `RET`, so omit the two `NOPs` immediately afterwards. The code will still be 1100 bytes long. You may add more code at this return point to clear the screen before returning. Assume that PENRAM has modified all registers except `Y`.

Using PENRAM

On entry, or whenever you press `shift/left-arrow`, PENRAM will request an address to start the display. Enter a four-digit hex address (or just press `Enter` to quit). A hex display of the 256 bytes of memory beginning at that address will appear on the screen. You may change this to an ASCII display by pressing `Clear`. Another `Clear` takes you back to hex.

The blinking edit cursor will be in the upper left corner. You move it using the four arrow keys—scrolling is automatic. At any time you may enter data at the current cursor position. In the hex mode two hex charac-

The Key Box

Model I
16K RAM Cassette
32K RAM Disk
Assembly Language
Editor/Assembler

ters (0-F) are required; in the ASCII mode any printable character may be entered (except arrows). These characters will replace the current byte at that location. You may Break after entering only one hex character in which case the original byte is restored. All data changes are seen instantly on the screen. Most keys repeat so that you may easily fill memory with a value, and high-speed scrolling is provided with the shift/up arrow and shift/down arrow keys.

On the right, you will see <nn> displayed as the actual address of the byte next to the edit cursor. This makes it easy to read off addresses of interest, without counting. Below that the value of the current reference address is shown (in decimal) and the displacement of the edit cursor from it.

The reference address is updated to the current edit cursor position whenever you press shift/Break. To understand the use of the reference address feature imagine that you wish to move the cursor 287 decimal bytes beyond where it is. You would press shift/Break to set the reference address to the current position of the edit cursor, and then you would move the cursor downwards while watching the displacement value to see when you have reached 287.

Attaching PENRAM to a Monitor

The addition of PENRAM will complement the editing features of any good monitor program. Patching PENRAM to a monitor program is easily done. For example, RSM-2 provides a U (user-definable) command that will access PENRAM. Under T-Bug the normal M editing command is replaced. In the following instructions all addresses and values are in hex.

The 48K version of RSM-2 is assumed. For 32K, subtract four from the first hex digit of each address or value marked "*". Thus *E7B3H for 48K becomes A7B3H for 32K. Similarly, *FFH becomes BFH. For 16K, subtract eight instead of four. Assemble PENRAM at *E7B3H by setting STARTP in the source code to this value. Load the resulting object code into memory. Load and run RSM-2. Using the E command of RSM-2, change the code at address:

```
*EEA6H from 00      to 7F
*EEB1H from 32 80 *FF to 00 00 00
*FF80H from C9 00 00 to C3 B3 *E7
```

At this point the new monitor program PENRSM resides from *E7B3H to *FFFFH, with entry point *EE94H. You may write it out to tape with the P command, or on a disk system you may go to DOS with G402D and use

TapeDisk or the Dump command to put PENRAM/CMD on disk.

Adding PENRAM to T-bug is very easy. (A Level II non-disk machine is assumed.) Assemble PENRAM at 4980H and load the object code into memory there. Load and run T-Bug. Use its M command to carefully change the two bytes at address 440EH:

```
from 32 45
to 80 49
```

Use X to break from the editing mode. The new monitor program PENBUG now resides from 4380H to 4D09H, with entry point 43A0H. Immediately, before doing anything else, punch it out to tape with the P command. Under PENBUG the M command will access PENRAM; shift/left arrow; Enter returns from it. It may also be necessary to press X on return to get the # prompt.

To attach PENRAM to other monitors locate the call or jump used when the edit command is invoked and replace it with a call to PENRAM.

How PENRAM Works

Those interested in modifying or extending PENRAM will need to know something of the program structure. Refer to the source code listing in Listing 1. PENRAM operates by keeping track of three important addresses, which will be referred to by the names of their storage locations (which are unimportant).

HOMADD, the address that is displayed in the upper left (home) corner.
 EDCUR, the current location in video memory (3C00H-3FFFH) of the edit cursor.
 BYTED, the actual address of the byte pointed to by the edit cursor.

Initially the screen is filled with 256 bytes of memory starting at the hex address input by the user. This address is the first value of HOMADD. The edit cursor is positioned at the first byte displayed. From there it can be moved 15 spaces to the right and/or 15 lines down, without causing any scrolling. A count (stored in RGTCUR) is kept of how many spaces to the right the cursor is moved. A similar count (in DWNCUR) is kept of how many lines down it is moved. PENRAM

begins each cycle of its operation at UpDate by calculating, from RGTCUR and DWNCUR the present address, EDCUR, of the edit cursor. It simultaneously calculates (from HOMADD, RGTCUR, and DWNCUR) the value of BYTED so that it knows to which byte in memory the edit cursor is pointing.

Once these values have been found, PENRAM displays the address stored at BYTED as the <nn> value mentioned earlier. It also displays the current reference address, called ATADD, and subtracts it from the BYTED address to find the present displacement. Available ROM routines are used to convert this displacement to decimal, and it too is displayed.

With this done, PENRAM goes into a keyboard scan loop at KBDSCN. It remains in this loop, blinking the edit cursor, until a key is pressed. The cursor blink rate is determined by BDELAY, and the graphics character used for the cursor is defined by CURCHR. Either of these may be changed before assembly.

When a key is pressed, PENRAM goes to KPRESS and takes the following actions:

- If a shifted up- or down-arrow key, PENRAM immediately checks the value of DWNCUR and modifies it or scrolls the screen, as appropriate.
- If the shift/left arrow key, PENRAM reinitializes by jumping back to the ENTRY2 point. This is almost a full restart.
- If the shift/Break key, PENRAM immediately sets ATADD equal to BYTED, thus updating the reference address, and returns to UpDate so that the new value will be displayed.

● If an unshifted arrow key, PENRAM enters a debounce delay loop and then processes the key by updating RGTCUR or DWNCUR and scrolling the screen if necessary.

● If the Clear key, PENRAM changes the type of display flag HATYPE from hex to ASCII or vice-versa, redraws the screen and restarts the cycle.

● If a valid hex character in the hex mode, PENRAM remembers the entry, delays briefly for debounce, and awaits the next

Program Listing

```
*****
00010 ;*****
00020 ;
00030 ; >>>> P E N R A M <<<<<
00040 ;
00050 ; A SCROLLING RAM EDITOR UTILITY
00060 ;
00070 ; SOFTWARE IN THE PUBLIC DOMAIN
00080 ;
00090 ;*****
00100 ;
00110 ; BY ROXTON BAKER
00120 ; BOX 8272, APO SAN FRANCISCO 96555
00130 ;
00140 ;
00150 ; VERSION 2.0
00160 ;-----
00170 ;
00180 ;COMMANDS:
00190 ; 'CLEAR' CHANGES TYPE OF DUMP (HEX/ASCII).
00200 ; 'BREAK' BREAKS FROM ERRONEOUS HEX ENTRY.
00210 ; 'SHIFT/BREAK' SETS REF. ADDRESS = CURRENT
ADDRESS.
00220 ; 'SHIFT/UP- OR DOWN-ARROW' SCROLLS RAPIDLY.
DRESS.
00230 ; 'SHIFT/LEFT-ARROW' ALLOWS NEW STARTING AD
00240 ; (REPLY <ENTER> TO LEAVE PENRAM)
00250 ;
00260 ;
00270 ;-----
00280 ; PENRAM CAN BE RELOCATED BY CHANGING THE VA
LUE OF
```

Listing continues

hex character. When that is received PENRAM forms the new byte and writes it into BYTED. Then it steps the edit cursor right one space by jumping to same place (DORT) that a right-arrow would have taken it.

• If a valid ASCII alpha-numeric and in the ASCII mode, PENRAM writes it into BYTED and then steps the edit cursor right.

The delay values used for the debouncing are specified as KDELAY1 and KDELAY2. You may wish to increase them if you experience keybounce.

The cursor movement referred to above as resulting from the arrow keys is coded in routines DOUP, DODN, DOLF, and DORT. For example, if the user is not attempting to move the cursor off-screen, then these routines just translate the arrow keystrokes into appropriate changes in RGTCUR and DWNCUR, and return to UpDate to begin the next cycle.

When the cursor is moved beyond the edge of the screen,

scrolling must take place. This is done by shifting the current contents of the screen up (or down) by one line, updating HO-MADD, and writing one new line at the bottom (or top). Note that this scrolling affects only the first 55 characters of each line. The BYTED and ATADD locations displayed on the right are not moved. RGTCUR and DWNCUR are also changed as required. PENRAM then returns to UpDate to begin the next cycle.

The detailed comments in the source code may be referred to for further information. ■

Note: Since this was written, a greatly improved version of PENRAM has become available. It allows true insert/delete, block move, fill and search, etc. However, the object code now requires 4K of RAM, and the source code can be assembled only on a disk system using MISOSYS' EDAS assembler. Contact The Alternate Source, 1806 Ada St., Lansing, MI 48910 for more information.

Listing continued

```

00290 ; 'STARTP' . ALLOW 1100 (044CH) BYTES TOT
AL. 00300 ;
E7B3 00310 STARTP EQU 0E7B3H ;FOR LINKING
WITH RSM48. 00320 ;
00330 ;
-----
00340 ;
00350 ; SYSTEM ROUTINES AND LOCATIONS ---
002B 00360 KI EQU 002BH ;INPUTS ASCI
I BYTE
01C9 00370 CLS EQU 01C9H ;CLEARS SCRE
EN
4020 00380 CURPOS EQU 4020H ;POS'N OF ST
D. CURSOR
4036 00390 KIBUF EQU 4036H ;WORKSPACE F
OR KI
05D9 00400 LINEIN EQU 05D9H ;INPUTS WHOL
E LINE
0033 00410 BYTDIS EQU 0033H ;PRINTS ASCI
I BYTE
0060 00420 DELAY EQU 0060H ;14.6 USEC P
ER COUNT BC
0A9D 00430 NTF2 EQU 0A9DH ;DENOTES INT
EGER VALUE
0FBD 00440 NUMSTR EQU 0FBDH ;CONVERTS NU
M. TO STRING
00450 ;
00460 ; CONSTANTS ---
00470 KDLAY1 EQU 2500H ;MAIN INTER-
1200
00480 KDLAY2 EQU 1200H ;AUX DELAY R
EGULAR CHAR.
00A0 00490 BDELAY EQU 00A0H ;SPEED OF CU
RSOR BLINK
0080 00500 BLANK EQU 80H ;BLANK GRAPH
ICS BLOCK
008A 00510 CURCHR EQU 8AH ;DEFINES CUR
SOR CHARACTER
00520 ;
00530 ; KEYBOARD INPUT VALUES ---
001P 00540 CLEAR EQU 1FH
0004 00550 BREAK EQU 4
0005 00560 SHPBK EQU 5
0009 00570 SHPTUP EQU 9
0011 00580 SHPTDN EQU 17
0021 00590 SHPLFT EQU 21H
005B 00600 UPAROW EQU 5BH
000A 00610 DNAROW EQU 0AH
0008 00620 LPAROW EQU 08
0009 00630 RTAROW EQU 09
00640 ;
00650 ; KEYBOARD SCAN ADDRESSES ---
3801 00660 KEYS1 EQU 3801H ;8-G KEYS
3840 00670 CNTL EQU 3840H ;DETECT CONT
ROL KEYS
38C0 00680 SHCNTRL EQU 38C0H ;SAME BUT SH
IFTED
3880 00690 SHIFT EQU 3880H ;0 HERE MEAN
S NO SHIFT
00700 ;
00710 ; STORAGE LOCATIONS ---
E7B5 00720 STRPLC EQU STARTP+2 ;STORES STRI
NG TO PRINT
E7F5 00730 STORAG EQU STARTP+66
E7F5 00740 ADDR EQU STORAG ;ADDRESS TO
PRINT NEXT
E7F7 00750 HOMADD EQU STORAG+2 ;ADDRESS AT
TOP LEFT
E7F9 00760 EDCUR EQU STORAG+4 ;LOC'N OF ED
IT CURSOR
E7FB 00770 BYTED EQU STORAG+6 ;BYTE AT EDI
T CURSOR
E7FD 00780 RGTCUR EQU STORAG+8 ;# TIMES MOV
ED RIGHT
E7FE 00790 DWNCUR EQU STORAG+9 ;# TIMES MOV
ED DOWN
E7FF 00800 HATYPE EQU STORAG+10 ;TYPE OF DUM
P FLAG
E800 00810 KEY EQU STORAG+11 ;KEY INPUT S
TORAGE
E801 00820 KEYH EQU STORAG+12 ;USED IN HEX
ENTRY
E802 00830 LSTARW EQU STORAG+13 ;DIRECTION O
F LAST SCROLL
E803 00840 ATADD EQU STORAG+14 ;HOLDS REFER
ENCE ADDRESS
00850 ;
00860 ; VIDEO LOCATIONS ---
3C00 00870 LINE01 EQU 3C00H
3C40 00880 LINE02 EQU 3C40H
3D00 00890 LINE05 EQU 3D00H
3FC0 00900 LINE16 EQU 3FC0H
3C00 00910 VIDFST EQU 3C00H
3FFF 00920 VIDLST EQU 3FFFH
00930 ;
00940 ;
00950 ;
-----
00960 ;START OF MAIN PENRAM ROUTINE
00970 ;
E7B3 00980 ORG STARTP
E7B3 1850 00990 JR ENTRY
01000 ;
0050 01010 DEFS 80 ;WORK AND ST
ORAGE SPACE.
01020 ;
E805 F3 01030 ENTRY DI
E806 CDC901 01040 CALL CLS
E809 21383E 01050 LD HL,3E38H ;PROMPT FOR
ADDRESS.
E80C 222040 01060 LD (CURPOS),HL
E80F 21EEEB 01070 LD HL,INMSG

```

Listing continues

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Listing continued

```

E812 CDC0EB 01080 CALL OUTSTR ;DISPLAY IT.
           01090 ;
           01100 ; TAKE IN 4-DIGIT HEX ADDRESS. BREAK
FROM PENRAM
           01110 ; IF ONLY <ENTER> WAS PRESSED.
           01120 ENTRY2 LD HL,3E78H ;CLEAR ANY P
E815 21783E          LD           (CURPOS),HL ; AND TAKE
E818 222040          LD           A,1EH ;ERASE TO EN
           01140          LD           D OF LINE.
E81D CD3300          CALL          BYTDIS
E820 0684           LD           B,4 ;ALLOW ONLY
           01160          LD           4 DIGITS
E822 21B5E7          LD           HL,STRPLC
E825 CDD905          CALL          LINEIN
E828 78             LD           A,B ;B HAS # CHA
           01190          LD           R. TYPED.
E829 A7             LD           A
           01200          AND          A
           01210 ;
           01220 RETLBL RET Z ;LEAVE PENRA
E82A C8             M IF NO CHAR.
E82B 00             NOP ; ENTERED.
           01230          CHANGE THIS
E82C 00             NOP ; TO A JUMP
           01240          IF DESIRED.
           01250 ;
           01260          CP          4
E82F 20E4           JR           NZ,ENTRY2 ;DO AGAIN IF
           01270          < 4 CHAR.
           01280 ;
           01290 ; IS INPUT VALID HEX? IF NOT, BACK TO
PROMPT.
E831 21B8E7          LD           HL,STRPLC+3
E834 CD80EA          CALL          FRMBYT ;MAKES ASCII
           01310          CHAR AT HL
E837 38DC           JR           C,ENTRY2 ; INTO VALI
           01320          D HEX IN A.
E839 32F7E7          LD           (HOMADD),A ; RETURNS C
           01330          ARRAY SET IF
E83C CD80EA          CALL          FRMBYT ; NOT VALID
           01340          HEX.
E83F 38D4           JR           C,ENTRY2
E841 32F8E7          LD           (HOMADD+1),A
           01350          (HOMADD+1),A
           01360          LD
           01370          LD
           01380 ; STARTING ADDRESS IS AT HOMADD. NOW
INITIALIZE
           01390 ; SCROLLING DUMP ROUTINE AND BEGIN.
E844 AF             XOR          A
           01400          LD           (HATYPE),A ;ASSUME HEX
           01410          DUMP.
           01420 ;
           01430          LD           (DWNCUR),A ;EDIT CURSOR
E848 32FE7         IS AT
           01440          LD           (RGTCUR),A ; TOP LEFT
E84B 32FE7         LD           (ATADD),HL ;THIS IS FIR
           01450 ;
           01460          LD           (REFERR)
E84E 2AF7E7        ST REFER-
E851 2283E8        LD           (ESS)
           01470          LD
           01480 ;
           01490          LD           HL,3C78H ;SET UP CURS
E854 21783C        OR AND
E857 222040        LD           (CURPOS),HL ; PRINT LOG
           01500          O AND
E85A 21F7EB        LD           HL,PENMSG ; OTHER MAR
           01510          KS.
E85D CDC0EB        CALL          OUTSTR
E860 3E3E          LD           A,'>'
E862 32F83C        LD           (3CF8H),A
E865 3E3C          LD           A,'<'
E867 32FF3C        LD           (3CF8H),A
E86A 3E3D          LD           A,'='
E86C 32783D        LD           (3D78H),A
E86F 3E48          LD           A,'H'
E871 327E3D        LD           (3D7EH),A
           01610 ;
E874 2AF7E7        REINIT LD           HL,(HOMADD) ;START WITH
REQUESTED
           01620          LD           (ADDR),HL ; ADDRESS.
E877 22F5E7        LD           B,16 ;FOR 16 LINE
E87A 0610          LD
           01640          S.
E87C 21FF3B        LD           HL,VIDFST-1 ;INITIALIZE
CURSOR.
           01650          LD
E87F 222040        LD           (CURPOS),HL
           01660          LD
           01670 ;
           01680          LD           INITLP EXX ;REPAINT SCR
E882 D9            EEN BY PRINT-
E883 2A2040        LD           HL,(CURPOS) ; ING 16 LI
NES.
E886 23            LD           HL
E887 222040        LD           (CURPOS),HL
E88A 2AF5E7        LD           HL,(ADDR)
E88D CD55EB        CALL          MAKSTR ;CREATES DUM
P STRING FROM
E890 21B5E7        LD           HL,STRPLC ; ADDR AND
THE 16 BYTES
E893 CDC0EB        CALL          OUTSTR ; THERE. P
RINT STRING.
E896 011000        LD           BC,16
E899 CDCAEB        CALL          AADDR ;POINT TO NE
XT ADDRESS.
E89C D9            LD           EXX
E89D 10E3          LD           DJNZ INITLP
           01780          LD
           01790          LD
           01800 ;
           01810          LD           A,1 ;CURSOR MOVE
E89F 3E01          D DOWN LAST.
E8A1 3202E8        LD           (LSTARW),A
           01820          LD
           01830 ;
           01840          LD           UPDATE LD           HL,(EDCUR) ;ERASE OLD E
DIT CURSOR.
E8A4 2AF9E7        LD           (HL),BLANK
E8A7 3680          LD           (HL),BLANK
           01850          LD
           01860 ;
           01870 ; NOW CALCULATE NEW EDIT CURSOR POSITION (ED
CUR) AND EDIT

```

Listing continues

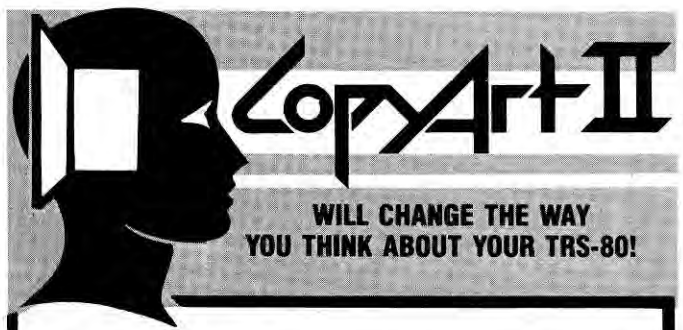
Listing continued

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NCUR AND          01880 ; BYTE ADDRESS (BYTED) FROM NEW VALUES OF DW
E8A9 3AFEE7      01890 ; RGTCUR,
E8AA 3AFEE7      01900 LD A,(DWNCUR) ; INITIALIZE
FOR BEING
E8AC 3C          01910 INC A ; COUNTED.
E8AD 47          01920 LD B,A
E8AE 21C33B      01930 LD HL,VIDFST-61
E8B1 114000      01940 LD DE,64
E8B4 D9          01950 EXX ;COUNT ADDR
SEES IN ALT
E8B5 2AF7E7      01960 LD HL,(HOMADD) ; REGISTER5
ERB8 011100      01970 LD BC,17
E8BB AF          01980 XOR A
E8BC ED42        01990 SBC HL,BC
E8BE 111000      02000 LD DE,16
E8C1 D9          02010 EXX
02020 ;
E8C2 19          02030 LINEDN ADD HL,DE ;FOR EVERY L
INE DOWN, ADD
E8C3 D9          02040 EXX ; 64 TO EDC
UR AND 16
E8C4 19          02050 ADD HL,DE ; TO BYTED.
E8C5 D9          02060 EXX
E8C6 10FA        02070 DJNZ LINEDN
02080 ;
E8C8 3AFDE7      02090 LD A,(RGTCUR)
E8CB 3C          02100 INC A
E8CC 47          02110 LD B,A
E8CD 110300      02120 LD DE,3
02130 ;
E8D0 19          02140 SPCRGD ADD HL,DE ;FOR EVERY S
PACE RIGHT,
E8D1 D9          02150 EXX ; ADD 3 TO
EDC9 AND 1
E8D2 23          02160 INC HL ; TO BYTED.
E8D3 D9          02170 EXX
E8D4 10FA        02180 DJNZ SPCRGD
02190 ;
E8D6 22F9E7      02200 LD (EDC9),HL ;UPDATE EDIT
CURSOR POS'N
E8D9 368A        02210 LD (HL),CURCHR ; AND PRINT
CURSOR.
E8DB D9          02220 EXX
E8DC 22FBE7      02230 LD (BYTED),HL ;UPDATE EDIT
BYTE POS'N
E8DF D9          02240 EXX
02250 ;
02260 ; DISPLAY THE CURRENT EDIT BYTE ADDRESS
S ALONG          02270 ; WITH THE REFERENCE ADDRESS AND OFFSE
T FROM IT.
E8E0 21FA3C      02280 LD HL,3CPAH ;WILL PRINT
HERE FIRST.
E8E3 222040      02290 LD (CURPOS),HL
E8E6 21B9E7      02300 LD HL,STRPLC+4 ;PUT IN TERM
INATOR FOR
E8E9 3603        02310 LD (HL),3 ; STRINGS B
ELOW.
02320 ;
E8EB 2B          02330 DEC HL ;MAKE BYTE T
HAT EDIT
E8EC ED4BFBE7    02340 LD BC,(BYTED) ; CURSOR PO
INTS TO INTO
E8F0 CD98EB      02350 CALL BSTRNG ; AN ASCII
STRING AND
E8F3 CDC0EB      02360 CALL OUTSTR ; PRINT IT.
02370 ;
E8F6 217A3D      02380 LD HL,3D7AH ;PRINT REF.
ADDRESS SIM-
E8F9 222040      02390 LD (CURPOS),HL ; ILARLY.
E8FC 21B8E7      02400 LD HL,STRPLC+3
E8FF ED4B03E8    02410 LD BC,(ATADD)
E903 CD98EB      02420 CALL BSTRNG
E906 CDC0EB      02430 CALL OUTSTR
02440 ;
E909 21B83D      02450 LD HL,3DB8H ;TO PRINT OF
FSET, FIRST
E90C 222040      02460 LD (CURPOS),HL ; CLEAR THE
LINE.
E90F 3E1E        02470 LD A,1EH
E911 CD3300      02480 CALL BYTDIS
E914 2AFBE7      02490 LD HL,(BYTED) ;NOW CALC. O
FFSET.
E917 ED5B03E8    02500 LD DE,(ATADD)
E91B AF          02510 XOR A ;RESET CARRY
FLAG.
E91C ED52        02520 SBC HL,DE ;GET OFFSET
IN HL.
E91E 222141      02530 LD (4121H),HL ;GIVE IT TO
THE ROM
E921 CD9D0A      02540 CALL NTF2 ; AS AN INT
EGER.
E924 CDBD0F      02550 CALL NUMSTR ;ROM MAKES I
T A STRING.
E927 CDC0EB      02560 CALL OUTSTR ;WHICH WE PR
INT.
E92A 3E44        02570 LD A,'D' ;FOLLOW WITH
D FOR DEC.
E92C 32BE3D      02580 LD (3DBEH),A
E92F 21B83D      02590 LD HL,3DB8H ;NOW SEE IF
IT WAS A
E932 7E          02600 LD A,(HL) ; NEGATIVE
NUMBER.
E933 FE2D        02610 CP '-'
E935 2802        02620 JR Z,KBDSCN
E937 362B        02630 LD HL,'+' ;IF NOT, MAR
K WITH +.
02640 ;
02650 ; THE EDIT CURSOR POSITION AND ALL POI
NTERS HAVE

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Listing continues



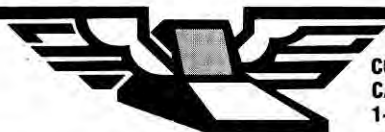
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T. ALL 02660 ; BEEN COMPLETELY UPDATED AT THIS POIN
D. NOW 02670 ; LOCATION INFORMATION HAS BEEN PRINTE
02680 ; BLINK THE CURSOR WHILE AWAITING KEYB
OARD INPUT. 02690 KBDSCN LD B,BDELAY ;BLINK ON CO
UNTDOWN TO 0. 02700 HALFCK LD A,(SHIFT) ;SEE IF SHIF
T PRESSED. 02710 AND A
E93E A7 02710 JR Z,REGKI ;GO IF NO SH
E93F 281C 02720 LD A,(SHCNTL) ;ELSE CHECK
E941 3AC038 02730 CP SHFLFT ; ADDRESS P
FOR RETURN TO 02740 CP SHFLFT ; ADDRESS P
E944 FE21 02740 CP SHFLFT ; ADDRESS P
ROMPT OR 02750 JP Z,ENTRY2 ; FOR SHIFT
E946 CA15E8 02750 ED UP/DOWN
E949 F009 02760 CP SHFTUP ; ARROWS.
IF UP OR DOWN 02770 JR Z,DOUP ; ARROW, SC
E94B 2841 02770 CP SHFTDN ; DELAY.
ROLL WITHOUT 02780 JR Z,DODN
E94D FE11 02780 CP SHFTDN ; DELAY.
E94F 2848 02790 JR Z,DODN
E951 FE05 02800 CP SHFBRK ;IF SHIFT/BR
EAK, REPLACE 02810 JR NZ,REGKI ; CURRENT R
E953 2000 02810 LD HL,(BYTED) ; WITH THE
EF. ADDRESS 02820 LD (ATADD),HL ; TO BY THE
E955 2AFBE7 02820 LD (ATADD),HL ; TO BY THE
BYTE POINTED 02830 JR JUPDAT
E958 2203E8 02830 JR JUPDAT
CURSOR. 02840
E95B 1874 02840
02850
E95D CD9BEA 02860 REGKI CALL KIR ;SCAN REGULA
R KEYS WITH 02870 ; REPEAT.
02880 JR NZ,KPRESS ;GO IF ANY K
E960 200B 02880 DJNZ HALFCK ;BACK UNLESS
EY DOWN. 02890
E962 10D7 02890
BLINK TIME. 02900 ;
02910 LD HL,(EDCUR)
E964 2AF9E7 02910 LD A,(HL) ; FLIP-FLOP
E967 7E 02920 XOR 0AH ; ACTER AND
CURSOR CHAR- 02930 LD (HL),A ; BLINK IT.
E968 E08A 02940 LD (HL),A ; BLINK IT.
GO BACK TO 02950 JR KBDSCN
E96A 77 02950 LD (KEY),A ;A KEY IS DO
E96B 18CC 02960 ;
02970 KPRESS LD (KEY),A ;A KEY IS DO
E96D 3200E8 02970 CP CLEAR
WN. SAVE IT. 02980 JR NZ,DBNC ;GO IF NOT C
E970 FE1F 02980 LD A,(HATYPE) ;ELSE ON CLE
E972 200B 02990 XOR 1 ; -FLOP TYP
LEAR KEY. 03000 LD A,(HATYPE),A
E974 3AFBE7 03000 LD A,(HATYPE),A ;ELSE ON CLE
AR ONLY, FLIP 03010 XOR 1 ; -FLOP TYP
E977 EB01 03010 LD (HATYPE),A
E OF DUMP. 03020 LD (HATYPE),A
E979 32FDE7 03020 JP REINIT ;AND REPAINT
E97C C374E8 03030 LD A,(KEY) ;RETRIEVE KE
SCREEN. 03040 ;
03050 DBNC LD BC,KDLAY1 ;DELAY TO AV
E97F 010025 03050 CALL DELAY
OID BOUNCE. 03060
E982 CD6000 03070 ;
03080 LD A,(KEY) ;RETRIEVE KE
E985 3A00E8 03080
Y ENTERED. 03090 ;
03100 ; NOW CHECK TO SEE IF THE KEY WAS AN A
RROW KEY. 03110 ; GO TO THE APPROPRIATE PROCESSING IF
IT WAS.
E988 FE5B 03120 CKUP CP UPAROW
E98A 2802 03130 JR Z,DOUP
E98C 1805 03140 JR CKDN
E98E CDADEA 03150 DOUP CALL CURSUP ;SCROLLING U
P IS EASY - 03160 JR JUPDAT ; CURSUP DO
E991 183E 03160
ES IT ALL. 03170 ;
03180 CKDN CP DNAROW
E993 FE0A 03180 JR Z,DODN
E995 2802 03190 JR CKLF
E997 1805 03200 CALL CURSDN ;SCROLLING D
E999 CD00EB 03210 DODN CALL CURSDN ;SCROLLING D
OWN IS EASY - 03220 JR JUPDAT ; CURSDN DO
E99C 1833 03220
ES IT ALL. 03230 ;
03240 CKLF CP LPAROW
E99E FE08 03240 JR Z,DOLF
E9A0 2802 03250 JR CKRT
E9A2 1815 03260 LD A,(RGTCUR) ;LEFT ARROW
E9A4 3AFDE7 03270 DOLF LD A,(RGTCUR) ;LEFT ARROW
MAY REQUIRE 03280
E9A7 3D 03280 DEC A ; MOVING CU
RSOR UP ONE 03290 CP 0FFH ; IF AT EXT
E9A8 FFFF 03290 RME LEFT.
E9AA 32FDE7 03300 LD (RGTCUR),A
E9AD 2022 03310 JR NZ,JUPDAT ;GO IF NOT A
T FAR LEFT. 03320 LD A,15 ;ELSE MOVE T
E9AF 3E0F 03320 LD (RGTCUR),A ; AND SCROL
O FAR RIGHT 03330 LD (RGTCUR),A ; AND SCROL
E9B1 32FDE7 03330 LD (RGTCUR),A ; AND SCROL
L CURSOR UP 03340 CALL CURSUP ; ONE ROW.
E9B4 CDADEA 03350 JR JUPDAT
E9B7 1818 03350
03360 ;
03370 CKRT CP RTAROW
E9B9 FE09 03370 JR Z,DORT
E9BB 2802 03380 JR KEYIN
E9BD 1815 03390 LD A,(RGTCUR) ;RIGHT ARROW
E9BF 3AFDE7 03400 DORT LD A,(RGTCUR) ;RIGHT ARROW

E9C2 3C 03410 INC A ; MOVING CU
RSOR DOWN ONE 03420 CP 16 ; IF AT EXT
E9C3 FE18 03420 RME RIGHT.
E9C5 32FDE7 03430 LD (RGTCUR),A
E9C8 2007 03440 JR NZ,JUPDAT ;GO IF NOT A
T FAR RIGHT.
E9CA AF 03450 XOR A ;ELSE MOVE T
O FAR LEFT 03460 LD (RGTCUR),A ; AND SCROL
E9CB 32FDE7 03460 LD (RGTCUR),A ; AND SCROL
L CURSOR DOWN 03470 CALL CURSDN ; ONE ROW.
E9CE CD00EB 03480 ;
03490 JUPDAT JP UPDATE ;ARROW KEY P
ROCESSED. 03500 ;
03510 ;
03520 ; ARRIVE HERE IF KEY PRESSED WAS NOT A
CONTROL 03530 ; KEY. THAT SIGNIFIES AN ATTEMPT TO E
NTER DATA. 03540 ; IP IN THE HEX MODE, CHECK THE DATA F
OR 0-F. IF 03550 ; IN THE ASCII MODE, JUST ENTER AND DI
SPLAY IT. 03560 KEYIN LD BC,KDLAY2
E9D4 010012 03570 CALL DELAY ;DELAY FOR D
E9D7 CD6000 03570 EBOUNCE.
E9DA 3AFBE7 03580 LD A,(HATYPE) ;CHECK TYPE
OF DUMP. 03590 AND A
E9DD A7 03600 JR NZ,ASCIN ;GO IF ASCII
. 03610 ;
03620 LD A,(KEY) ;IN HEX MODE
E9E0 3A00E8 03620 . CHECK KEY.
E9E3 CD4FEA 03630 CALL VALHEX ;RETURNS CAR
RY SET IF KEY 03640 JP C,UPDATE ; IS INVALI
E9E6 DAAA4E8 03640 D HEX.
E9E9 07 03650 RLCA ;ELSE RETURN
S VALID HEX 03660 RLCA ; IN A.
E9EA 07 03670 RLCA ;PUT HEX 0-F
E9EB 07 03670 RLCA ; NYBBLE OF
IN HIGH 03680 RLCA ; NYBBLE OF
E9EC 07 03680 LD (KEYH),A ;SAVE IT,
A. 03690 LD HL,(EDCUR) ;INCIDENTALL
E9ED 3201E8 03700 LD HL,(EDCUR) ;INCIDENTALL
03710 LD A,CURCHR ; EDIT CURS
E9F0 2AF9E7 03720 LD A,CURCHR ; EDIT CURS
Y REDRAW 03730 LD (HL),A ; MAY BE OF
E9F3 3E8A 03730 LD (HL),A ; MAY BE OF
OR SINCE IT 03740 ;
E9F5 77 03740 ;
F. 03750 LD A,(KEY) ;RETRIEVE KE
E9F6 3A00E8 03750 LD A,(KEY) ;RETRIEVE KE
Y AND DISPLAY 03760 CALL CURINC ; IT AT EDC
E9F9 CD93EA 03760 UR+1.
E9FC CD3300 03770 CALL BYTDIS
03780 ;
03790 LD A,(CNTL) ;NOW WAIT FO
E9FF 3A4038 03790 WAITNX LD A,(CNTL) ;NOW WAIT FO
R NEXT VALID 03800 CP BREAK ; HEX ENTRY
EA02 FE04 03800 . BREAK BACK
EA04 CA74E8 03810 JP Z,REINIT ; TO MAIN R
OUTINE IF 03820 CALL KIR ; REQUIRED.
EA07 CD9BEA 03820 CALL VALHEX ;CHECK WHATE
EA0A CD4FEA 03830 VER CAME IN,
EA0D 38F0 03840 JR C,WAITNX ; EVEN IF N
OTHING DID. 03850 ;
03860 LD C,A ;HAVE A VALI
EA0F 4F 03860 LD A,(KEYH) ;MERGE IT WI
D HEX CHAR I 03870 OR C
EA10 3A01E8 03870 LD HL,(BYTED) ;STORE NEW B
TH LAST CHAR. 03880 LD (HL),A
EA13 B1 03880
EA14 2AFBE7 03890 LD A,(HL),A
YTE AT BYTED. 03900
EA17 77 03910 ;
03920 LD A,(HL) ;RETRIEVE AN
EA18 7E 03920 D DISPLAY IT
D DISPLAY IT 03930 CALL CURINC ; AT THE ED
EA19 CD93EA 03930 IT CURSOR.
EA1C 4F 03940 LD C,A ; THIS VERI
FIES THE EDIT 03950 CALL ASCII
EA1D CDA7EB 03950 EX DE,HL ; ACTION.
EA20 EB 03960 LD A,H
EA21 7C 03970 CALL BYTDIS
EA22 CD3300 03980 LD A,L
EA25 7D 03990 CALL BYTDIS
EA26 CD3300 04000 CALL BYTDIS
04010 ;
04020 LD BC,KDLAY1+KDLAY2 ;DEBOUNCE
EA29 010037 04020 DELAY HERE
EA2C CD6000 04030 CALL DELAY ; LIKE OTHE
R PATHS. 04040 JP DORT ;AND GO ACT
EA2F C3BFEB 04040 JUST AS IF
04050 ; RIGHT ARR
OW PRESSED. 04060 ;
04070 ASCIN LD A,(KEY) ;KEY IN SHOU
EA32 3A00E8 04070 LD BE VALID
EA35 4F 04080 LD C,A ; ASCII, BU
T CHECK IT 04090 CALL VALASC ; TO BE SUR
EA36 CD72EA 04090 E...
EA39 3096 04100 JR NC,JUPDAT ;GO IF BAD.
EA3B 2AFBE7 04110 LD HL,(BYTED) ;ELSE ENTER
INTO RAM AND 04120 LD (HL),A ; READ IT B
EA3E 77 04120

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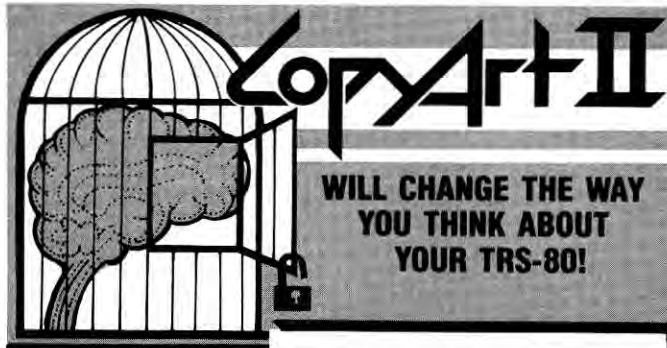
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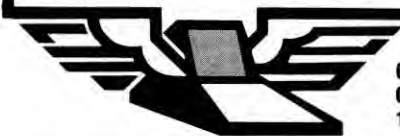
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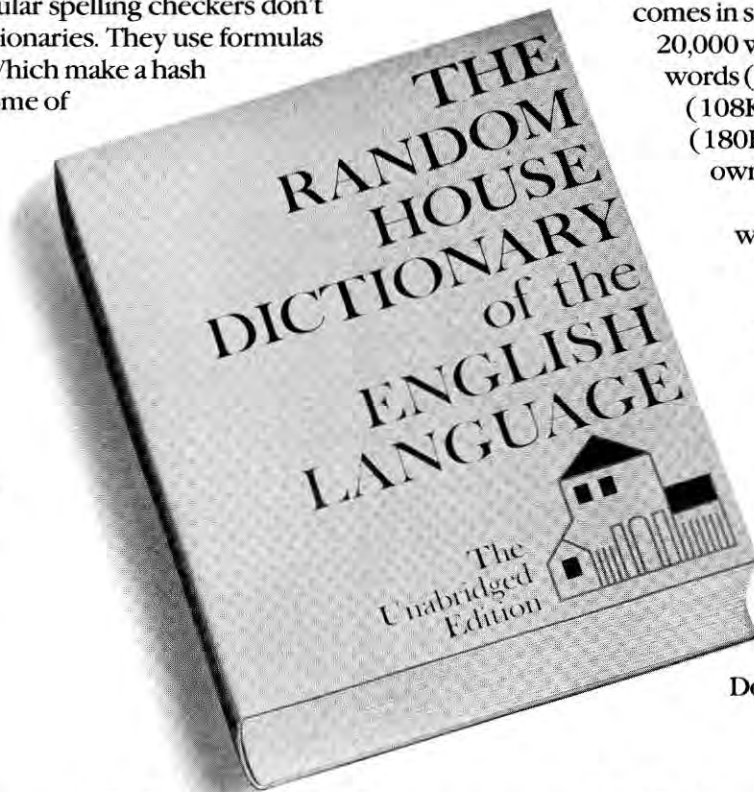
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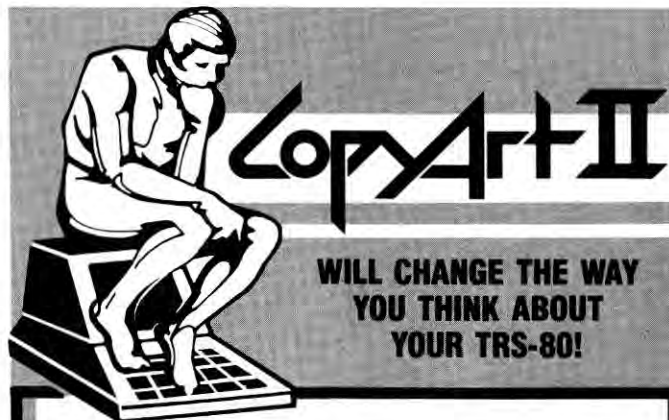
Listing continued

```

ACK TO VERIFY
EA3F 7E      04130      LD      A,(HL)      ; THE EDIT
ACTION.
EA40 4F      04140      LD      C,A         ;CHECK AGAIN
FOR ASCII
EA41 CD72EA  04150      CALL   VALASC      ; IN CASE W
E'RE IN ROM.
EA44 3006    04160      JR     NC,ENDASC   ;GO IF BAD.
EA46 CD93EA  04170      CALL   CURINC      ;
EA49 CD3300  04180      CALL   BYTDIS      ;ELSE DISPLA
Y IT.
04190 ;
EA4C C3BF9E  04200      ENDASC JP      DORT ;PRETEND WAS
RIGHT-ARROW.
04210 ;
04220 ;
04230 ; END OF MAIN PENRAM ROUTINE.
04240 ;-----
04250 ;
04260 ; SUBROUTINES ---
04270 ;
04280 ; VALHEX TAKES AN ASCII CODE IN A AND CHEC
KS TO SEE IF
04290 ; IT IS A VALID HEX CHARACTER (0-F). IF IT
IS NOT,
04300 ; VALHEX RETURNS WITH THE CARRY FLAG SET. I
F IT IS A
04310 ; HEX VALUE, THE A REGISTER RETURNS WITH T
HAT HEX
04320 ; VALUE (0-F) IN IT, AND THE CARRY FLAG RESE
T TO 0.
EA4F 3200E8  04330      VALHEX LD      (KEY),A
EA52 4F      04340      LD      C,A
EA53 3E46    04350      LD      A,'P'
EA55 B9      04360      CP      C
EA56 380F    04370      JR     C,NOTHEX    ;C SET IF CH
AR > F.
EA58 3E2F    04380      LD      A,'/'
EA5A B9      04390      CP      C
EA5B 300A    04400      JR     NC,NOTHEX   ;C SET IF CH
AR > /.
EA5D 3E40    04410      LD      A,'0'
EA5F B9      04420      CP      C
EA60 380A    04430      JR     C,ATHRUF    ;C SET IF CH
AR > 0.
EA62 79      04440      LD      A,C
EA63 FE3A    04450      CP      ':'
EA65 3802    04460      JR     C,ZTHRU9    ;C SET IF CH
AR < :
EA67 37      04470      NOTHEX SCF        ;TO FLAG NOT
-HEX.
EA68 C9      04480      RET
EA69 D630    04490      ZTHRU9 SUB      30H ;CONVERT TO
HEX.
EA6B C9      04500      RET ;CARRY WON'T
BE SET FOR
EA6C 3A00E8  04510      ATHRUF LD      A,(KEY) ; EITHER OF
THESE.
EA6F D637    04520      SUB      37H ; RETURNS O
N VALID HEX.
EA71 C9      04530      RET
04540 ;
04550 ;
04560 ; SUBROUTINE VALASC TAKES A BYTE IN C AND CH
ECKS TO SEE
04570 ; IF IT A PRINTABLE ASCII CHARACTER - EITHER
UPPER OR
04580 ; LOWER CASE. IF ALPHANUMERIC IT IS SIMPLY
RETURNED
04590 ; IN A, WITH THE CARRY FLAG SET. IF NON-PRI
NTABLE, AN
04600 ; UNDERSCORE IS SUBSTITUTED AND THE CARRY FL
AG IS RESET.
EA72 3E7F    04610      VALASC LD      A,7FH
EA74 B9      04620      CP      C
EA75 3805    04630      JR     C,NOTASC    ;HAVE CARRY
IF CHAR > 7F
EA77 3E1F    04640      LD      A,1FH ;SEE IF ITS
TOO LOW TO
EA79 B9      04650      CP      C ; BE ASCII.
EA7A 79      04660      LD      A,C
EA7B D8      04670      RET ;RETURN IF P
RINTABLE.
04680 ;
04690 NOTASC LD      A,5FH ;NOT ASCII.
EA7C 3E5F    04700      AND      A
EA7E A7      04710      RET ; RESET CAR
RY.
04720 ;
04730 ;
04740 ; FRMBYT LOOKS AT (HL), (HL+1) AND IF THE AS
CII CODES
04750 ; THERE ARE BOTH FOR HEX CHAR 0-F, THEN THE
HEX BYTE
04760 ; THEY DEFINE IS FORMED IN A AND RETURNED,
WITH THE
04770 ; CARRY FLAG RESET TO 0. IF EITHER OF THE A
SCII CHAR
04780 ; IS NOT 0-F, THEN A RETURN IS MADE WITH THE
CARRY FLAG
04790 ; SET.
EA80 7E      04800      FRMBYT LD      A,(HL) ;GET FIRST C
HAR.
EA81 CD4FEA  04810      CALL   VALHEX ;CHECK IT FO
R 0-F.
EA84 D8      04820      RET ;RETURN IF N
OT 0-F.
EA85 5F      04830      LD      E,A ;WAS 0:F. K
EEP ITS
EA86 2B      04840      DEC     HL ; VALUE IN
E.

```

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Listing continued

```
EA87 7E 04850 LD A,(HL) ;GET SECOND
CHAR.
EA88 CD4FEA 04860 CALL VALHEX ;IS IT ALSO
HEX?
EA8B D8 04870 RET C ;RETURN IF N
OT.
EA8C 07 04880 RLCA ;BOTH ARE 0-
F. FORM
EA8D 07 04890 RLCA ; THE HEX B
YTE IN A.
EA8E 07 04900 RLCA
EA8F 07 04910 RLCA
EA90 B3 04920 OR E
EA91 2B 04930 DEC HL ;PREPARE FOR
NEXT CALL.
EA92 C9 04940 RET ;RETURN W/HE
X IN A.
04950 ;
04960 ;
04970 ; CURINC POSITIONS THE STANDARD CURSOR AT TH
E LOCATION
04980 ; OF THE EDIT CURSOR PLUS ONE.
EA93 2AF9E7 04990 CURINC LD HL,(EDCUR)
EA96 23 05000 TNC HL
EA97 222040 05010 LD (CURPOS),HL
EA9A C9 05020 RET
05030 ;
05040 ;
05050 ; KIR SCANS THE KEYBOARD AND RETURNS IN A TH
E ASCII VALUE
05060 ; OF ANY KEY THAT IS PRESSED AT THAT INSTANT
IT
05070 ; ALSO CLEARS THE KEYBOARD INPUT ROUTINE BUF
FER AT
05080 ; 4036-403C. THIS MAKES THE KI ROUTINE THIN
K THAT
05090 ; THE LAST KEY PRESSED WAS SUBSEQUENTLY RELE
ASED, SO THAT
05100 ; IT WILL SCAN AGAIN, THUS GIVING THE EFFECT
OF REPEATING
05110 ; KEYS.
EA9B CD2B00 05120 KIR CALL KI ;GET KEY IF
PRESSED.
EA9E 57 05130 LD D,A
EA9F 1E07 05140 LD E,7 ;WILL PUT 7
ZEROS IN
EAA1 213640 05150 LD HL,KIBUF ; BUFFER.
EAA4 AF 05160 XOR A
EAA5 77 05170 RPT LD (HL),A ;CLEAR ONE B
YTE.
EAA6 23 05180 INC HL
EAA7 1D 05190 DEC E
EAA8 20FB 05200 JR NZ,RPT
EAAA 7A 05210 LD A,D ;RETRIEVE CH
AR.
EAAB A7 05220 AND A ;SET FLAG IF
ZERO.
EAAC C9 05230 RET
05240 ;
05250 ;
05260 ; CURSUP HANDLES ALL MOVEMENT OF THE CURSOR
UPWARDS.
05270 ; IT CHECKS FIRST TO SEE IF THE TOP OF THE S
CREEN HAS
05280 ; BEEN REACHED (DWNCUR=0). IF NOT, IT SIMPL
Y DECREMENTS
05290 ; DWNCUR AND RETURNS TO THE UPDATE. IF AT T
HE TOP OF
05300 ; SCREEN, THE TOP 15 LINES MUST BE MOVED DOW
N ONE, AND
05310 ; THE NEW DUMP LINE (AS FORMED BY MAKSTR) PR
INTED ON THE
05320 ; TOP LINE. SINCE MAKSTR NEEDS AN ADDRESS A
DDR TO FORM
05330 ; THE DUMP STRING, CURSUP MUST ALSO DETERMIN
E WHETHER THE
05340 ; LAST SCREEN SCROLLING WAS DUE TO THE CURSO
R MOVING UP
05350 ; (IN WHICH CASE THIS IS MERELY A CONTINUATI
ON AND ADDR
05360 ; IS ALREADY CORRECT) OR DOWN (IN WHICH CASE
THE VALUE OF
05370 ; ADDR WAS LEFT BY CURSDN AT 272 BYTES MORE
05380 ; WANTED HERE).
05390 ; BEFORE RETURNING, CURSUP SUBTRACTS 16 FROM
BOTH ADDR
05400 ; (ANTICIPATING ANOTHER CURSOR-UP SCROLL) AN
D FROM
05410 ; HOMADD, BECAUSE THE ADDRESS DISPLAYED AT T
HE TOP LEFT
05420 ; HAS ALSO DECREASED BY 16 BYTES.
05430 ; NOTE THAT ONLY THE FIRST 55 CHAR. OF EACH
LINE ARE
05440 ; SCROLLED; THE LAST 9 CHAR. ARE UNTOUCHED.
EAAD 3AFEE7 05450 CURSUP LD A,(DWNCUR)
EAB0 A7 05460 AND A
EAB1 2805 05470 JR Z,CONTUL ;GO IF TOP O
F SCREEN.
EAB3 3D 05480 DEC A ;ELSE MOVE E
DIT CURSOR UP
EAB4 32FEE7 05490 LD (DWNCUR),A ;AND RETURN
TO UPDATE.
EAB7 C9 05500 RET
05510 ;
05520 ;
EAB8 3A02E8 05520 CONTUL LD A,(LSTARW) ;SEE IF LAST
SCROLL WAS
EABB A7 05530 AND A ;DUE TO CURS
OR DOWN.
EABC 2806 05540 JR Z,CONTUP ;GO IF NOT.
EABE 011001 05550 LD BC,272 ;MUST FIX AD
DR.
EACL CDDAEB 05560 CALL SADDR ;SUBTRACT 27
2 FROM IT.
```

Listing continues

Listing continued

```

EAC4 2AF9E7 05570 ;
RECT HERE. 05580 CONTUP LD HL,(EDCUR) ;ADDR IS COR
EAC7 3680 05590 LD (HL),BLANK ;REMOVE OLD
CURSOR.
EAC9 2AF5E7 05600 LD HL,(ADDR) ;GET ADDR TO
DUMP.
EACC CD55EB 05610 CALL MAKSTR ;MAKE DUMP S
TRING OF IT.
05620 ;
EACF 3E0F 05630 LD A,15 ;SCROLL TOP
15 LINES
EAD1 21803F 05640 LD HL,3F80H ; DOWN, MOV
ING ONLY THE
EAD4 11C03F 05650 LD DE,3FC0H ; LEFT 55 C
HARACTERS.
EAD7 013700 05660 MVLOPS LD BC,37H
EADA EDB0 05670 LDIR
EADC 0189FF 05680 LD BC,-119
EADF 09 05690 ADD HL,BC ;POINT TO NE
XT LINE.
EAE0 EB 05700 EX DE,HL
EAE1 09 05710 ADD HL,BC ;AND WHERE I
T WILL GO.
EAE2 EB 05720 EX DE,HL
EAE3 3D 05730 DEC A
EAE4 20F1 05740 JR NZ,MVLOPS ;BACK IF 15
NOT DONE.
05750 ;
EAE6 21003C 05760 LD HL,LINE01 ;POINT TO FI
RST LINE.
EAE9 222040 05770 LD (CURPOS),HL
EAE0 21B5E7 05780 LD HL,STRPLC
EAEF CDC0EB 05790 CALL OUTSTR ;PRINT DUMP
STRING THERE.
05800 ;
EAF2 011000 05810 LD BC,16 ;ADD 16 TO A
DDR, HOMADD.
EAF5 CDDAEB 05820 CALL SADDR
EAF8 CDE4EB 05830 CALL SHOMAD
EAFB AF 05840 XOR A ;NOTE SCROLL
CAUSED BY
EAPC 3202E8 05850 LD (LSTARW),A ; UP-ARROW.
EAFP C9 05860 RET
05870 ;
05880 ;
05890 ; CURSDN IS THE MIRROR IMAGE OF CURSUP IN TH
AT ALL
05900 ; THE SAME ACTIONS ARE INVOLVED, BUT THE CUR
SOR IS
05910 ; MOVED DOWNWARD. IF IT IS ALREADY AT THE B
OTTOM OF
05920 ; THE SCREEN, THE BOTTOM 15 LINES ARE SCROLL
ED UP AND
05930 ; THE NEW LINE FORMED BY MAKSTR IS PRINTED O
N THE
05940 ; BOTTOM. ADDR IS CORRECTED IF THE LAST SCR
OLL WAS DUE
05950 ; TO AN UP-ARROW, AND IS LEFT ANTICIPATING A
NOTHER DOWN-
05960 ; ARROW COMMAND. THAT IS, IT POINTS 16 BYTE
S BEYOND THE
05970 ; ADDRESS DISPLAYED AT THE BOTTOM LINE. HOM
ADD IS
05980 ; UPDATED TO REFLECT THE NEW ADDRESS DISPLAY
ED IN THE
05990 ; TOP LEFT CORNER.
EB00 3AFEE7 06000 CURSDN LD A,(DWNCUR)
EB03 FE0F 06010 CP 15
EB05 2005 06020 JR Z,CONTD1 ;GO IF BOTTO
M OF SCREEN.
EB07 3C 06030 INC A ;ELSE MOVE E
DCURSOR DOWN.
EB08 32FEE7 06040 LD (DWNCUR),A ;AND RETURN
TO UPDATE.
EB0B C9 06050 RET
06060 ;
06070 ;
EB0C 3A02E8 06070 CONTD1 LD A,(LSTARW) ;SEE IF LAST
SCROLL WAS
EB0F A7 06080 AND A ;DUE TO CURS
OR UP.
EB10 2006 06090 JR NZ,CONTD2 ;GO IF NOT.
EB12 011001 06100 LD BC,272 ;MUST FIX AD
DR.
EB15 CDCAEB 06110 CALL AADDR ;ADD 272 TO
IT.
06120 ;
06130 ;
EB18 2AF9E7 06130 CONTD2 LD HL,(EDCUR) ;ADDR IS COR
RECT HERE.
EB1B 3680 06140 LD (HL),BLANK ;REMOVE OLD
CURSOR.
EB1D 2AF5E7 06150 LD HL,(ADDR) ;GET ADDR TO
DUMP.
EB20 CD55EB 06160 CALL MAKSTR ;MAKE DUMP S
TRING OF IT.
06170 ;
06180 ;
EB23 3E0F 06180 LD A,15 ;SCROLL BOTT
OM 15 LINES
EB25 21403C 06190 LD HL,3C40H ; UP, MOVIN
G ONLY THE
EB28 11003C 06200 LD DE,3C00H ; LEFT 55 C
HARACTERS.
EB2B 013700 06210 MVLOPA LD BC,37H
EB2E EDB0 06220 LDIR
EB30 010900 06230 LD BC,9
EB33 09 06240 ADD HL,BC ;POINT TO NE
XT LINE.
EB34 EB 06250 EX DE,HL
EB35 09 06260 ADD HL,BC ;AND WHERE I
T WILL GO.
EB36 EB 06270 EX DE,HL
EB37 3D 06280 DEC A
EB38 20F1 06290 JR NZ,MVLOPA ;BACK IF 15

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Listing continues

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NOT DONE.
EB3A 21C03F 06300 ;
06310 LD HL,LINE16 ;POINT TO LA
ST LINE.
EB3D 222040 06320 LD (CURPOS),HL
EB40 21B5E7 06330 LD HL,STRPLC
EB43 CDC0EB 06340 CALL OUTSTR ;PRINT DUMP
STRING THERE.
EB46 011000 06350 LD BC,16 ;SUB 16 FROM
ADDR, HOMADD
EB49 CDCAEB 06360 CALL AADDR
EB4C CDD2EB 06370 CALL AHOMAD
EB4F 3E81 06380 LD A,1 ;NOTE SCROLL
CAUSED BY
EB51 3202E8 06390 LD (LSTARW),A ; DOWN-ARRO
W.
EB54 C9 06400 RET
06410 ;
06420 ;
06430 ; SUBROUTINE MAKSTR EXPECTS TO RECEIVE AN AD
DRESS IN HL.
06440 ; IT FORMS THIS ADDRESS AND THE 16 BYTES OF
DATA STARTING
06450 ; THERE INTO AN ASCII STRING AT STRPLC . I
F THE TYPE OF
06460 ; DUMP REQUIRED IS HEX, THEN EACH CHARACTER
BLOCK (THERE
06470 ; ARE 16 OF THESE AFTER THE ADDRESS STRING)
WILL CONTAIN
06480 ; THE ASCII REPRESENTATION OF THE BYTE IN ME
MORY. IF THE
06490 ; TYPE OF DUMP IS ASCII, THEN EACH BLOCK WIL
L SIMPLY
06500 ; CONTAIN THE ASCII CODE OF THE BYTE IN MEMO
RY. SPACES
06510 ; ARE ADDED SO THAT EITHER WAY EACH CHARACTE
R BLOCK TAKES
06520 ; UP THREE POSITIONS. A TOTAL OF 64 BYTES I
S REQUIRED TO
06530 ; HOLD THIS STRING AND ITS '03' TERMINATOR.
EB55 E5 06540 MAKSTR PUSH HL ;SAVE ADDRESS
S.
EB56 E5 06550 PUSH HL
EB57 DDE1 06560 POP IX ;PUT IT IN I
X.
EB59 C1 06570 POP BC ;GET MSBYTE
OF ADDRESS.
EB5A 21B8E7 06580 LD HL,STRPLC+3 ;LAST DIGIT
OF ADDRESS.
EB5D CD98EB 06590 CALL BSTRNG ;BC INTO ASC
II AT HL.
06600 ;
EB60 21B9E7 06610 LD HL,STRPLC+4 ;POINT AFTER
ADDRESS.
EB63 363A 06620 LD (HL),':' ;PUT : AFTER
ADDRESS.
EB65 23 06630 INC HL
EB66 3620 06640 LD (HL),' ' ;PUT SPACE A
FTER ADDRESS.
06650 ;
EB68 23 06660 INC HL ;POINTS TO 1
ST CHAR. BLK.
EB69 0610 06670 LD B,16 ;WILL DO 16
CHAR. BLOCKS.
EB6B 3620 06680 CHRBLK LD (HL),' ' ;EACH START
WITH BLANK.
EB6D 23 06690 INC HL
EB6E DD4E00 06700 LD C,(IX+0) ;GET BYTE AT
ADDRESS.
EB71 3AF7E7 06710 LD A,(HATYPE) ;CHECK DUMP
TYPE.
EB74 A7 06720 AND A
EB75 2008 06730 JR NZ,ACHAR ;GO IF ASCII
DUMP.
EB77 CDA7EB 06740 CALL ASCII ;HEX DUMP RE
Q'D.
EB7A 72 06750 LD (HL),D ;FIRST DIGIT
OF BYTE.
EB7B 23 06760 INC HL
EB7C 73 06770 LD (HL),E ;SECOND DIGI
T OF BYTE.
EB7D 1807 06780 JR CHRDN ;ONE BLOCK D
ONE.
06790 ;
EB7F CD72EA 06800 ACHAR CALL VALASC ;ASCII DUMP.
CHECK CHAR.
EB82 77 06810 LD (HL),A ;PUT FINAL C
HAR IN STRING
EB83 23 06820 INC HL
EB84 3620 06830 LD (HL),' ' ;FOLLOW WITH
BLANK.
06840 ;
EB86 DD23 06850 CHRDN INC IX ;DONE WITH C
HAR. BLOCK.
EB88 23 06860 INC HL ;POINT TO ST
ART NEXT BLK.
EB89 10E0 06870 DJNZ CHRBLK ;DO NEXT ONE
.
06880 ;
EB8B 36AA 06890 LD (HL),0AAH ;ONE CHAR. F
OR BORDER.
EB8D 23 06900 INC HL
EB8E 0608 06910 LD B,8 ;EIGHT CURSO
R-ADVANCES AT
EB90 3619 06920 TRALER LD (HL),19H ; END RESUL
T IN STRING
EB92 23 06930 INC HL ; PRINTING
TO END OF
EB93 10FB 06940 DJNZ TRALER ; LINE MINU
S ONE.
06950 ;
EB95 3603 06960 LD (HL),03H ;TERMINATOR
OF STRING.
EB97 C9 06970 RET ;END OF MAKS
TR.

```

Listing continues

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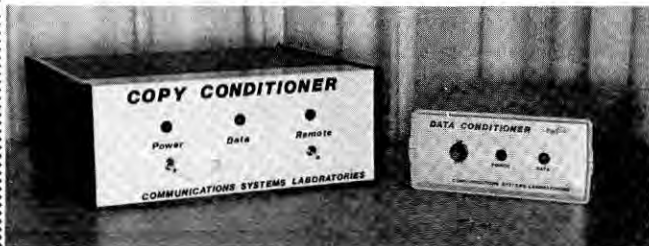
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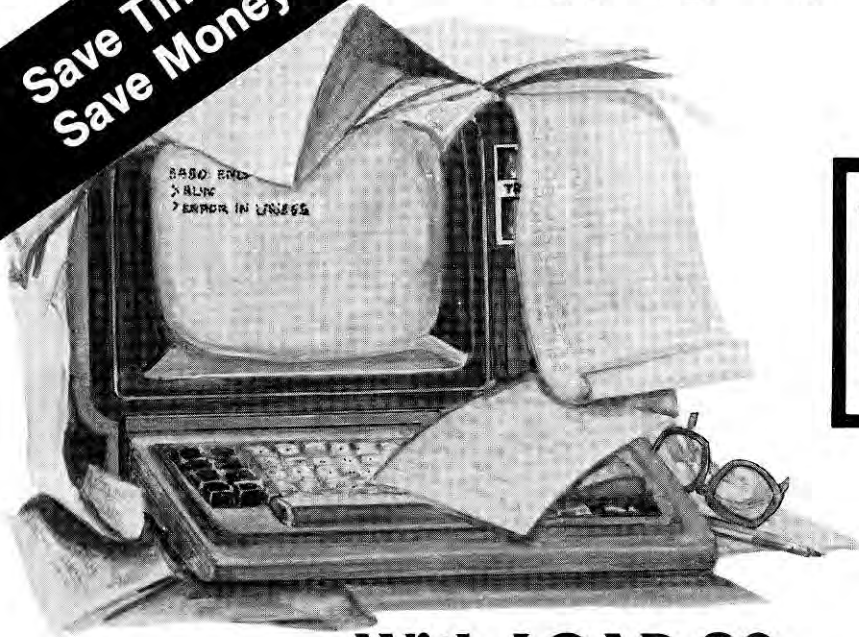
06988 ;					
06998 ;					
07000 ;	SUBROUTINE BSTRNG CONVERTS THE TWO BYTES I				
N BC INTO AN	07010 ;	ASCII STRING OF FOUR HEX DIGITS WHICH IT L			
OADS INTO	07020 ;	HL-3, HL-2, HL-1, HL,			
E IN C,	07030	BSTRNG CALL ASCII			;CONVERT BYT
EB98 CDA7EB					
EB99 73	07040	LD	(HL),E		
EB9C 2B	07050	DEC	HL		
EB9D 72	07060	LD	(HL),D		
EB9E 2B	07070	DEC	HL		
EB9F 48	07080	LD	C,B		;NOW CONVERT
B.					
EBA0 CDA7EB	07090	CALL	ASCII		
EBA3 73	07100	LD	(HL),E		
EBA4 2B	07110	DEC	HL		
EBA5 72	07120	LD	(HL),D		
EBA6 C9	07130	RET			
	07140 ;				
	07150 ;				
	07160 ;	SUBROUTINE ASCII TAKES A BYTE IN C AND RET			
URNS, IN DE,	07170 ;	THE ASCII CODES REPRESENTING ITS TWO DIGIT			
S.					
EBA7 79	07180	ASCII LD	A,C		
EBA8 CDB6EB	07190	CALL	SBRASC		;DO FIRST 4
BITS.					
EBAB 5F	07200	LD	E,A		
EBAC 79	07210	LD	A,C		
EBAD 0F	07220	RRCA			;BRING NEXT
4 OVER.					
EBAE 0F	07230	RRCA			
EBAF 0F	07240	RRCA			
EBB0 0F	07250	RRCA			
EBB1 CDB6EB	07260	CALL	SBRASC		;CONVERT THE
M TOO.					
EBB4 57	07270	LD	D,A		
EBB5 C9	07280	RET			
	07290 ;				
EBB6 E60F	07300	SBRASC AND	0FH		;CHANGE LOWE
R 4 BITS OF					
EBB8 F630	07310	OR	30H		; A TO ASCI
I BYTE.					
EBBA FE3A	07320	CP	3AH		
EBBC D8	07330	RET	C		
EBBD C607	07340	ADD	A,07		
EBBF C9	07350	RET			
	07360 ;				
	07370 ;				
	07380 ;	SUBROUTINE OUTSTR CALLS BYTDIS TO PRINT A			
STRING	07390 ;	POINTED TO BY HL AT THE CURRENT CURSOR POS			
ITION.					
	07400 ;	IT RECOGNIZES 00, 01, 02, OR 03 AS A TERMI			
NATOR.					
EBC0 7E	07410	OUTSTR LD	A,(HL)		;GET CHAR. F
ROM STRING.					
EBC1 FE04	07420	CP	04		;ONE OF THE
TERMINATORS?					
EBC3 D8	07430	RET	C		;RETURN IF S
O (0-3).					
EBC4 CD3300	07440	CALL	BYTDIS		;ELSE PRINT
IT.					
EBC7 23	07450	INC	HL		
EBC8 18F6	07460	JR	OUTSTR		;GO DO NEXT
BYTE.					
	07470 ;				
	07480 ;				
	07490 ;	AADDR - A UTILITY THAT ADDS BC TO AADDR.			
EBCA 2AF5E7	07500	AADDR LD	HL,(AADDR)		
EBCD 09	07510	ADD	HL,BC		
EBCF 22F5E7	07520	LD	(AADDR),HL		
EBD1 C9	07530	RET			
	07540 ;				
	07550 ;				
	07560 ;	AHOMAD - A UTILITY THAT ADDS BC TO HOMADD.			
EBD2 2AF7E7	07570	AHOMAD LD	HL,(HOMADD)		
EBD5 09	07580	ADD	HL,BC		
EBD6 22F7E7	07590	LD	(HOMADD),HL		
EBD9 C9	07600	RET			
	07610 ;				
	07620 ;				
	07630 ;	SADDR - A UTILITY THAT SUBTRACTS BC FROM A			
DDR.					
EBDA 2AF5E7	07640	SADDR LD	HL,(AADDR)		
EBDD AF	07650	XOR	A		
EBDE ED42	07660	SBC	HL,BC		
EBE0 22F5E7	07670	LD	(AADDR),HL		
EBE3 C9	07680	RET			
	07690 ;				
	07700 ;				
	07710 ;	SHOMAD - A UTILITY THAT SUBTRACTS BC FROM			
HOMADD.					
EBE4 2AF7E7	07720	SHOMAD LD	HL,(HOMADD)		
EBE7 AF	07730	XOR	A		
EBE8 ED42	07740	SBC	HL,BC		
EBEA 22F7E7	07750	LD	(HOMADD),HL		
EBED C9	07760	RET			
	07770 ;				
	07780 ;				
	07790 ;	MESSAGES			
	07800 ;				
EBEE 41	07810	INMSG DEFM	'ADDRESS?'		
EBF6 03	07820	DEFB	03		
	07830 ;				
EBF7 2D	07840	PENMSG DEFM	'-PENRAM-'		
EBFF 03	07850	DEFB	03		
	07860 ;				
	07870 ;				
E7B3	07880	END	STARTP		
00000	TOTAL ERRORS				

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Repairing a Disk Crash

by Philip Martel

One of my disks failed recently, but I was lucky. I managed to recover everything on it. This article describes the methods I used to get my programs back.

When a disk fails, one or more of the sectors are bad. A bad sector can be in a program or in the directory. If the fault is in a program, you will get an I/O error while trying to load that particular program. If the fault is in the directory, you won't be able to load all your programs, and you might not be able to read the directory.

In either case, try to back up the disk. If that doesn't work, load Program Listing 2 if you have two disk drives, or Program Listing 3 if you only have one drive.

These programs perform the back-up function from Basic, but use the machine-language disk calls described on page 60 of the Color Computer Disk System manual. The advantage to this, as opposed to using the Basic commands `DSKI$` and `DSKO$`, is that if a bad sector is read, the machine-language call will return an error code but continue running. The Basic commands will cause the program to stop with an I/O error.

I originally used Program Listing 1 to back up the bad disk. It uses `DSKI$` and `DSKO$`. When I got an error, I had to modify the program to start again after the bad sector. Program Listing 2 will back up the disk and write anything recovered onto the new disk. If nothing remains of a given sector, it will not be

If a disk crashes, you could lose several programs. Save them with the steps outlined here.

written onto the new disk. When the program is running, note the bad tracks and sectors, along with the error codes.

You now have a disk with all the good sectors on it. The sectors that were totally bad on your original disk are filled with `FF (255)` from when the back-up disk was initialized.

Now comes the interesting part. Read the description of how data is organized on the disk (pages 58 and 59 of the disk-system manual). Assuming that it was a single file that crashed rather than the directory, you can use Colorzap and the granule map from the article "Gobs of Goodies for Your Color Computer Disk" by Robert Nicholas and myself (*80 Micro*, Feb. 1983), to determine which granule the bad sector is in and to examine the surrounding sectors.

How you proceed from here depends on what the lost data was and whether you were able to recover the sector. If you were able to recover the sector, looking at it with Colorzap might show you one or two bad bytes. You might be able to fix them from context, especially if the data was part of a Basic program.

If you look through Basic programs

with Colorzap, you will notice a certain pattern to the bytes. By playing with Colorzap you should spot the different types of programs very readily. Getting familiar with your tools ahead of time pays off.

If the sector is part of a machine-language program or a file with a lot of random data, you might not be able to fix bad bytes. However, with a disassembler (and perseverance) you might be able to fix a few bad bytes in a machine-language program.

If a whole sector is lost out of a data file or machine-language program, you're stuck. You can't recover the data in a Basic program, either. But if you have a listing of the program, you should be able to fix the disk by using Colorzap and by spending ten minutes typing.

Load the Basic program and list it on the screen. There will be a line with a lot of exclamation points in it. The line number might not be in sequence. Note the last line number that is in sequence (the bad line or the one before it). Write this number down in hexadecimal (`PRINT HEX$(your line number)`). Now run Colorzap.

If the bad line has a line number that is still in sequence (a good line number) modify the bad sector on the disk as follows: Change the first six bytes to `00 01 01 ## ## 82`, where `## ##` is the hexadecimal representation of the number one greater than the line number you noted. Save these changes onto disk and change the first six bytes on the next Colorzap page (bytes 80-86) to `00 01 01 ## ## 82` where the `## ##` is the hex-

```
100 'QUICK AND DIRTY BACKUP PROGRAM FOR THE COLOR COMPUTER
110 'BY PHIL MARTEL
120 CLEAR 500
130 FOR TR= 0 TO 34
140 FOR SC = 1 TO 18
150 I 0,TR,SC,A$,B$
160 I 1,TR,SC,A$,B$
170 NEXT SC
180 NEXT TR
```

Program Listing 1

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adecimal representation for the next larger line number. Save these changes and load your program.

If the last good line number was 1000, you will have a program with lines 1000, 1001, and 1002. Lines 1001 and 1002 will be remarks with lots of exclamation points in them. You can now delete these lines and type in the correct ones from your listing. Save the program and you're in business.

Now suppose the first bad line has a bad line number, or a number out of sequence—65535, for example. In this case, patch the bad line number and then put in a new line at byte 80 (hex) of the bad sector. The theory behind this step should help you see how to do it:

The Color Computer normally stores the lines of a Basic program in memory, on tape, or on disk in the same way: Two bytes of pointer to the next line, two bytes for the line number, the line in tokenized form, and a 00 byte to end the line. In memory, the pointer to the next line is meaningful. It indicates the address at which the next line begins. On tape or disk, the pointer is not meaningful, except that 0000 as a pointer means the end of the program.

Tokenized form means that key words such as For, Next, and If and functions such as EXP, SIN, and STRING\$ are stored in a packed form. One byte is used for keywords and two bytes for functions. This tokenized form makes Basic programs easy to recognize on disk.

If you look back at the description for patching a line with a bad line number, you will see that it finishes the old line (00), puts in a dummy pointer (01 01) and a line number (## ##), and then an 82, which is the token for REM. A Basic program line shouldn't be over 255 characters long, and adding the extra line at byte 80 prevents this.

The only other situations that might occur are if the bad sector is the first or last sector of the file. If it's the last sector, just put 00 00 00 at the start of the sector. If it's the first sector, the situation is a bit more complicated. The first byte is FF, and the next two bytes are the length of the program plus one. The length of the program can be found by determining the number of gran, the number of sectors in the last gran, and the number of bytes in the last sector.

This information is available on the directory track. Find the number of bytes in the last sector and the number of the first granule in the directory. Then look in the file allocation table (FAT) to find the total number of granules and the number of sectors in

the last granule. To find the number of granules, you have to trace a path something like this: "I'm starting at gran 20. Byte 20 in the FAT has 1C. Byte 1C has C3. That means that this file has one full granule (20) and three sectors of another (1C)."

Each sector has 256 bytes and each granule has nine sectors. Load the bad first sector with FF, the number of bytes in the program (+ 1), and the usual two dummy lines. Give the dummy lines the line numbers 1 and 2, and you should be able to load the program and fix it with

```

100 'DISC CHECK AND BACKUP PROGRAM
110 'FOR COLOR COMPUTER WITH TWO DISCS
120 ' BY PHIL MARTEL
130 CLEAR 500,&H3E00
140 DEF FNP(X)=256*PEEK(X)+PEEK(X+1)
150 INPUT"(C)HECK OR (D)UPLICATE";A$:A$=LEFT$(A$,1):IF (A$<>"C")
    AND(A$<>"D") THEN 150
160 DEF USR0=FNP(&HC004)' DSKCON -SEE MANUAL PAGE 60
170 PA=FNP(&HC006)' PA POINTS TO THE DSKCON PARAMETER TABLE
180 POKE PA+4,&H3E:POKE PA+5,0'SET UP BUFFER
190 FOR TR=0TO34
200 FOR SE=1TO18
210 POKE PA,2:POK EPA+1,0'READ FROM DRIVE 0
220 POKE PA+2,TR:POKE PA+3,SE
230 POKE PA+6,0
240 X=USR0(0)
250 EC=PEEK(PA+6):PRINT@480,TR;SE;EC;
260 IF EC<>0 THEN PRINT" ERROR"
270 IF A$="C" THEN 310
280 IF EC=16 THEN FOR I=&H3E00 TO &H3EFF:POKE I,255:NEXT I'REALLY
    BAD RECORD-CLEAR IT
290 POKE PA+6,0:POKE PA,3:POKE PA+1,1'SET UP TO WRITE TO DRIVE 1
300 X=USR(0)
310 NEXT SE,TR

```

Program Listing 2

```

100 'DISC CHECK AND BACKUP PROGRAM
110 'FOR COLOR COMPUTER WITH ONE DISC
120 ' BY PHIL MARTEL
130 CLS:Pmode 0,1:PCLEAR 1:CLEAR 100,&H1C00
140 DEF FNP(X)=256*PEEK(X)+PEEK(X+1)
150 INPUT"(C)HECK OR (D)UPLICATE";A$:A$=LEFT$(A$,1):IF (A$<>"C")
    AND(A$<>"D") THEN 150
160 DEF USR0=FNP(&HC004)' DSKCON -SEE MANUAL PAGE 60
170 PA=FNP(&HC006)' PA POINTS TO THE DSKCON PARAMETER TABLE
180 POKE PA+5,0'SET UP BUFFER
190 FOR T1=0TO34 STEP2
195 FOR T2=0 TO 1 :TR=T1+T2 :IF TR=35 THEN 290
200 FOR SE=1TO18
205 BA=18*(TR AND 1)+SE+27:POKE PA+4,BA'BUFFER ADDRESS
210 POKE PA,2:POKE PA+1,0'READ FROM DRIVE 0
220 POKEPA+2,TR:POKEPA+3,SE
230 POKE PA+6,0
240 X=USR0(0)
250 EC=PEEK(PA+6):PRINT@480,TR;SE;EC;
260 IF EC<>0 THEN PRINT" ERROR"
280 IF EC=16 THEN FOR I=BA TO BA+255:POKE I,255:NEXT I'REALLY BA
    D RECORD-CLEAR IT
285 NEXT SE
290 NEXT T2
300 IF A$="C" THEN 500
310 PRINT@0,"INSERT DESTINATION DISC, HIT ENTER";:SOUND200,20
315 GOSUB 600
320 FOR T2=0 TO 1: TR=T1+T2 :IF TR=35 THEN 385
330 FOR SE=1 TO 18
340 POKE PA+4,18*T2 +SE +27' SET UP BUFFER
350 POKE PA,3:POKE PA+2,TR:POKE PA+3,SE
360 POKE PA+6,0: X=USR(0)'WRITE BUFFER
370 IF PEEK (PA+6) <>0 THEN PRINT"DISC WRITE ERROR HIT ENTER TO T
    RY AGAIN":GOSUB 600 :GOTO340
380 NEXT SE
385 NEXT T2
390 PRINT@0,"INSERT SOURCE DISC, HIT ENTER ";:SOUND150,2
0
400 GOSUB 600
500 NEXT T1
510 END
599 'SUBROUTINE TO WAIT FOR ENTER
600 B$=INKEY$: IF B$=""THEN 600
610 IF ASC(B$)<>13 THEN 600
630 RETURN

```

Program Listing 3

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F02-1

Basic.

Bad Directory

Having a bad directory segment is frustrating. All your programs are there, but you can't get at them. Having the directory go bad is at least as likely to happen as having an individual program go bad, because when you access a program, you are also accessing the directory. So, the directory gets at least as much use and has the same chance for random failure as all the programs together.

When my disk crashed, I lost the file allocation table and one of the other directory sectors. I backed up the disk with Program Listing 1. When the program gave me an I/O error, I changed the For statement in line 130 to copy the rest of the disk. Then I changed the program so that it ran only on the bad track, but past the bad sector. In this fashion, I copied the whole disk. I found that on track 17, sectors 2 and 5 were bad.

I started to fill in the file allocation table by what amounts to cryptanalysis. I knew the starting granule of all programs except those that were lost with sector 5. By looking at the first sector of the starting granule, I could tell how long the program was. If it was less than a full granule, I could assign that byte in the file allocation table the value C1 to C9 as appropriate.

If the file was longer than one granule, I looked at the last line number in the granule (assuming it was a Basic program) and searched for a granule that started with a larger line number that might be a continuation of the pro-

gram. After I had reconstructed most of the file allocation table in this fashion, I used a machine-language program to read the bad sectors.

I wrote a short program using the Sigmon monitor, which has a one-line assembly feature. Here's where I got lucky. This program showed that the file allocation table (Tr 17, Sec 2) was still there, but had a CRC error. I was able to read the data, patch a bad byte and recover the file allocation table.

Since I had almost restored the whole table by hand, I wasn't too thrilled by this. I did notice that bytes 68 to 255, which the manual claims are zeroes, seemed to have data on recent additions to the directory. Since the other bad sector (Tr 17, Sec 5), which could not be recovered by the machine-language program, was at the end of the directory at the time, I was able to recover almost the entire directory.

You might have noticed that I have not provided a listing of this marvelous machine-language program. Program Listings 2 and 3 do the same thing entirely from Basic, so the listing is not necessary.

If the bad sector in the directory is not recoverable by using Program Listings 2 and 3, and it was not the most recently updated, then you have problems. You can get some idea of where the programs referred to in the bad sector are stored by writing a table with 68 rows, one for each granule on the disk. Go through the directory and write the name of each program on the line with its starting granule. Then look at the file allocation table and write down the sequence of granules associated with each

granule.

Every granule has associated with it either an FF, a C1-C9, or 00-44 (hex). If the granule points to another one (that is, its number in the file allocation table is 00-44) write that granule number and any granules it points to in the row following the first granule. Cross out rows as you write them out as successors to other granules. You will develop a set of "chains" of granules. Most of these will have a program name associated with them.

The chains that don't have program names are the ones that were named in the bad sector. Look at the files. You might be able to remember the names of some of them. Give new names to the rest.

As you look through the files, determine how many bytes in the last sector are used by looking for 00 00 00, for Basic files, or by working from the byte-length information in machine-language and data files.

You now have the information needed to restore the bad sector. Go into Colorzap, patch the segment, and you're back in business.

While working on this article, I had another disk failure. Since I had the disk backed up this time, I didn't worry about it. I decided to try some of the ideas I had been developing.

I found that I couldn't read any of the disk reliably with Program Listing 1 which had worked so well the first time. The disk did not seem to be physically damaged, so I bulk-erased it and ran the DSKINI command. When DSKINI didn't work, I knew I had a problem. Since it didn't work for a good blank disk on either of my disk drives, I decided that the problem was in the controller.

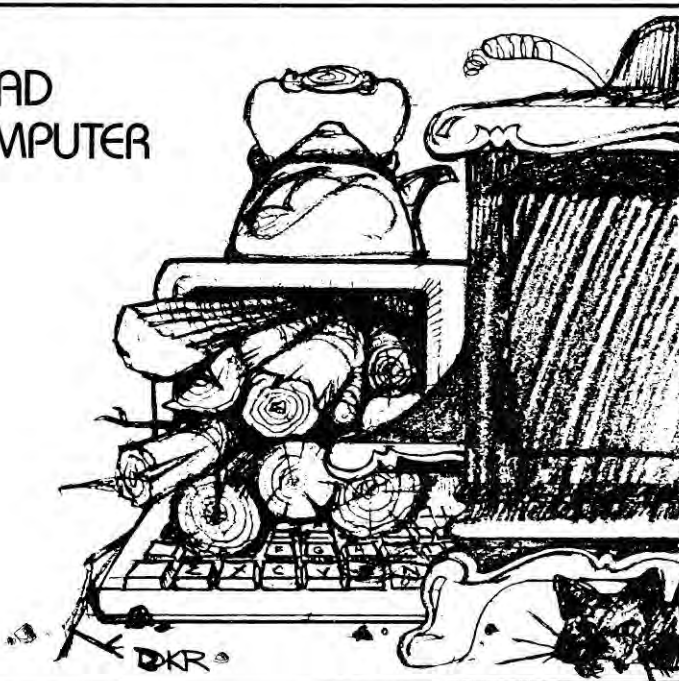
I removed the controller from the Color Computer and rubbed the contacts on both sides of the board with an eraser. This allowed me to initialize the disks. To avoid further problems from oxidation, I have had the contacts plated.

I hope you have fewer problems with your disk drive than I have had with mine. The sort of trouble a disk crash causes can be a great learning experience, but it does cut down on your programming time. Since I got the finger connectors of my controller plated, I haven't had any trouble with the disk drives. ■

Contact Philip Martel at 748 Tyler St., Pittsfield, MA 01201. His hobbies include ham radio and karate.

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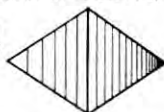
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Discipline for the DIR Command

by Gerry Schechter

Confused by the order your Color Computer prints the directory? This utility makes your directory look the way you want it to.

Disk storage versus tape storage is like comparing Cadillacs and Pintos. But disks, in spite of their advantages, can be troublesome. Trying to read those disk directory file names as they scroll off the top of the screen at Mach 2 speeds can cause your eyeballs to pound dents into your frontal lobes. What disk

users need is a utility to clean up those directory displays.

After I bought my Radio Shack Color Computer Disk System and packed one disk with as many programs as I could, I discovered the DIR command displays file names and other information in an order that I haven't yet

figured out. It also scrolls information off the screen if there are more than 14 files on the disk. The manual states that you can press the shift and @ keys to stop the display, but once it's off the screen you'll have to type in the command again.

It didn't take long to realize that I would have to write a program to eliminate the problem. To their credit, Radio Shack included enough technical information in the manual to allow me to write this program.

Once I wrote the program I enhanced it by allowing you to run, load or kill any file directly from the screen. I also added a print function to allow easy documentation of the files for any given disk.

How the Program Works

Load and run the program; the screen clears and displays a skeleton screen with headings at the top and commands at the bottom. The middle of the screen shows "Reading Directory." The disk directory is read directly using the DSKI\$ command and stores all relevant information into arrays. The file allocation table is read to calculate the number of granules used by each file. Next, the middle of the screen changes to read "Sorting Directory," at which point the program performs an alphanumeric sort based on file name and extension. Finally, the screen fills with the information for the first 10 files, and a pointer (->) is displayed to the left of the first file. The pointer indicates the file on which the commands will be acted.

Program Listing

```

10 ' DIRUTIL/BAS VER 1.0
20 ' GERRY SCHECHTER
30 ' 75 MIDLAND TERRACE
40 ' YONKERS NY 10704
50 ' FEB 82
60 CLEAR1200
70 GOSUB720
80 DIM F$(68),ES$(68),T$(68),M$(68),G(68)
90 NF=0:SE=3
100 ' get default drive #
110 D=PEEK(&H95A)
120 PRINT@263,"READING DIRECTORY";
130 ' read directory
140 DSKI$ D,17,SE,AS,BS
150 CS=AS+LEFT$(BS,127)
160 FOR X=0TO7
170 Z=X*32
180 IF MID$(CS,Z+1,1)=CHR$(0) THEN NF=NF-1:GOTO250
190 IF MID$(CS,Z+1,1)=CHR$(255) GOTO280
200 F$(NF)=MID$(CS,Z+1,8)
210 ES$(NF)=MID$(CS,Z+9,3)
220 IF MID$(CS,Z+12,1)=CHR$(0) THEN T$(NF)="BP" ELSE IF MID$(CS,
Z+12,1)=CHR$(1) THEN T$(NF)="BD" ELSE IF MID$(CS,Z+12,1)=CHR$(2)
THEN T$(NF)="ML" ELSE T$(NF)="TE"
230 IF MID$(CS,Z+13,1)=CHR$(0) THEN M$(NF)="B" ELSE M$(NF)="A"
240 G(NF)=ASC(MID$(CS,Z+14,1))
250 NF=NF+1:NEXT X
260 SE=SE+1
270 IF SE<12 GOTO140
280 NF=NF-1:F$(NF+1)=CHR$(255)
290 ' read file allocation table
300 DSKI$ D,17,2,AS,BS
310 ' calculate granules
320 FOR X=0TONF
330 Y=1
340 IF MID$(AS,G(X)+1,1)>HEX$(191) THEN G(X)=Y:GOTO400
350 Y1=G(X)+1
360 Y=Y+1
370 Y1=ASC(MID$(AS,Y1,1))+1
380 IF MID$(AS,Y1,1)>HEX$(191) THEN G(X)=Y:GOTO400
390 GOTO360
400 NEXT X
410 ' sort by filename & ext
420 PRINT@263,"SORT";
430 Y=0:Y1=1:X=0
440 IF F$(Y1)>F$(Y) OR (F$(Y1)=F$(Y) AND ES$(Y1)>ES$(Y)) GOTO510
450 F$(68)=F$(Y):ES(68)=ES(Y)
460 T$(68)=T$(Y):M$(68)=M$(Y):G(68)=G(Y)
470 F$(Y)=F$(Y1):ES(Y)=ES(Y1)
480 T$(Y)=T$(Y1):M$(Y)=M$(Y1):G(Y)=G(Y1)
490 F$(Y1)=F$(68):ES(Y1)=ES(68)
500 T$(Y1)=T$(68):M$(Y1)=M$(68):G(Y1)=G(68):X=1
510 Y=Y+1:Y1=Y+1
520 IF Y<NF GOTO440
530 IF X=1 GOTO430

```

Listing continues

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```

540 FB=0;Y=128
550 GOSUB660
560 ' wait for keyboard input
570 IS="":IS=INKEY$:IF IS="" GOTO570
580 IF IS="D" THEN GOSUB780:GOTO570
590 IF IS="U" THEN GOSUB830:GOTO570
600 IF IS="F" THEN GOSUB880:GOTO570
610 IF IS="B" THEN GOSUB930:GOTO570
620 IF IS="R" OR IS="L" OR IS="K" THEN GOSUB980:GOTO570
630 IF IS="P" THEN GOSUB1100:GOTO570
640 GOTO570
650 ' fill screen
660 GOSUB720:Z=0
670 IF FB+9>NF THEN FE=NF ELSE FE=FB+9
680 FOR X=FB TO FE
690 PRINT@130+Z*32,FS(X);" ";ES(X);" ";TS(X);" ";MS(X);"
";G(X);
700 Z=Z+1:NEXT X
710 PRINT@Y,"->";:RETURN
720 CLS
730 PRINT@1,"*** DIRECTORY LIST UTILITY ***";
740 PRINT@66,"FILENAME EXT TYPE FMT GRN";
750 PRINT@481,"RUN-LOAD-KIL-FWD-BWD-UP-DO-PRT";
760 RETURN
770 ' move pointer down
780 IF Y+32>416 OR Y+32>128+Z*32 THEN SOUND120,3:RETURN
790 Y=Y+32
800 PRINT@Y,"->";:PRINT@Y-32," ";
810 SOUND130,1:RETURN
820 ' move pointer up
830 IF Y-32<128 THEN SOUND120,3:RETURN
840 Y=Y-32
850 PRINT@Y,"->";:PRINT@Y+32," ";
860 SOUND130,1:RETURN
870 ' scroll forward
880 IF FE=NF THEN SOUND120,3:RETURN
890 FB=FB+10:Y=128
900 GOSUB660
910 SOUND130,1:RETURN
920 ' scroll backward
930 IF FB=0 THEN SOUND120,3:RETURN
940 FB=FB-10:Y=128
950 GOSUB660
960 SOUND130,1:RETURN
970 ' load-run-kill
980 X=FB+(Y-128)/32
990 IF G(X)=0 THEN SOUND120,3:RETURN
1000 IF TS(X)="ML" AND IS="R" THEN SOUND120,3:RETURN
1010 AS=FS(X)+"/"+ES(X)
1020 IF IS="L" THEN CLS:PRINT:PRINT" LOADING..";AS:IF TS(X)="ML"
THEN LOADM AS ELSE LOAD AS
1030 IF IS="R" THEN CLS:PRINT:PRINT" LOADING..";AS;","R":LOAD AS,
R
1040 PRINT@Y+16,"VERIFY KILL Y/N";
1050 IS=INKEY$:IF IS="" GOTO1050
1060 IF IS="Y" THEN KILL AS:TS(X)="*":MS(X)="*":G(X)=0
1070 PRINT@Y+16," ";TS(X);" ";MS(X);" ";G(X);" ";
1080 RETURN
1090 ' print directory
1100 SOUND130,1
1110 AS=STRING$(5," ");:PRINT@Y," ";
1120 PRINT#-2
1130 PRINT#-2,AS;"*** DIRECTORY LIST UTILITY ***"
1140 PRINT#-2
1150 PRINT#-2,AS;"FILENAME EXT TYPE FMT GRAN"
1160 PRINT#-2
1170 FOR X=0 TONF
1180 PRINT#-2,AS;FS(X);" ";ES(X);" ";TS(X);" ";MS(X);"
";G(X)
1190 NEXT X
1200 PRINT@Y,"->";:RETURN

```

Using the Program

Once the screen fills and the pointer appears, the following commands (using INKEY\$) are available:

- D—move pointer down one line
- U—move pointer up one line
- F—display next group of files
- B—display previous group of files
- R—load and run file
- L—load file
- K—kill file (requires a Y/N verification)
- P—print entire directory

All commands produce an audible response when you press any valid command key. Hitting an invalid command key, such as trying to load a killed file, also produces an audible response.

Modifications

All the comments in the program were added after I thoroughly tested it, and they precede the lines they describe. You can save typing time without worrying about UL errors.

Since I have only one disk drive, the program will not format the directory of more than one disk at a time. The program uses the default drive number, which you can change with the Drive command, or you can modify it to handle more than one drive at a time.

I've modified all my programs by replacing all End statements with a Load and Run of this program to allow me to work directly from the screen. ■

Gerry Schechter can be reached at 75 Midland Terrace, Yonkers, NY 10704, and is employed by New York Hospital, New York.

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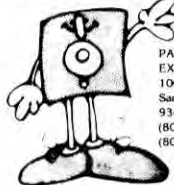
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APL Primer—Part II

by Margaret M. Grothman

Vectors were your favorite part of high-school physics class, right? This month, Margaret tells you how to use them in APL on your 80.

I first mentioned vectors last month, in Part I of this series on APL. This month you will study vectors in more detail, and also learn many new APL functions.

To begin, assign values to two variables, VAR1 and VAR2. Single values assigned to variables are called scalars, or scalar variables.

```
Enter: VAR1←10
Enter: VAR2←12
```

Now assign a third variable, VAR3, in the following way:

```
Enter: VAR3←VAR1, VAR2
Enter: VAR3
Result: 10 12
```

You have created a two-element vector by chaining two scalar variables together. The function denoted by the comma is called catenation—last month you chained together two names (literals) using the catenation function.

Operations can be done with vector variables in the same way as with scalar variables.

```
Enter: VAR4←VAR3,X VAR1
Enter: VAR4
```

```
Result: 100 120
Enter: VAR5←VAR3,X VAR4
Enter: VAR5
Result: 1000 1440
```

In the first example, VAR1 (a scalar), is multiplied by a vector (VAR3), resulting in VAR4 (a new vector containing two elements).

When two vectors are multiplied as in the second example, corresponding elements of each are multiplied together. This is called parallel processing. The vectors must be the same length or an error message will result.

Random (Monadic)

A question mark followed by an integer produces a random integer between 1 and the integer entered. A question mark followed by 0 produces a random number between 0 and 1. If the symbol is followed by a vector consisting of integers, the result will be another vector containing random numbers. The entry, ? 6 6, for example, returns a two-element vector consisting of random integers between 1 and 6 (like the roll of a pair of dice).

Deal (Dyadic)

The deal function is the dyadic

counterpart of the random function. It uses the same symbol, and also involves random selection of numbers.

The first argument in deal is an integer that determines the number of random integers to be selected. The second argument, like the single argument in random, is the upper limit of integers that can be selected. If you enter 3 ? 10, three integers from 1 to 10 will be displayed. There is no replacement—no number will be chosen twice. Entering 6 ? 52, for example, produces a vector containing six integers between 1 and 52, simulating a deal of six cards out of a deck of 52.

Power Function

The power function uses the asterisk symbol. The function works with zero and one, negative or fractional powers, as well as positive integers.

```
Enter: 5 * 2
Result: 25
```

```
Enter: 5 * -2
Result: .04
```

```
Enter: 5 * .5
Result: 2.23607
```

```
Enter: 5 * 1
Result: 5
```

```
Enter: 5 * 0
Result: 1
```

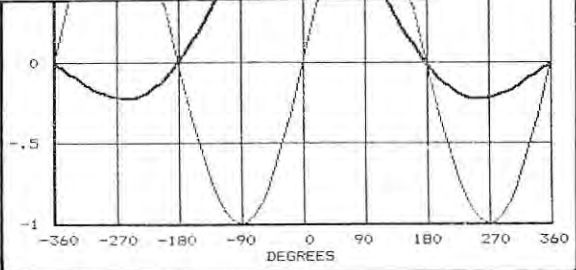
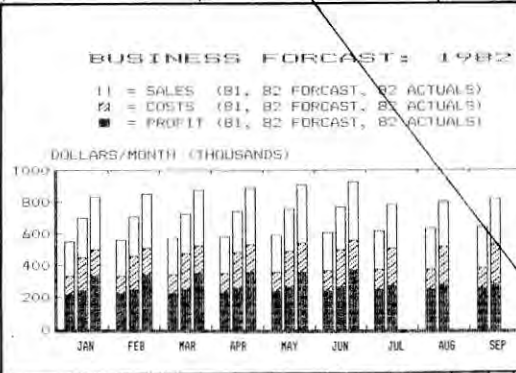
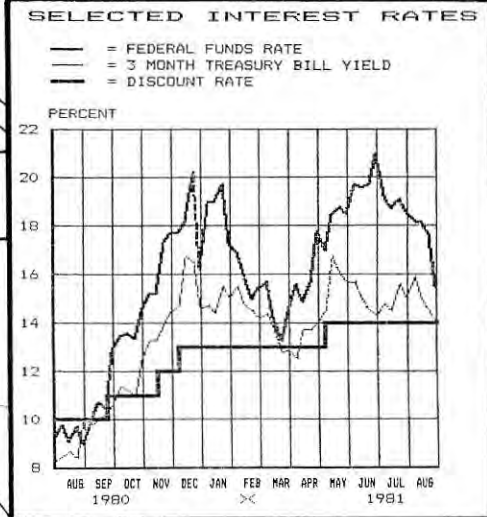
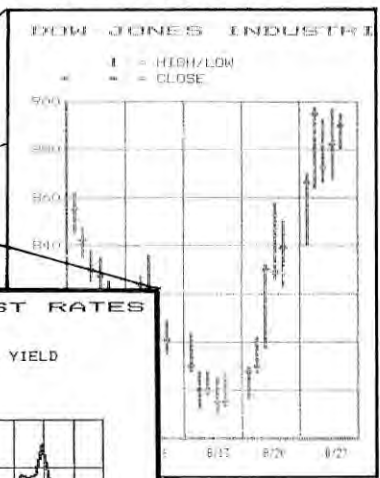
```
Enter: 5 * 1 % 2
Result: 2.23607 (the square root of 5)
```

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122	74.76	946.44	392.03	113.09	135.25	467	782	11,057		
123	74.72	946.44	391.61	111.78	139.23	685	780	16,604		
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The last example shows the form for obtaining roots. The cube root of 5 is obtained by $5 * 1 \% 3$, the fourth root by $5 * 1 \% 4$, and so on.

Exponential Function (Monadic)

An asterisk used as a monadic function results in 2.71828 (e, the base for natural logarithms) raised to a power.

```
Enter: * 1
Result: 2.71828
```

```
Enter: * 2 3 4
Result: 7.38906 20.0855 54.5982
```

Ceiling Function (Monadic)

Typing shift and H followed by a number produces the next higher integer.

```
Enter: H 3.2
Result: 4
```

```
Enter: H -3.2
Result: -3
```

Floor Function (Monadic)

The shift key followed by L and a number returns the next lower integer. The floor function is useful for extracting the integer part of a positive number.

```
Enter: L 3.6
Result: 3
```

```
Enter: L -3.6
Result: -4
```

Maximum (Dyadic)

This function shares its symbol (shift H) with the ceiling function. It can be used in several ways.

```
Enter: 17 H 5
Result: 17
```

```
Enter: VEC1 ← 1 2 3 4
Enter: VEC1 H 3
Result: 3 3 3 4
```

In the first example, the larger of the

two numbers is returned. In the second example, each element of the vector, VEC1, is compared with 3. The vector returned contains the maximum result from each comparison.

Two vectors may be compared element by element, as in the following example:

```
Enter: VEC2 ← 4 3 2 1
Enter: VEC1 H VEC2
Result: 4 3 3 4
```

Minimum (Dyadic)

The minimum function is used in the same ways as the maximum function. Its symbol, also used by the floor function, is shift, L.

```
Enter: VEC1 L VEC2
Result: 1 2 2 1
```

Relational Operators

These functions all yield a result that depends on the truth of the expression in which they are used. The result is a one if the expression is true, a zero if false. There are six relational functions; all are dyadic (see Table 1).

Vectors, as well as scalars, may be compared using the relational functions. The result is a vector in which all elements are zeros or ones.

```
Enter: V1 ← 2 4 6 4 2
Enter: V1 = 4
Result: 0 1 0 1 0
```

The relational operators can also be used with literals. Since comparison in APL80 is made character by character, the literals compared must be the same length.

```
Enter: N1 ← 'JOHN JONES'
Enter: N2 ← 'JOAN JOKES'
Enter: N1 = N2
Result: 1 1 0 1 1 1 1 0 1 1
```

```
Enter: N1 > N2
Result: 0 0 1 0 0 0 0 1 0 0
```

CHRS/ASC (Monadic)

This function can be used in two

ways. The symbol # followed by a number returns an alphanumeric or graphics character. The symbol followed by a character within single quotes returns the ASCII code for that character.

```
Enter: #'A'
Result: 65
```

```
Enter: #43
Result: +
```

The short program that follows illustrates how graphics are produced in APL80 by means of the # sign. Lines 1 and 2 of Turtle assign a pair of vector variables containing the graphics codes to draw a turtle on the screen. Lines 3 and 4 print the graphics blocks represented by those codes. Call the function by typing Turtle.

```
)DEF TURTLE
1: ROW1 ← 184 190 191 191 188 184 140
2: ROW2 ← 130 129 128 128 131
3: # ROW1
4: # ROW2
```

In APL80, some, but not all, of the screen control codes work with #. Three that do are:

```
#23 (change to 32 CPL mode)
#28 (return cursor to top of screen, change to 64
    CPL mode)
#31 (clear to end of screen)
```

For a large turtle, first enter #23, then call Turtle. To return to regular-size print, type #28.

The combination of #28 and #31 can be used at the start of a program to clear the screen and begin at the top. Together they are equivalent to the Basic CLS command.

In APL80, the # sign followed by a dash can be used in the same way as the Basic PRINT@ command. For example, #-960 moves the cursor to the beginning of the bottom line on the screen.

The # sign can also be used to divide the screen into zones or fields. The code #3 gives 16-zone printing, #7 gives eight-zone printing, and #15 gives four-zone printing. Cancel zone printing by typing #255.

Compression (Dyadic)

This function uses the slash symbol. The argument on the left of the slash is a vector consisting of only ones or zeros. On the right is another variable containing the same number of elements. The resulting vector consists of values from the second argument corresponding to ones in the array on the left.

Function	APL80 Symbol	Example	Result
equals	=	5 = 8	0
does not equal	\$	5 \$ 8	1
is greater than	>	5 > 2	1
is less than	<	5 < 8	1
is greater than or equal to	shift Z	5 Z 8	0
is less than or equal to	shift K	5 K 8	1

Table 1. Relational Functions

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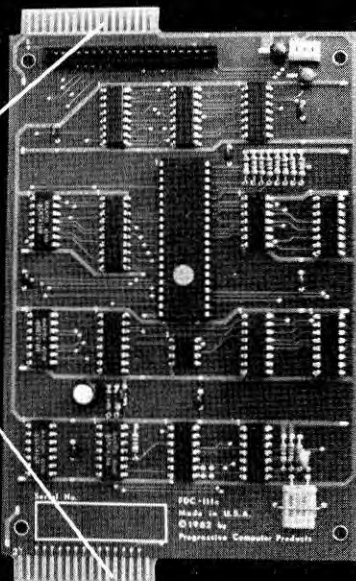
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Enter: 1 0 1 0 1/18 23 13 42 0
Result: 18 13 0

Compression also works with scalars, a property I will use further in the section on branching.

Enter: 1/15
Result: 15

Literals can also be compressed, as in the following example:

Enter: VOWELS←1000100010
Enter: ALPHA←'ABCDEFGHJI'
Enter: VOWELS/ALPHA
Result: AEI

Expansion (Dyadic)

The expansion function uses the symbol shift W. It is used to insert zeros or spaces into a vector (numerical or literal).

Enter: Q←ALPHA←'ABCDE'
Enter: Q←EXVEC←1010101010
Enter: EXVEC W ALPHA
Result: A B C D E

Editing

You can edit functions by typing

)EDIT followed by the function name. Let's use Turtle to demonstrate the edit mode in APL80. First, type and enter)EDIT TURTLE. The screen should appear as follows:

0: TURTLE
5:

Now you can add to the program beginning with line 5. If you want to review the entire function first, type)? and lines 0-4 will be listed. Add the following lines:

5: # ROW1
6: # ROW2
7: break

Calling Turtle now results in two turtles being printed, one above the other. What if you want the two turtles on the same line? Unfortunately, you can't suppress the line feed in APL80—but vectors can be catenated to produce two turtles in a row. Replace lines 3-6 as follows.

Type)EDIT TURTLE, then)? to list the entire function. To revise line 3, type)3. Enter the new line 3. Replace the other lines in the same way.

3: ROW3←ROW1, ROW1
4: ROW4←ROW2, ROW2
5: #ROW3
6: #ROW4
7: break

Something is wrong with these turtles. Since ROW2 is shorter than ROW1, you must add spaces to make the vectors the same length. Return to the edit mode, enter)2 and retype the line, adding two 128s (the code for blank spaces) to the end of the ROW2 vector. After making the change, press break to leave the edit mode.

To delete a line, go to the line you want dropped and press break. Lines are automatically renumbered after a deletion.

The APL80 tape version doesn't allow you to insert lines—nor can you leave lines blank as you are writing functions. If you expect to need extra lines later, use comment lines. They can be revised into program lines later or deleted if they are not needed. A comment line is produced by typing shift and C followed by a comment or by nothing at all.

In the tape version of APL80, you can do three things with the editor: add lines, replace lines, or delete lines. The disk version has other edit commands that are described in the manual.

One last point about the APL80 editor: If you are editing a long program, the first part will scroll off of the screen when you type)?. You can stop the action by holding down the shift and the @ keys together.

Logical Functions

There are five logical functions: AND, OR, NOT, NAND, and NOR. All but one are dyadic. They are used to compare logical values (ones or zeros, representing truth or the presence of a condition).

Logical AND (&)

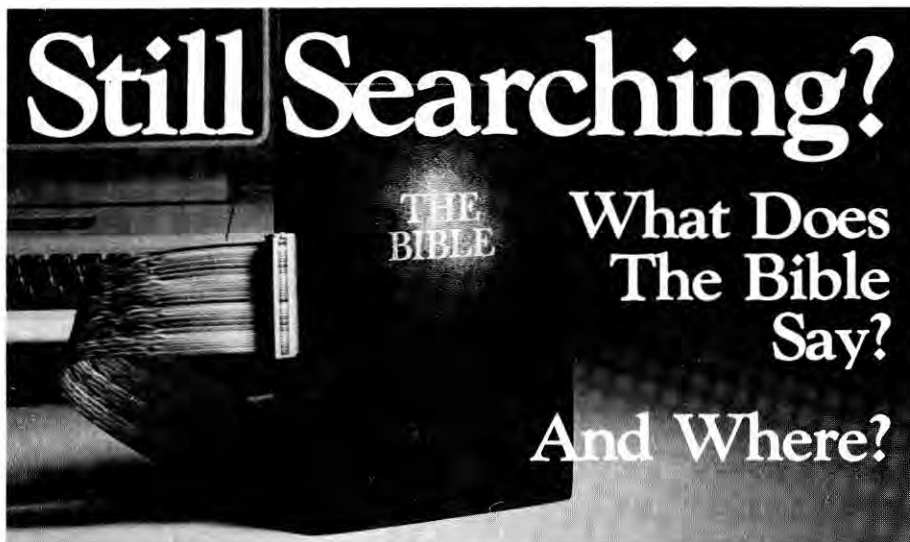
The logical AND function returns a one if the two values compared are both ones (both are true). Otherwise a zero is returned.

Enter: 0 & 0
Result: 0

Enter: 0 & 1
Result: 0

Enter: 1 & 1
Result: 1

Enter: A←0 0 1 1
Enter: B←1 0 1 0
Enter: A & B
Result: 0 0 1 0



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Logical OR (Shift V)

If either of the logical values compared is true, a one is returned. A zero results only if both values are false.

Enter: A V B
Result: 1 0 1 1

Logical NOT (Shift N)

This is the only monadic logical function. It returns the negative of its logical argument.

Enter: N A
Result: 1 1 0 0

Logical NAND (Shift A)

This is the reverse of the AND function—a one results unless both values are true.

Enter: A A B
Result: 1 1 0 1

Logical NOR (Shift Y)

This is the opposite of the logical OR function.

Enter: A Y B
Result: 0 1 0 0

Branching

In an APL program, you can go to a specific statement by typing a right arrow followed by the statement number.

The short program that follows creates an infinite loop. Each time statement 2 is reached, the instruction to return to statement 1 is executed. The program generates random integers between 1 and 18 until you press the break key.

```
)DEF RANDOM
1: ? 18
2: 1
```

The next program (a variation of the Turtle program) creates a loop that will be executed seven times. This is accomplished by the counter variable, INDEX. On each pass through the loop, the value of INDEX is increased by one. Statement 7 tests the value of INDEX to determine if it is less than eight.

```
)DEF TURTLES
1: ROW1←184 190 191 191 188 184 140
2: ROW2←130 129 128 128 131
3: INDEX←1
4: # ROW1
5: # ROW2
6: INDEX←INDEX + 1
7: →(INDEX < 8) / 4
```

Statement 7 can be read as "if INDEX is less than eight, go to statement 4." It uses a relational operator to test the truth of (INDEX < 8). If that expression is true, the compression operator (/) compares 1 and 4. Since 1/4 returns a 4, execution passes to statement 4 to begin the loop again. If (INDEX < 8) is false, (INDEX < 8) / 4 is evaluated as a null vector (a vector containing no elements). In that case, execution falls through to the next statement. In the above program there is no other statement, so the program ends.

You can also write a program with a loop that will stop when a certain condition is met. For example, (X > Y) / 0 can be read as "if X is greater than Y, then stop." "Go to 0" always stops execution.

The program Test, which follows, contains instructions to go to statement 5 if X equals Y and to go to statement 4 if X is greater than Y. If neither of those conditions is met, statement 3 is executed. Program lines 3 and 4 contain multiple statements. The instruction →6 is a statement by itself, separated from the other statement on the same line by a semicolon. Since there is no statement 6, execution stops. An arrow with no

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statement number following also ends the program.

```
)DEF TEST
1: →(X = Y) / 5
2: →(X > Y) / 4
3: 'X < Y'; →6
4: 'X > Y'; →6
5: 'X = Y'
```

Enter: X←5.000001
Enter: Y←5
Enter: TEST
Result: X>5

Enter: X←5.0000001
Enter: TEST
Result: X = Y

Besides illustrating the program Test, the two examples above show that APL80 stores only seven significant digits. The value of X in the second example is equivalent to five, because the eighth digit is dropped internally.

Two conditions are required in a branch statement, as in the examples that follow:

→(X > Y) & V > W) / 0

Read: "If X > Y and V > W, then stop."

→(0 = 1 ⍒ J N) / 5

Read: "If N is an integer, go to statement 5."

→(0 = 2 ⍒ J N) / 5

Read: "If N is an even integer, go to statement 5."

In APL80, the residue function cannot be used with negative numbers. In the last two examples, N must be positive.

Labeled Branches

Execution can be directed to a label rather than a statement number. This feature simplifies programming and editing, because lines do not have to be counted and changed as the program is developed. Labels also make a program easier to read. The program Test is rewritten below with labels. Any name that is not a variable can be used as a line label. The name must be followed by a colon and a statement.

```
)DEF TEST
1: →(X = Y) / EQUALS
2: →(X > Y) / GREATER
3: 'X < Y'; →0
4: GREATER: 'X > Y'; →0
5: EQUALS: 'X = Y'
```

Next month we will consider APL program types and special functions. ■

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by John Nicolettos

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Basic and the Color Computer

Figure 1 shows a simplified memory map for a Color Computer with Extended Basic. Locations 0-1023 are used by the Color Computer for system functions. Locations 1024-1535 store the text screen information and locations 1537-13,824 are reserved for graphic displays. This area is divided into eight 1,536-byte pages. The PCLEAR command determines how much memory will be reserved for graphics. A PCLEAR 1 reserves 1,536 bytes while PCLEAR 8 reserves 8 by 1,536 or 12,288 bytes.

The Extended Basic version of the Color Computer automatically does a PCLEAR 4 when first turned on. If the Color Computer's status is not changed by another PCLEAR command, then Basic programs start load-

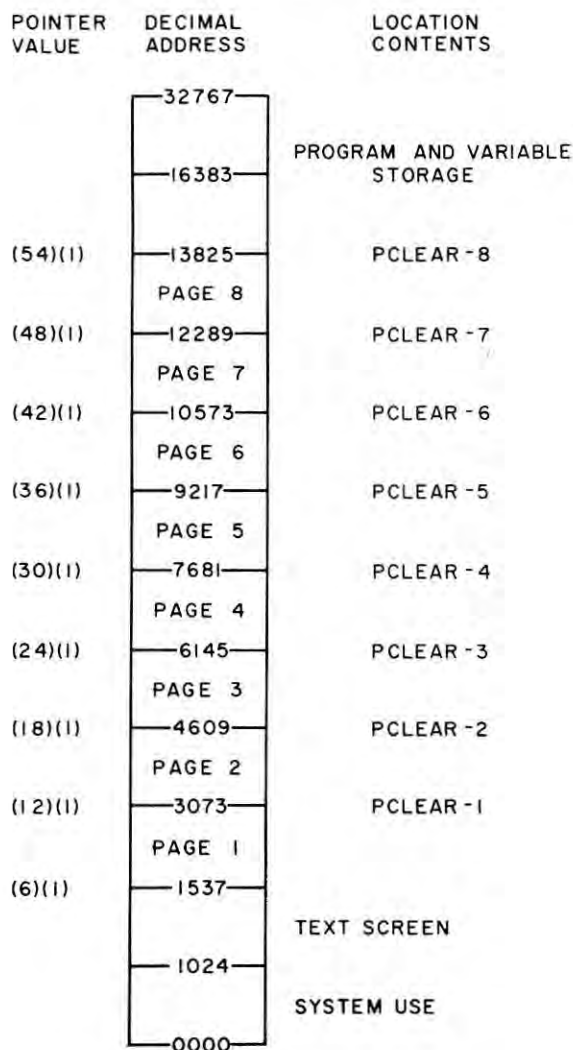
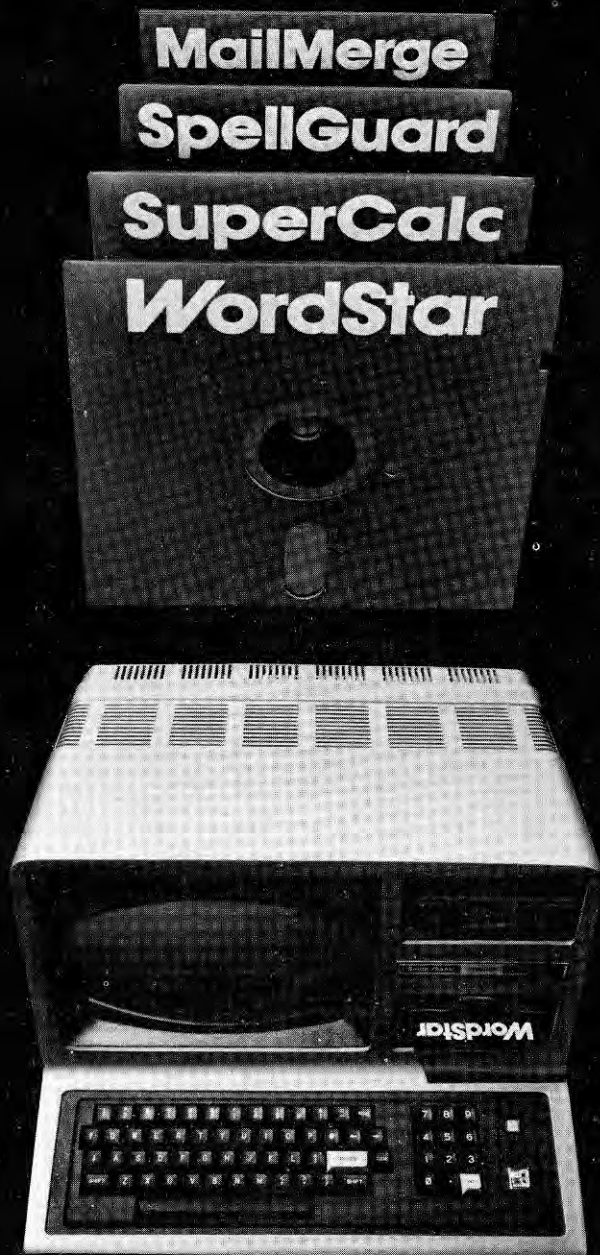
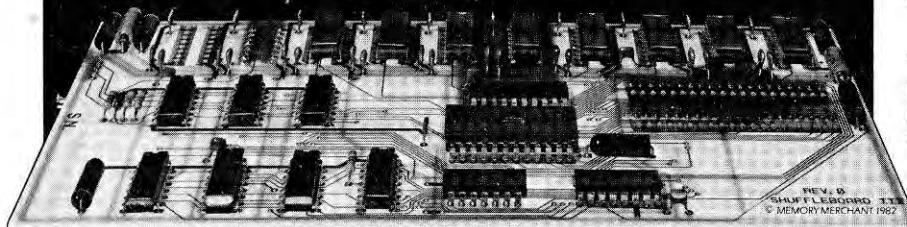


Fig. 1. Simplified Memory Map for the Color Computer

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ing at location 7681. Since the 4K Color Computer does not have the PCLEAR function, it starts loading Basic programs at 1537.

The Basic program continues to fill memory from the bottom up until the program ends. Figure 2 shows that the Color Computer appends an end-of-Basic (EOB) flag and establishes a storage area for the program variables immediately following the flag. If the Color Computer had been commanded into another PCLEAR mode, this process would take place at the locations identified in Fig. 1. For example, a PCLEAR 1 command causes the Basic program to load at 3073.

Since a Basic program can reside in a number of different memory locations, the Color Computer needs to determine the precise starting location. Memory locations 25 and 26 provide this information. Specifically, these locations are two-byte pointers containing the Basic program's start address. To see these locations in action, type

PRINT PEEK(25);PEEK(26).

The Color Computer displays the numbers 30 and 1 for Extended Basic or 6 and 1 for Color Basic. These numbers are decimal representations of the binary numbers stored in the two locations. To translate these numbers into their decimal value you need to know which number represents the most significant byte (MSB). For the Color Computer, location 25 contains the most significant byte. To determine the decimal equivalent, multiply the value in location 25 by 256 and add the value from location 26 to the product. In our example, the decimal equivalent is $30 \times 256 + 1 = 7,681$ for Extended

Basic or $6 \times 256 + 1 = 1,537$ for Color Basic.

In Fig. 1 you'll see that for PCLEAR 4 Basic starts at 7681 and the first free space in lower memory is 1537. The pointer values and their decimal equivalents are included in Fig. 1. If you have Extended Basic you can execute a different PCLEAR command, then check the pointer values in locations 25 and 26 against those in Fig. 1. Figure 3 is a model of a Basic program line. The Color Computer stores three specific items for each program line. These items are shown as information blocks in Fig. 3. The first block is the address of the next program line; the second block is the current program line number and the last block contains a code number that represents the Basic function to be performed. The Color Computer executes the Basic function, then moves to the next address.

Each block shown in Fig. 3 is made up of two bytes of information, so one program line requires at least six bytes of memory. These bytes are interpreted as most significant byte (MSB) and least significant byte (LSB). Complex functions can have many bytes of instructions associated with them. The Color Computer steps through each line of the program until it arrives at the EOB flag. It is this linking of instructions that provides the capability to merge cassette programs. To illustrate this process enter 10 CLS. Find the start of Basic pointer by entering PRINT PEEK(25);PEEK(26). Then convert the pointer to a decimal address and PEEK at that and the next seven memory locations. Extended Basic models at PCLEAR 4 display 30, 7, 0, 10, 158, 0, 0, 0 in locations 7681-7688. Color Basic models display 6, 7, 0, 10, 158, 0, 0, 0 in locations 1537-1544.

The first two bytes are a pointer to the address of the next program line (7687 or 1543). The second two bytes are the current line number (10). The following byte (158) is the code for the CLS function. The zero after 158 indicates the end of the current program line. The final two bytes are the EOB flag (two consecutive

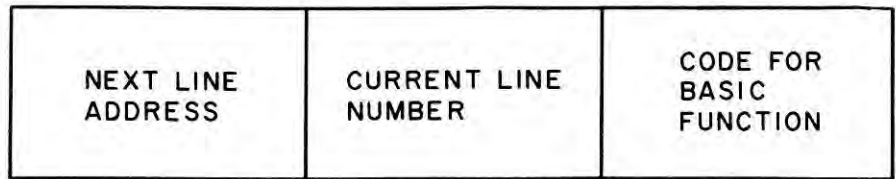


Fig. 3. Simplified Block Diagram of a Basic Program Line

4K, 16K, OR 32K
END OF MEMORY

2 BYTES (0,0)

7681 EXTENDED BASIC
OR
1537 COLOR BASIC

0000 START OF MEMORY

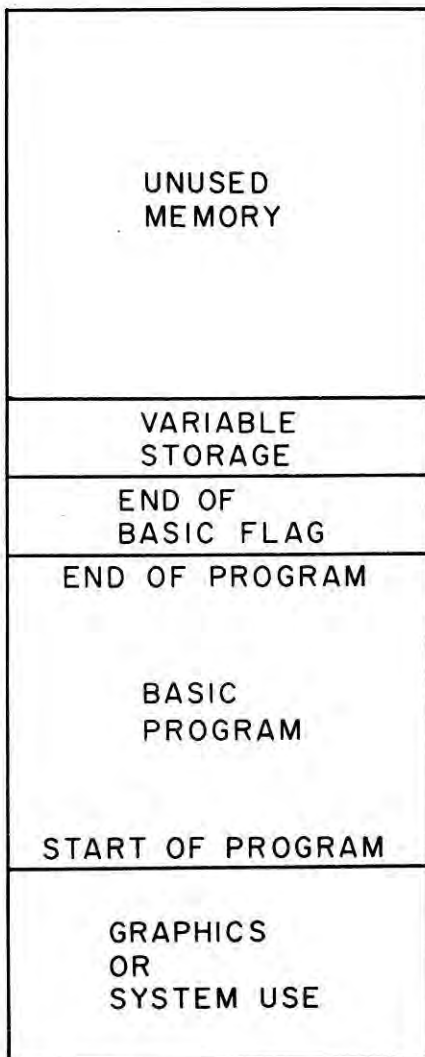


Fig. 2. Typical Basic Program in Memory

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zeros). Notice that the address identified by the first two bytes is the EOB flag address, which is the next (and last) line of the program.

Locations 27 and 28 store the end-of-Basic pointer in a manner similar to the way locations 25 and 26 store the beginning-of-Basic pointer. PEEK at these two values; you should get either 6,9 or 30,9 for this one-line program. This address is the very next memory location after the EOB flag.

The Cassette Merge Procedure

We now have the knowledge to understand the cassette merge procedure. The first program is CLOADed into memory. We know the Color Computer adds a two-byte EOB flag to the program. We also know that the program daisy-chains its way to this point. We can serve two purposes by starting the second program at the EOB flag address. First, the EOB flag is overwritten; next, the first program automatically feeds into the second program. The Color Computer then appends another EOB flag at the end of the second program, reserves variable space, and executes both programs as though they were one.

Table 1 lists the six steps required to merge two cassette programs. These steps mechanize the process described earlier. With a little experience the steps become automatic and the entire process takes only a little more time than CLOADing the two cassette programs. The following example illustrates the process by merging two simple programs. Type and CSAVE the programs in Program Listings 1 and 2. Now CLOAD Listing 1 and find the start and end of Basic pointers by PEEKing locations 25,26,27 and 28. For Extended Basic Color Computers the following should be displayed: 30, 1, 30, 69. While Color Basic displays: 6, 1, 6, 69.

You will not get 69 for the value in

*“With practice you
can relocate
program lines without
retyping them.”*

location 28 unless you typed Listing 1 exactly as shown. Each character, space or punctuation mark that's different from Program Listing 1 causes a one-byte change in location 28. The absolute value 69 is not critical; so if your program is longer or shorter than Listing 1, use the number you got (as long as your program runs).

To relocate the start of Basic pointer so the second program overwrites the EOB flag, enter POKE 26,67. If you're wondering where 67 came from, recall that locations 27 and 28 specify the end-of-Basic address, not the address of the EOB flag. You know the flag is two bytes long; therefore, you must subtract two from the value in location 28 (least significant byte) to cause the second program to overwrite the EOB flag. The value in location 25 (most significant byte) is equal to value in location 27; therefore, it doesn't have to be changed. If you didn't get 69, then subtract two from whatever number you did get and POKE the result into location 26. You can now CLOAD the second program. At this point anything done to the second program, such as renumbering, does not affect the first program. Move the start-of-Basic pointer back to its original location by entering POKE 26,1. The cassette merge operation is now complete. You can list, run or CSAVE the merged programs.

This technique isn't limited to merg-

ing two cassette programs. You can use it to merge three or more programs, or as a page editor, to move blocks of Basic program lines within a single program. This is tricky, but with practice you can relocate program lines without retyping them.

Caution

Make sure there's no conflict of line numbers. The Color Computer doesn't know how to handle two lines numbered 10. The Color Computer cannot deal with line numbers that are not in ascending order. Make sure the second program starts with a line number greater than the last line number of the first program. Be careful about your new program flow; make sure the merged program performs as intended and that you did not inadvertently change the logic. Variables can also be a source of problems. Be extra careful with any variable used by both programs. Finally, locate and confirm all transfers between the two programs.

Owners of Extended Color Basic computers can get an additional 1,536 bytes of program storage by using the techniques in this article. For some reason Radio Shack did not provide a PCLEAR 0 capability for Extended Basic. Therefore, the Color Computer reserves 1,536 bytes of memory for graphics, even if the graphics capability is not used. Once again look at Fig. 1, notice that the memory from 1537-3072 is not used to store a Basic program. These 1,536 bytes can be used by changing the start of Basic pointer (locations 25 and 26) to 6, 1 or decimal 1537. Once you do this you'll lose any program in memory. Therefore, POKE these values into locations 25 and 26 before you CLOAD your program. ■

John Nicoletto (8612 Snowden Loop, Laurel, MD 20708) enjoys photography and racquetball.

1. CLOAD first cassette program
2. Find address for start and end of Basic
 PEEK at locations 25 and 26 (start)
 PEEK at locations 27 and 28 (end)
3. Save these values for later use
4. Relocate start of Basic to overwrite EOB flag
 POKE value found in 27 into 25
 POKE 2 less than value found in 28 into 26
5. CLOAD second cassette program
6. Relocate start of Basic to original location
 POKE original value (step 2.) back into 25
 POKE original value (step 2.) back into 26

Table 1. Cassette Merge Procedures

```
10 CLS
20 I=1
30 PRINT@262,"THIS IS PROGRAM NO. ";I
40 FOR T=0 TO 100:NEXT
```

Program Listing 1

```
100 CLS
110 I=I+1
120 PRINT@262,"THIS IS PROGRAM NO. ";I
130 FOR T=0 TO 100:NEXT
140 GO TO 10
```

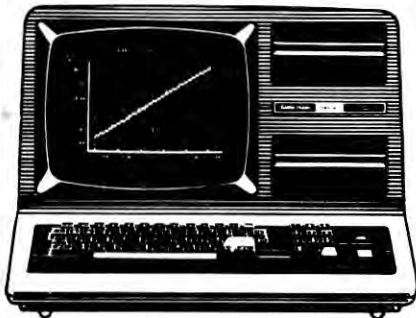
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by Jay Chidsey

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I've often spent a frustrating half hour or more trying to get the title and credits page at the beginning of a program to look the way I wanted it to. Table 1 shows the 16 lines available on the

Model I and III screens along with the corresponding PRINT @ number for the left margin of the screen on each line. Just add 10 or 15 to that left margin number, and type each title and

credit line in. You can adjust by subtracting from that PRINT @ value to move the line left, or adding to it to move the line right. The xxx in Table 1 is the suggested spacing for 2-6 lines

Program Listing 1 offers a more elegant method for setting up a title and credits screen. If you start even one program per month, it will be worth your time to type this short utility into your machine and save it. It runs just a shade over 4K as is, but could fit into 4K by dropping most of the easy reading spaces; be sure to cut the Clear value to 200 or less in line 80. Figures 1-3 show how the program works in three important stages.

This program is offered this month to illustrate several useful programming tips. Notice the unusual number of string Data lines at the end, running from lines 1000 to 1290. These 30 Data lines contain all the instructional ma-

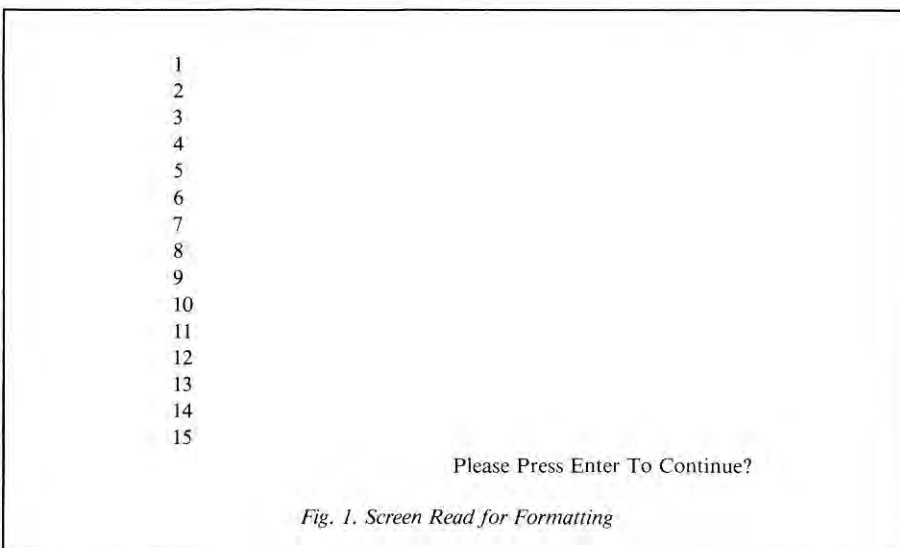


Fig. 1. Screen Read for Formatting

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```

1
2
3
4           TITLE AND CREDITS
5
6
7           FORMATTER
8
9
10          By Jay Chidsey
11
12
13          Green Springs OH 44836
14
15
           Please Press Enter To Continue?

```

Fig. 2. Title and Credits Formatted in Lines 180-250

```

216          TITLE AND CREDITS
412          FORMATTER
601          By Jay Chidsey
789          Green Springs OH 44836
           Please Press Enter To Continue?

```

Fig. 3. Formatted title and credits are displayed with proper PRINT @ numbers at left of screen

terial presented in the program. The first set runs from line 1000 through 1080, the second from line 1090 through 1180, and the third from line 1190 through 1290. Note how much easier it is to keep these lines about the same length for neat block appearance. Note also that I used the same array, A\$(Q), to present the three information blocks at lines 90, 170, and 300.

In each case the Data lines are first read into A\$(Q) in a For...Next loop and then printed by a similar For...Next loop. Q is incremented by one on each pass through the loop, and thus produces a subscript larger by one on each pass. A single spacing command TAB(10) sets all the lines printed to begin in the same column on the screen. Note the commas in Data lines 1050, 1190 (fore and aft), and 1240; these are read as empty data entries, and create spacing lines on the screen. Commas can be used in Data lines, as illustrated in line 1210, if the entry is preceded by a quote (") or enclosed (" ") if more than one entry is placed on the Data line. The third information page consists of 15 lines, including blank spacers, and thus exceeds the TRS-80's automatic acceptance of up to 11 array subscripts (0-10). In line 80 the array field is dimensioned to 15.

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Maximum spike current (For an 8 x 20 micro-second spike pulse)	2.000 amps	2.000 amps
Clamping response time	10 nanoseconds (10 x 10 ⁻⁹ sec.)	10 nanoseconds (10 x 10 ⁻⁹ sec.)
Noise rejection Filter network Frequency range: Attenuation	1KHz to 100 MHz 20 to 40 dB voltage ratio	—
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1	0					
2	64					
3	128				XXX	XXX
4	192			XXX		
5	256	XXX	XXX		XXX	XXX
6	320					
7	384			XXX		XXX
8	448		XXX		XXX	
9	512					XXX
10	576	XXX		XXX	XXX	
11	640		XXX			XXX
12	704				XXX	
13	768			XXX		XXX
14	832					
15	896					
16	960					

Press Enter To Continue?

Table 1

Q	Dummy variable; For . . . Next loops
A\$(Q)	Content of arrays for program instruction
S1	Vertical (line) location on screen of first line of title
T1	Calculation of PRINT @ location, first line of title
L1	Screen location of PRINT @, first line of title
T1\$	Content (in words) of first line of title
YY	Dummy variable for "To Continue" subroutine
X	Dummy variable for numbering of vertical lines (must reset to 0)
C	Counter for number of Title/Credit lines after the first
S(C)	INPUT of vertical (line) location of subsequent title lines
T(C)	Calculation of PRINT @ location, subsequent title lines
L(C)	Screen location of PRINT @, subsequent title lines
T\$(C)	INPUT of content of subsequent title lines
S(Q)	Vertical (line) location of subsequent lines
L(Q)	PRINT @ location of subsequent lines
T\$(Q)	Content of subsequent lines

Table 2. Variables Used in Title Page Formatting Program

Program Listing 1

```

0 GOTO 10
2 FOR N=1 TO 15: PRINT@X, N: X = X + 64: NEXT: X=0: RETURN
3 PRINT @977, "Please Press ENTER To Continue";: INPUT YY: RETURN
10 Z1$="PROGRAM TITLE": Z2$="AND CREDITS FORMATTER"
20 Z3$="By Jay Chidsey": Z4$="Green Springs, Ohio 44836"
30 Z1=210: Z2=330: Z3=594: Z4=710
50 CLS: PRINT CHR$(23) @Z1, Z1$: PRINT @Z2, Z2$
60 PRINT @Z3, Z3$: PRINT @Z4, Z4$
70 PRINT @902, "PRESS ENTER TO CONTINUE";: INPUT YY
80 CLEAR 1000: DIM A$(15): FOR Q=1 TO 10: READ A$(Q): NEXT
85 CLS: PRINT: PRINT
90 FOR Q=1 TO 10: PRINT TAB(10) A$(Q): NEXT: GOSUB 3: CLS
100 GOSUB 2: GOSUB 3: CLS: PRINT: PRINT: PRINT
110 PRINT "Please ENTER location of first screen line (1-15)":
INPUT S1
115 IF S1<1 OR S1>15 RESTORE: GOTO 80
120 S1 = (S1 - 1) * 64: PRINT: PRINT
130 PRINT "Please type in Title or first Title line": PRINT: INPUT T1$
135 IF T1$ = "" RESTORE: GOTO 80
140 T1 = LEN(T1$): T1 = INT(T1/2)
150 CLS: L1 = S1 + 32 - T1: PRINT @L1, T1$
160 FOR Q=1 TO 9: READ A$(Q): NEXT: FOR Q=1 TO 1000: NEXT
170 FOR Q=1 TO 9: PRINT TAB(10) A$(Q): NEXT: GOSUB 3: CLS
180 GOSUB 2: PRINT @L1, T1$: GOSUB 3: C=1
190 CLS: PRINT: PRINT: PRINT: C=C+1

```

Listing continues

Since the former content of A\$ is written over and wiped out on each succeeding use, you can reserve much less string space. The CLEAR 1000 at line 80 is extravagant, but is no problem in a 16K machine. The TRS-80's automatic CLEAR 50 is not enough. That CLEAR 1000 also nulls the strings in lines 10 and 20, to save further string space.

The restore commands in lines 340 and 370 deserve comment also. Once A\$(Q) has read and printed the data and has nulled that information by replacing it with new data, the data stack has been read out or used up. In line 340 it is restored so that the user can loop back to the beginning of the program. In line 370 it is restored and then the top 19 items are read but not stored so that the data beginning with line 1200 is available.

Note lines 0-10. I always start a program with the line 0 GOTO 10. This reserves lines 1-9 for subroutines that are frequently used. There are several advantages to this technique: It requires a lesser number of bytes to GOSUB3 than it does to GOSUB10000 and the computer finds the GOSUB right away, rather than having to scan every line from 0 to 10000 to find the item—a saving in execution time. If you're forgetful or bad at keeping program development notes you always know where to look for the important subroutines—between lines 1 and 9.

Lines 140 and 230 use Basic's LEN function, the computer's string length function. If you are going to center lines on the screen, you have to know how long each line is. LEN () tells you. Then subtract 1/2 of LEN () from the midpoint location in the line, and you can then center the title or credit entry. Use of the INTeger function gives a whole number, avoiding half spaces that the computer cannot use. Table 2 records the variables used in this program.

Useful Subroutines

One of the subroutines I often include in an instructional program, or in any case where several successive pages of material are to be presented. The space bar trigger is CHR\$(32), and you set it up for the bottom of your screen:

```

5 PRINT@ 915, "Press SPACE BAR To Continue";
6 K$=INKEY$: IF K$<>CHR$(32)THEN 6 ELSE RETURN

```

Else is often useful in If instructions. Had I written IF xxxx GOTO 6, it would have been necessary to add line 7



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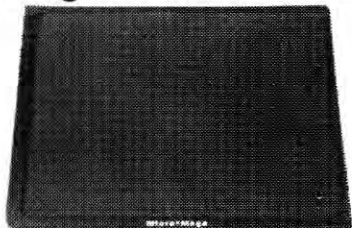
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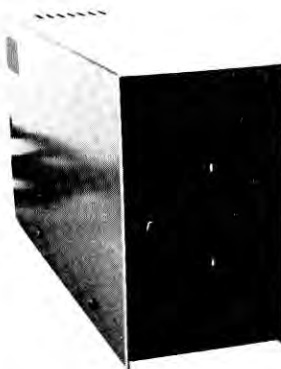
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Listing continued

```
200 PRINT @195, "Please ENTER location of next Title/Credit line
";
: INPUT S(C): S(C) = (S(C) - 1) * 64
205 IF S(C) = 0 OR S(C)<0 GOTO 300
210 PRINT @389, "Type in and ENTER next line, or N if finished"
: PRINT @517, "": INPUT T$(C)
220 IF T$(C) = "N" OR T$(C) = "n" OR T$(C) = "" GOTO 300
230 T(C) = LEN(T$(C)): T(C) = INT(T(C)/2): L(C) = S(C) + 32 - T(
C)
240 CLS: GOSUB 2: PRINT @L1, T1$: FOR Q=2 TO C: PRINT @L(Q), T$(
Q): NEXT
250 GOSUB 3: GOTO 190
300 CLS: FOR Q=1 TO 14: READ A$(Q): PRINTTAB(10) A$(Q): NEXT
310 PRINT @970, "": INPUT "ENTER 1 or 2": YY
320 IF YY=0 OR YY>2 GOTO 310
330 ON YY GOTO 340, 350
340 RESTORE: GOTO 80
350 CLS: PRINT @S1, L1: PRINT @L1, T1$
360 FOR Q=2 TO (C-1): PRINT @S(Q), L(Q): PRINT @L(Q), T$(Q): NEX
T: GOSUB 3
370 RESTORE: FOR Q=1 TO 19: READ A$: NEXT: GOTO 300
1000 DATA Next to be displayed on the screen are
1010 DATA the sixteen lines which are available to
1020 DATA you in formatting Titles and Credits for
1030 DATA your program. Line 16 is reserved for the
1040 DATA 'Press ENTER To Continue' line... so you
1050 DATA have only 15 lines to work with. ,
1060 DATA Be prepared (before you press ENTER) to choose
1070 DATA the first screen line you will want to use
1080 DATA and to type that line in.
1100 DATA When you press ENTER the 16 line page format
1110 DATA will appear again... and you will be able to
1120 DATA input the next line. After each such input
1130 DATA the Title and Credit page as formatted so far
1140 DATA will be presented. Enter an N when you have
1150 DATA ended your entries of Title and Credit lines.
1160 DATA At that point your page format will appear with
1170 DATA numbers at the left indicating the PRINT AT or
1180 DATA @ numbers you should use to achieve that format.
1190 DATA , YOU HAVE A CHOICE AT THIS POINT IN THE PROGRAM ,
1200 DATA 1. You may return right now to begin over in
1210 DATA "choosing line locations and/or line content, or
1220 DATA 2. You may view the PRINT AT ( @ ) locations
1230 DATA for your lines and then return to this menu
1240 DATA to choose reformatting if you wish. ,
1250 DATA The numbers at the left of the screen will be
1260 DATA those you would type in as @ or PRINT AT to
1270 DATA format your Title/Credits page as shown here.
1280 DATA Locations can be moved to left or right by sub-
1290 DATA tracting or adding to the @ given.
```

```
0 GOTO 10
1 A$=INKEY$: S = 0: X=X+1: IF A$ = "" GOTO 1
2 S = X/67: PRINT @768, "YOUR ANSWER, # " A$ ", REQUIRED"
INT(S * 100) / 100 "SECONDS": RETURN
3 TS = TS + S: TM = INT(TS/60): X = 0
: PRINT "TOTAL TIME SO FAR ELAPSED: " TM "MINUTES AND"
INT(TS - (TM * 60)) "PLUS SECONDS.": PRINT @980,
"PRESS ENTER TO CONTINUE": INPUT YY: RETURN
10 A=0
100 CLS: PRINT : PRINT: PRINT,
"WHICH OF THESE IS A MAMMAL?": PRINT: PRINT
110 PRINT, "1. SHARK": PRINT, "2. DUCK": PRINT, "3. WHALE"
: PRINT, "4. BOA CONSTRICTOR": PRINT, "5. ALLIGATOR": GOSUB 1
120 IF A$ = "3" GOTO 150
130 PRINT @832, "SORRY, WRONG NUMBER.": GOSUB 3: GOTO 200
150 PRINT @832, "RIGHT! THE WHALE IS A WARM BLOODED MAMMAL"
: GOSUB 3
200 CLS: PRINT: PRINT: PRINT,
"WHICH OF THESE IS A EGG-LAYING MAMMAL?": PRINT
210 PRINT, "1. BAT": PRINT, "2. PLATYPUS": PRINT, "3. MANATEE"
: PRINT, "4. CROCODILE": PRINT, "5. ARCHEOPTERYX": GOSUB 1
220 IF A$ = "2" GOTO 250
230 PRINT "NO GO THIS TIME.": GOSUB 3: GOTO 300
250 PRINT "RIGHT! THE PLATYPUS OF AUSTRALIA IS THE ONLY EGG-LAYI
NG MAMMAL.": GOSUB 3
300 CLS: PRINT "THIS BEING A DEMO PROGRAM, PRESS ENTER GO ON"
: INPUT YY: GOTO 100
```

Program Listing 2

RETURN. Else saves a line and saves bytes.

You can also use the INKEY\$ function to strobe the keyboard and move on if any key is pressed:

```
7 PRINT@ 917 "Press Any Key To Continue":
8 IF INKEY$ = "" THEN 8 ELSE RETURN
```

The " " following INKEY\$ (inkey string) must have no space between the quote marks; it represents a null string meaning no key was pressed during that strobe of the keyboard.

I have not been able to find a way to position these two lines (space bar or any key) on the bottom line of the screen, say at 979 or 981 respectively.

Add a Timer

If you construct instructional programs or game programs, you will find uses for a simple timer that records how long the program's user took to answer a question or to make some other required response (see Program Listing 2). Lines 1-3 are the timer program. Lines 100-300 present a simple quiz sequence that loops back to line 100 from line 300 to permit demonstration of the time accumulation function.

If you do not want to give the user the time used in each response, delete the part of the print section of line 2 that follows A\$; if you do not want accumulated time displayed, delete the print section of line 3. You can use response time in ways that do not involve feedback to the user; as a factor in determining the final score, for example.

The heart of the timer is S equals X/67 at the beginning of line 2. That formula works well in my Model III, but Model I programmers will have to adjust it for the slightly slower processing time of their machine. Run the program for a measured minute, or half hour, and adjust the formula. You can achieve great precision by going out to S equals X/59.2598 or some such decimal. Listing 2 as given accepts either one number (0-9) or one letter (A-Z) as a response. This is accepted on lines 120 and 220. A program that accepts a word, such as mammal, or a multi-digit number, such as 98.6, is somewhat more complex. It was the timer that we were illustrating here.

The Model III has a built-in clock, but I find it more difficult to set and access this function than to use the simple subroutine. ■

Jay Chidsey can be reached at 205 E. Adams St., Green Springs, OH 44836.

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Tape File Manager

by Roger W. Faulds

Program Listing

```

00010      DSEG
00020      ; THIS SET OF SUBROUTINES ARE AN ENHANCEMENT
00030      ; TO THE RESIDENT LII OR DISK BASIC. IT ALLOWS
00040      ; THE USER TO MANAGE HIS DATA FILES ON TAPE BY
00050      ; THE USE OF A 1-12 CHARACTER FILE NAME AND A PHYSICAL
00060      ; TAPE LAYOUT SIMILAR TO THAT OF THE IBM VARIABLE
00070      ; BLOCKED DATA SET ORGANIZATION.
00080      ; GLOBAL EQUATES & MISC MACROS
00090      TRSDOS EQU 402DH
00100      TESTVC EQU 4304H ;USED TO DETERMINE MACHINE TYPE
00110      KEYBD EQU 2BH ;ROM KEYBOARD RTN
00120      VARPTR EQU 260DH ;LOOK UP BASIC VARIABLE
00130      TYPE EQU 40AFH ;VARIABLE TYPE KEPT HERE
00140      TRSBAS EQU 5200H ;DISK BASIC ENTRY POINT
00150      TRSOFF EQU 1371H ;TRSDOS DISK VECTOR OFFSET
00160      NDOFF EQU 2651H ;NEWDOS/80 DISK VECTOR OFFSET
00170      LOAD EQU 4430H ;LOAD A CMD FILE
00180      CLOSE EQU 4428H ;DOS CLOSE
00190      DOSPRT EQU 4467H ;DISPLAY MESSAGE TILL CR
00200      ERROR EQU 28A7H ;PRINT HL TIL=0
00210      RTAPE EQU 0235H ;READ BYTE FROM TAPE
00220      WTAPE EQU 0264H ;WRITE 1 TO TAPE
00230      DEFDRV EQU 0212H ;DEFINE DRIVE
00240      STOPIT EQU 01F8H ;STOP TAPE
00250      RDLDR EQU 0296H ;READ LEADER & SYNC
00260      DOSTOP EQU 4049H ;TOP OF MEM
00270      BEDIT EQU 1A11H ;EDIT LINE IN ERROR
00280      ERR EQU 409AH ;BASIC ERR (1 BYTE)
00290      ENABLE EQU 0FBH ;ENABLE INTERRUPTS INSTR
00300      NEW EQU 1B49H ;BASIC NEW ADDR
00310      RESET MACRO FIELD
00320      LD HL,(A&FIELD)
00330      LD DE,(OFFSET)
00340      ADD HL,DE
00350      PUSH HL
00360      LD DE,V&FIELD
00370      LD BC,3
00380      PUSH BC
00390      LDIR
00400      POP BC
00401      POP DE
00420      LD HL,N&FIELD
00430      LDIR
00440      ENDM

```

```

00010      ENTRY EQU $ ;START OF INIT
00020      LD (PARMS),HL ;SAVE HL PARMS
00030      LD IX,FILE1+262 ;POINT TO FILE2
00040      SET 1,(IX+3) ;SET LOGICAL FILE2
00050      LD A,(TESTVC) ;PU VECTOR BYTE
00060      LD HL,NEW ;PERFORM A LEV II "NEW"
00070      PUSH HL ;PLACE AS RET
00080      CP X'11' ;RET IF BASIC2
00090      CALL Z,DISKBL ;USING DISK BASIC
00100      RESET OPEN ;ADD/MOVE OFFSET
00110      RESET CLOSE ;TO ALL
00120      RESET INPUT ;DISK BASIC

```

Listing continues

These four routines will increase the speed with which your buffer reads and writes data.

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Tape File Manager also increases the efficiency of the original cassette hardware by using programming techniques I learned while working with various IBM data-management access methods. The benefits of TFM include the following:

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Our popular smart terminal program has just gotten a lot smarter. After two years of experience with **TELCOM** and many requests from customers, we have created **TELCOM II** for the most demanding telecommunications applications. **TELCOM II** maintains the same ease of operation and all the features of our original program (see below), and includes many enhancements. The terminal mode now has a help menu, a large spooler for simultaneous printer output at high baud rates, acknowledges receipt of all commands, and displays control characters. You can now load disk files into the memory buffer from within the terminal mode, transmit the buffer with a single command, and send files a line at a time. You can even view the buffer or data that has already scrolled off the screen. **TELCOM II** has 10 different 40 character programmable messages that can each be sent with a single command, and the messages can now include control codes and delays. It also has 5 different character translation tables for compatibility with different systems. One of the most substantial additions to **TELCOM** is a full protocol file transfer mode which is compatible with the **LYNC** program available on CP/M systems and the IBM PC. **TELCOM II** will exchange disk files with any computer running this protocol (including another TRS-80 running **TELCOM II**), and will automatically correct errors in transmission! Files can be sent to or fetched from an unattended computer with ZERO errors. The extreme ease of use **TELCOM** is known for has not been compromised. Reconfiguration of the programmable features is done internally from clear menus for fast, easy operation. **TELCOM II** comes with a comprehensive instruction manual which is available separately for \$5 (which will apply to subsequent purchase of the program). You won't find a smarter or easier to use terminal program at any price.

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Listing continued

```

00130      RESET      PRINT      ;VECTORS
00140      LD          HL,OFFSET-1 ;SET
00150      LD          (DOSTOP),HL ;TOP OF DISK MEM
00160      LD          HL,(PARMS)  ;RELOAD PARAMETERS
00170      RET
00180  DISKBL: POP      HL          ;REMOVE CLEAR RET
00190      EX          (SP),HL     ;REPLACE RET W/CLEAR
00200  DISK1: LD      DE,BASICD   ;POINT TO DCB
00210      LD          A,ENABLE    ;SET ENABLE INSTR
00220      LD          (EI),A      ;ONLY FOR DISK SYSTEMS
00230      CALL       LOAD        ;LOAD IT
00240      JR          Z,BASLD     ;IT WORKED
00250      LD          HL,MMSG     ;MOUNT MESSAGE
00260      CALL       DOSPRT      ;DISPLAY MESSAGE
00270  TKA      EQU          $
00280      CALL       KEYBD       ;GET A CHAR
00290      CP          X'0D'      ;CARRIAGE RET
00300      JR          NZ,TKA     ;NO
00310      JR          DISK1      ;LOAD AGAIN
00320  BASLD   EQU          $
00330      EX          (SP),HL     ;EXCHANGE ENTRY W/RET
00340      CALL       CLOSE      ;CLOSE IT
00350      POP        DE          ;PUT ENTRY INTO DE
00360      PUSH       DE         ;RESTORE ENTRY TO STACK
00370      PUSH       HL         ;RESTORE RET TO STACK
00380      EX          DE,HL      ;PUT ENTRY INTO HL
00390      LD          DE,TRSBAS  ;ENTRY TO RS DISK BASIC
00400      XOR         A          ;REMOVE CARRY
00410      SBC        HL,DE       ;COMPARE THEM
00420      LD          HL,TRSOFF  ;SET TRSDOS OFFSET
00430      JR          NZ,NEWD80  ;IT IS NEWDOS 80 BASIC
00440  STROFF: LD      (OFFSET),HL ;STORE OFFSET
00450      RET
00460  NEWD80  EQU          $
00470      LD          HL,NDOFF    ;LOAD NEWDOS/80 OFFSET
00480      JR          STROFF     ;GOTO STORE
00490  PARMS:  DW          0000H  ;SAVE AREA FOR HL
00500  BASICD:  DB          'BASIC/CMD',13,'
00510  MMSG:   DB          '* INSERT DISKETTE CONTAINING BASIC/CMD
*' ,13,00
00520  OFFSET: DW          0000H  ;DISK VECTOR OFFSETS
00530  AOPEN:  DW          4179H  ;OPEN VECTOR
00540  ACLOSE: DW          4185H  ;CLOSE VECTOR
00550  AINPUT: DW          41D6H  ;INPUT VECTOR
00560  APRINT: DW          41CAH  ;PRINT VECTOR

```

```

00020      CSEG
00030      ;          ROUTINE:      TAPE OPEN
00040  TOPEN   EQU          $
00050      CALL       CHECK2      ;IS IT TAPE OPER
00060      JP          NZ,VOPEN    ;NO
00070      INC        HL          ;SKIP #
00080      INC        HL          ;SKIP +
00090      CALL       FSELCT      ;SET IX FILE BASE
00100      JP          NZ,IFNO     ;BAD FILE NUMBER
00110      BIT        7,(IX+3)    ;IS FILE OPEN
00120      JP          NZ,FAOP    ;YES
00130      INC        HL          ;SKIP FILE NO
00140      INC        HL          ;SKIP ,
00150      LD          A,(HL)     ;PU DRIVE NO
00160      CP          30H        ;IS DRIVE<0

```

Listing continues

● TFM returns an input/output completion status in the Basic error variable, ERR, for input operations.

● You can supply up to a 12-character file name to be written to the file header with no restrictions on the content of the name.

● TFM displays English error messages on the display when it detects an error instead of the two-character abbreviated error message inherent in Level II Basic.

● You can read and write any data without losing any of it to the infamous "Extra Ignored," since these routines do not look at the data but at its length.

● If you forget the name that is on a file, you can open it with the name parameter equal to 12 question marks; TFM will open the file and replace the question marks with the name from the file header.

TFM does not replace the INPUT#-n and PRINT#-n functions, but adds itself to the many Level II functions.

Example of Increased Efficiency

Here is an example of a short program that creates a tape output file from a string array:

```
10 FOR I=1 TO 100:PRINT#-1,A$(I):NEXT
```

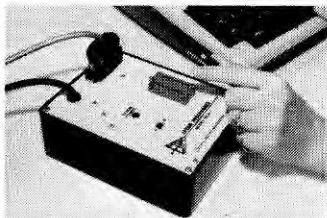
If the average string length were 50 bytes, then the above loop would take about 10 minutes to complete.

With my routines, and with no change in baud rate, the same data could be written as follows:

```
10 OPEN#-1,1,0,"TESTFILE"
20 FOR I=1 TO 100:PRINT#-1,A$(I):NEXT:
CLOSE#+1
```

This code would need six seconds to write the header from the open statement and two minutes to write all the data (based on six seconds for each data

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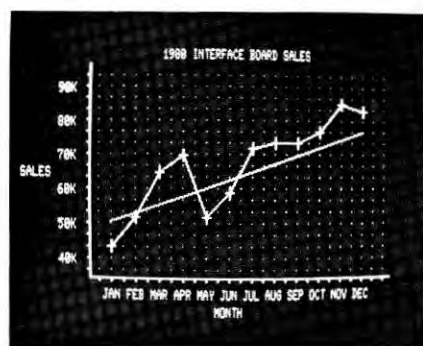
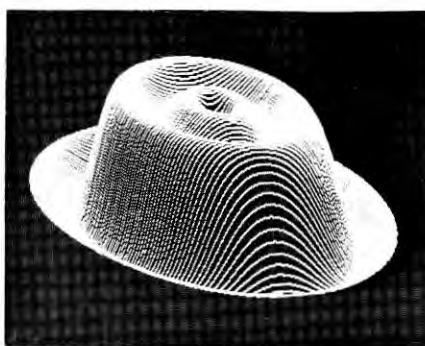
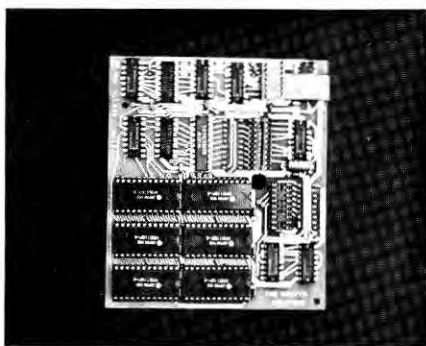
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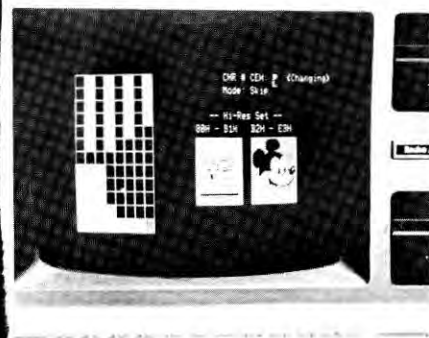
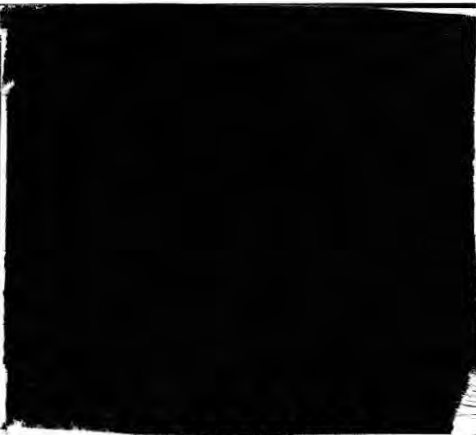
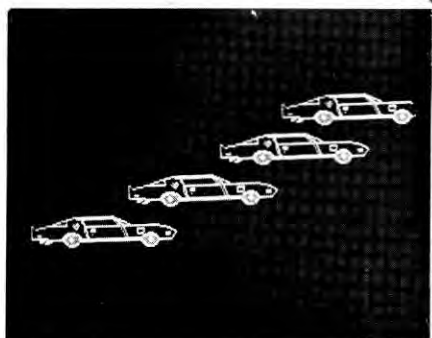


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Listing continued

00170	JP	C,BDN	;BAD DRIVE NO
00180	SUB	33H	;SUBTRACT 33H
00190	JP	NC,BDN	;BAD DRIVE NUMBER
00200	ADD	A,02H	;RESTORE DRIVE NO
00210	RES	0,(IX+3)	;SET DRIVE 0
00220	RRC	A	;IS IT DRIVE 1
00230	JR	NC,DSET	;NO
00240	SET	0,(IX+3)	;SET DRIVE 1
00250	DSET	EQU	\$
00260	INC	HL	;SKIP DRIVE NO
00270	INC	HL	;SKIP
00280	RES	4,(IX+3)	;SET INPUT FILE
00290	LD	A,(HL)	;PU FILE OPTION
00300	CP	'I'	;IS IT INPUT
00310	JR	Z,OPTSET	;YES
00320	SET	4,(IX+3)	;SET OUTPUT
00330	CP	'O'	;IS IT OUTPUT
00340	JP	NZ,IFO	;INVALID FILE OPTION
00350	OPTSET	EQU	\$
00360	INC	HL	;SKIP OPTION
00370	INC	HL	;SKIP
00380	LD	A,(HL)	;PU BYTE OF FILE NAME
00390	CP	22H	;IS IT "
00400	CALL	Z,BDPTR	;YES-BUILD PTRS
00410	CALL	NZ,LUVAR	;LOOK UP VARIABLE
00420	LD	A,(DE)	;MOVE LEN
00430	LD	(IX),A	;TO FILE AREA
00440	CP	13	;IS LEN < 13
00450	JP	NC,VTL	;FILE NAME TOO LONG
00460	INC	DE	;DE=ADDR(ADDR(STR))
00470	LD	(S+6),DE	;MOVE ADDR(STR)
00480	LD	DE,(\$)	;INTO DE
00490	LD	(IX+1),E	;SET MSB
00500	LD	(IX+2),D	;SET LSB
00510	LD	(BLINE),HL	;SAVE ADDR(BASIC LINE)
00520	CALL	SETBUF	;SET HL=ADDR(BUFFER)
00530	LD	(HL),20H	;BLANK OUT
00540	PUSH	HL	;PUT HL
00550	POP	DE	;INTO DE
00560	INC	DE	;ADVANCE TO NEXT ONE

Listing continues

record containing five variables).

Record Formats

All tape records have the same basic format as described below:

- **BDW**—Block Descriptor Word. Contains an 8-bit unsigned integer that is a count of how many bytes follow.

- **DATA**—Data for the record. (See Fig. 3 for a breakdown.)

- **CKSB**—Checksum Byte. Eight-bit sum of all DATA plus BDW bytes.

The format and content of the header record is:

- **BDW**—Block Descriptor Word.

- **DATA**—Header Data Segment.

- x'OD'—Record Descriptor Word

- x'C3'—Header Record Designator

- 12 bytes—File Name

- **CKSB**—Checksum of all DATA plus BDW bytes.

The data record contains:

- **BDW**—Block Descriptor Word.

- **DATA**—Data Segment.

- **RDW**—Record Descriptor Word. Eight bit unsigned integer indicating how long the data is that follows.

- **DATA**—The data associated with the RDW. (There can be as many occurrences as RDW/DATA as will fit in the 256-byte buffer.)

- **CKSB**—Checksum of all DATA plus

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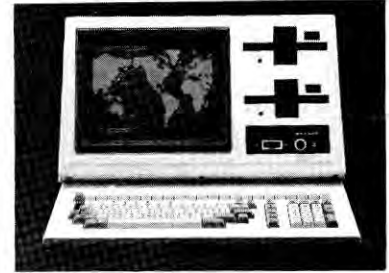
- NEC PC-8023A-C CALL
- NEC 3550 CALL
- NEC 3510, 3515, 3530 CALL
- NEC 7710, 7715, 7730, 7720, 7725 CALL
- C.I.TOH 8510AP CALL ● 8510ACD CALL
- C.I.TOH 1541SP CALL ● 1541SRE CALL
- C.I.TOH F10-40PU & F10-40RU CALL
- C.I.TOH F10-55PU & F10-55RU CALL
- EPSON MX80 F/T GRAFTRAX PLUS CALL
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- TALLY MT 1602 MT 1605 \$1495
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BDW bytes.

The trailer record does not follow the uniformity rules. The RDW is x'F0', but the data is only one byte long:

- BDW—Block Descriptor Word.
- DATA—Data Segment.
- x'F0F'—Trailer Designator.
- CKSB—Checksum of all DATA plus BDW bytes.

What Is a Buffer?

A data buffer collects data from Basic until it is full. Then the contents are written to the tape. In the routines described here, up to 256 bytes of data can be sent to the buffer before they are transferred to the tape. This results in much faster tape I/O due to reduced physical drive movement.

Loading the Routines

Loading the routines is easy, but disk and nondisk loading procedures are different. To load TFM under a nondisk system, the memory size must be set according to the amount of RAM your system contains: 16K—30983; 32K—47367; and 48K—63751.

Once the memory size is set and you have a ready prompt you can proceed to load TFM as you would any System tape. TFM, as part of its initialization,

Listing continued

```

00570 LD BC,16 ;SET LEN=16
00580 LDIR ;FILE NAME AREA
00590 BIT 4,(IX+3) ;IS IT INPUT
00600 CALL Z,RHEAD ;YES
00610 BIT 4,(IX+3) ;IS IT OUTPUT
00620 CALL NZ,WHEAD ;YES
00630 LD HL,(BLINE) ;RESTORE ADDR(BLINE)
00640 CALL ADVLIN ;ADVANCE BASIC LINE
00650 SET 7,(IX+3) ;SET FILE OPEN
00660 RET
00670 ; ROUTINE: RHEAD
00680 ; THIS ROUTINE READS THE HEADER AND COMPARES IT TO THE
00690 ; HEADER IN THE OPEN STATEMENT.
00700 ;
00710 RHEAD EQU $
00720 CALL READP ;READ A PHYSICAL BLOCK
00730 LD E,(IX+1) ;LOAD ADDR OF FILE NAME
00740 LD D,(IX+2) ;INTO DE
00750 LD B,(IX) ;LOAD LEN
00760 CALL SETBUF ;HL=ADDR OF FILE NAME-1
00770 CPNI EQU $
00780 INC HL ;ADVANCE 1 FILE BYTE
00790 LD A,(HL) ;PU FIRST BYTE
00800 CP X'C3' ;IS IT HEADER
00810 JP NZ,NDF ;NO-RET IF HEADER ERR
00820 CPN2 EQU $
00830 INC HL ;SKIP C3
00840 LD A,(DE) ;PU VAR BYTE
00850 CP (HL) ;IS IT EQUAL
00860 JR NZ,CFAF ;NO-CHECK FOR ANY FILE
00870 INC DE ;NEXT VAR
00880 DJNZ CPN2 ;REPEAT FOR NEXT
00890 RSIX EQU $
00900 LD A,0 ;RC=0
00910 LD (IX+4),A ;READ INDEX=0
00920 LD (IX+5),A ;BLOCK DESC WORD=0
00930 RET ;EXIT
00940 CFAF EQU $
00950 LD E,(IX+1) ;RELOAD STRING
00960 LD D,(IX+2) ;ADDRESS

```

Listing continues



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Listing continued

```

00970      LD      A,(IX)      ;RELOAD LEN
00980      CP      12          ;IS IT 12
00990      JP      NZ,FNF     ;NO-FILE NOT FOUND
01000      LD      A,(DE)     ;GET FILE NAME CHAR
01010      CP      '?'       ;IS IT QUERY
01020      JP      NZ,FNF     ;NO-FILE NOT FOUND
01030      CALL   SETBUF     ;SET HL=FILE-1
01040      INC     HL          ;SKIP LEN DESC
01050      INC     HL          ;SKIP HEADER DESC X'C3'
01060      LD      BC,12      ;SET LEN
01070      LDIR    ;MOVE FILE NAME
01080      JR      RSIX
01090      ;      SUBROUTINE:      WHEAD
01100      ;      THIS SUBROUTINE WRITES THE HEADER ON THE OUTPUT TAPE
.
01110      ;
01120      WHEAD EQU      $
01130      LD      (IX+6),0DH   ;SET RDW
01140      LD      (IX+5),0EH   ;SET BDW
01150      LD      (IX+7),X'C3' ;SET HEADER
01160      CALL   SETBUF     ;HL=FILENAME-1
01170      INC     HL          ;SKIP LEN DESC
01180      INC     HL          ;SKIP C3
01190      EX     DE,HL       ;DE=FILE NAME
01200      LD      H,(IX+2)    ;LOAD STR ADDR
01210      LD      L,(IX+1)   ;INTO HL
01220      LD      C,(IX)     ;PU FILENAME LEN
01230      LD      B,0        ;B=0
01240      LDIR    ;MOVE IT
01250      LD      A,255      ;SET HEADER LEN
01260      LD      (NUMZ),A    ;TO 255
01270      CALL   WRITEP     ;WRITE PHYSICAL BLOCK
01280      LD      A,50        ;SET NEW HEADER LEN
01290      LD      (NUMZ),A   ;STORE NEW LEN
01300      XOR     A
01310      RET

```

```

00010      ;      SUBROUTINES
00020      ;
00030      SELCT2 EQU      $
00040      INC     HL          ;SKIP #
00050      INC     HL          ;SKIP +
00060      CALL   FSELECT    ;SET FILE #
00070      JP      NZ,IFNO    ;INVALID FILE #
00080      BIT    7,(IX+3)    ;IS IT OPEN
00090      JP      Z,FC       ;NO
00100      BIT    4,(IX+3)    ;CHECK HOW OPEN
00110      INC     HL          ;SKIP FILE #
00120      INC     HL          ;SKIP ','
00130      RET
00140      FSELECT EQU      $
00150      LD      IX,FILE1    ;SET IX/IY
00160      LD      IY,FILE1+262 ;IX=FILE1
00170      LD      A,(HL)     ;IY=FILE2
00180      CP      '1'       ;PU FILE NUMBER
00190      RET      Z          ;IS IT 1
00200      PUSH   IX          ;YES
00210      PUSH   IY          ;SWAP
00220      POP    IX          ;IX
00230      POP    IY          ;WITH
00240      CP      '2'       ;IY
00250      RET      Z          ;FILE 2
00251      ;      BUILD STRING POINTERS
00260      BDPTR EQU      $
00270      INC     HL          ;SKIP "
00280      LD      (DUMADD),HL ;STR ADDRESS
00290      LD      BC,0FF00H   ;B=FF,C=0
00300      LD      A,22H      ;A="
00310      CNCFQ EQU      $
00320      CP      (HL)        ;END OF STR
00321      INC     HL          ;NEXT LINE BYTE
00330      JR      Z,SDLEN    ;YES
00340      INC     C          ;ADD 1 TO LEN
00360      DJNZ  CNCFQ       ;LOOP IF MORE
00370      JP      VTL        ;VAR TOO LONG
00380      SDLEN EQU      $
00390      LD      A,C          ;SET
00400      LD      (DUMLEN),A   ;STR LEN
00410      LD      DE,DUMLEN  ;DE=PTRS
00420      CP      C          ;SET Z
00430      RET
00440      SETBUF EQU      $
00450      PUSH   IX          ;PUT IX
00460      POP    HL          ;INTO HL
00470      REPT  6
00480      INC     HL          ;SET HL=ADDR(BUFFER)
00490      ENDM

```

Listing continues

will execute a Clear. However, to complete the initialization you must key in Clear and hit enter. If you have a program that has run and has variables established, you will lose the contents of the variables when you load in TFM.

Loading TFM from DOS is slightly different. From DOS command level, key in TFM; DOS will load in the TFM program, and then begin its execution. TFM will then attempt to load Disk Basic from the file named BASIC/CMD, and if it does not find it, a message will be displayed. When it loads Disk Basic, it will determine which Basic you are using.

TFM can distinguish between Radio Shack Disk Basic and NEWDOS80 Disk Basic, since they store the vectors that TFM needs to modify at different addresses, before moving them into the vector area. When TFM determines the Basic being used, it modifies the vectors and jumps to the beginning of Basic that was returned from DOS in the HL register pair.

TFM is easy to use since it has only four instructions. The first two are almost identical to the Level II Basic INPUT#-1 and PRINT#-1 instructions.

PRINT#+n,V\$,I%,S!,D#

The first instruction, PRINT#+n, is identical in format to the PRINT#-1 instruction, but it differs in the way it outputs data to the tape file. Print will accept any type of Basic variable in the instruction, whether it is integer, string, single, or double precision. However, Print outputs only the data portion of all variables into the buffer to be written to the tape. In this way, the Input routine can be simplified, and the efficiency of data transfer increased. The data portions stored on tape are as follows:

- the RDW byte (see Fig. 3)
- String—LEN(string)
- Integer—2 bytes
- Single—4 bytes
- Double—8 bytes

If you have a double-precision 16-digit number, it can be stored on tape in half the space it would need if it was written out via the PRINT#-1 function.

Another major difference between PRINT#+n and PRINT#-n is that TFM puts the data into 256-byte buffers before doing a physical I/O.

Additionally, the n in the PRINT#+n is used differently than with PRINT#-n. With PRINT#-n, the n is the cassette to which the data is written, whereas with TFM the n is the logical file that is to be accessed on either logical drive 1 or 2.

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Listing continued

```

00500      RET
00520      ; LOOK UP VARIABLE
00530      ;
00540      LUVAR EQU      $
00550      CALL      VARPTR      ;LOOK UP VARIABLE
00560      LD        A,(TYPE)      ;PICKUP VAR TYPE
00570      CP        03H          ;IS IT STRING
00580      RET        Z            ;ALREADY STRING
00590      BIT        4,(IX+3)      ;IS IT OUTPUT
00600      RET        Z            ;RETURN. IT IS INPUT
00610      ; THE NEXT 3 LINES WILL MAKE INT,SNG,DBL VARIABLES
00620      ;APPEAR TO BE STRING SO THEY CAN BE PUT ON TAPE
00630      LD        (DUMLEN),A      ;STORE LEN
00640      LD        (DUMADD),DE     ;STORE ADDR OF STRING
00650      LD        DE,DUMLEN      ;DE=ADDR(VAR)
00660      RET
00670      MOUNT EQU      $
00680      BIT        5,(IX+3)      ;IS IT MOUNTED
00690      JR        NZ,ALMTD      ;ALREADY MOUNTED
00700      BIT        7,(IY+3)      ;IS OTHER OPEN
00710      JR        Z,MOUNTM      ;NO
00720      LD        A,(IX+3)      ;PU STATUS
00730      AND      X'01'          ;SET DRIVE NO
00740      LD        C,A          ;IN C
00750      LD        A,(IY+3)      ;PU STATUS-2
00760      AND      X'01'          ;SET DRIVE-2
00770      CP        C            ;SAME??
00780      JR        NZ,MOUNTM      ;NO
00790      BIT        5,(IY+3)      ;IS OTHER MOUNTED
00800      JR        Z,MOUNTM      ;NO
00810      RES        5,(IY+3)      ;SET NOT MOUNTED
00820      LD        A,(IY+3)      ;PU STATUS BYTE
00830      SRL      A            ;MOVE RIGHT
00840      AND      X'01'          ;LEAVE ONLY FILE#
00850      ADD      A,31H          ;RESET DRIVE FILE2
00860      PUSH     HL            ;SAVE HL
00870      LD        H,A          ;H=FILE #
00880      LD        L,'R'        ;REMOVE MESSAGE
00890      LD        (3C3EH),HL    ;DISPLAY IT
00900      JR        APHL
00910      MOUNTM EQU      $
00920      PUSH     HL            ;SAVE HL
00930      APHL EQU      $
00940      LD        A,(IX+3)      ;PU DRIVE 1
00950      SRL      A            ;MOVE RIGHT
00960      AND      X'01'          ;REM ALL BUT FILE #
00970      ADD      A,31H          ;SET FILE NUM
00980      LD        H,A          ;H=FILE #
00990      LD        L,'M'        ;MOUNT MESSAGE
01000      LD        (3C7EH),HL    ;MOUNT MESSAGE
01010      GETC EQU      $
01020      CALL     KEYBD          ;GET A CHAR
01030      CP        13           ;ENTER PRESSED
01040      JR        NZ,GETC      ;NO
01050      SET        5,(IX+3)      ;SET FILE OPEN
01060      LD        HL,2020H      ;BLANK
01070      LD        (3C3EH),HL    ;OUT MESSAGE
01080      LD        (3C7EH),HL    ;AREAS
01090      POP       HL            ;RESTORE HL
01100      ALMTD EQU      $
01110      LD        A,(IX+3)      ;PU STATUS BYTE
01120      AND      X'01'          ;SET DRIVE IN A

```

Listing continues

INPUT# + n,SS,I%,S!,D#

INPUT# + n is identical in format to INPUT# - n, with the exception that the variables listed in the instruction must either be all string or match the data on the data file exactly.

The input routine looks up the INPUT variable, and, before moving the data to the variable, it checks the variable type. If the type is 03 (string) the variable's pointers are changed to point to the data in the buffer. If the type is anything else, the length of incoming data is compared to the data type.

The reason for this comparison is that the integer, single, and double-precision variables have their data portion the same length as their type code. Integer type code is 02, single type code is 04, double type code is 8, and string type code is 03. If the types don't match a type-mismatch error appears. If the data type matches the RDW, the data in the buffer is moved to the data segment of the INPUT variable.

The type-mismatch error differs from the Level II messages in that it prints the variable type and the data type. The data type is derived by ORing the RDW with X'30' and if greater than X'39', X'33' is used. So the data type sometimes can't be 2, 3, 4, or 8.

Input also uses the complement to Print data buffering technique, and the n is used the same way as the n in the print statement.

OPEN# + n,DN,H,F\$ or "file name"

In discussing the Open instruction, I will first explain its parameters as they are used with TFM. The logical number with which to associate the open file is n, and it can be only 1 or 2.

DN is the drive number on which the file will reside when open, 1 for the standard cassette, and 2 for the second drive used with the expansion interface. You



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Listing continued

```

01130      DI                ;DISABLE INTERRUPTS
01140      CALL             DEFDRV      ;DEFINE DRIVE
01150      RET              ;EXIT
01160      CHECK2 EQU      $
01170      PUSH            HL          ;PUT HL
01180      POP             IX          ;INTO IX
01190      LD              A,(IX+1)    ;PU BYTE 2
01200      CP              X'CD'      ;IS IT ENCODED '+'?
01210      LD              A,(HL)     ;RESTORE A VARIABLE
01220      RET
01240      ADVLIN EQU      $
01250      LD              A,(HL)     ;PU
01260      CP              0          ;IS IT END OF LINE
01270      RET              Z          ;YES
01280      CP              ':'        ;IS IT END
01290      RET              Z
01300      CP              ', '      ;IS IT ANOTHER
01310      INC             HL          ;DO NEXT ONE
01320      JR              NZ,ADVLIN  ;YES
01330      CP              0          ;SET NZ
01340      RET
01350      CKSUM EQU      $
01360      PUSH            HL          ;SAVE HL
01370      PUSH            DE          ;SAVE DE
01380      CALL            SETBUF     ;HL=ADDR(BUFFER)
01390      DEC             HL          ;BACK UP TO BDW
01400      LD              A,(HL)     ;PU BDW
01410      LD              B,A        ;SET FOR LOOP
01420      LD              C,A        ;SET START CKSUM
01430      RNC SB EQU      $
01440      INC             HL          ;NEXT BYTE
01450      LD              A,(HL)     ;PU BYTE
01460      ADD             A,C        ;ADD TO CKSUM
01470      LD              C,A        ;PUT CKSUM IN C
01480      DJNZ            RNC SB     ;DO NEXT
01490      POP             DE          ;RESTORE DE
01500      POP             HL          ;RESTORE HL
01510      RET
01520      STO T P EQU      $
01530      CALL            STOPIT      ;STOP TAPE

```

Listing continues

can have both files open on the same drive since TFM will prompt for the mounting and dismounting of the correct files.

H is used for accessing the file, I is for input, O is for output, and F\$ is the variable containing the file name; or, the file name can be coded as a string literal.

When TFM encounters an Open, it first validates the logical file number and then the drive. Then it checks to see if you wish to open the file for input or output. If you are opening an output file, TFM constructs a header record, used for opening the file for a later read, and writes the header onto the tape.

If you are opening the file for input, TFM reads the first record on the tape, and determines whether or not it is a TFM data file (first data byte = X'C3'). If it is not a TFM data file, then an error is printed and the file remains closed. If it is a TFM file, then the name in the header is compared with the name coded in the Open statement; if they match, the file is marked as opened in the file status byte. When the files don't match, you will get a file-not-found message.

If you forget what a file name is, you can make the file name in Open equal to

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12 question marks, and TFM will copy the file name from the tape header into the Open file name area.

CLOSE#+n

The instruction CLOSE#+n tells TFM that you are done processing an open file and it is to be closed. If the file was an output file, then TFM checks to see if any data remains in the buffer from output operations. If it does, the buffer is written to the tape and then a short trailer record is written. The logical file number n is used to open the file.

ERR Completion Status

TFM only returns a completion status for input operations. TFM will return the following status codes:

- 0—Normal Completion
- 1—End of Input File
- 4—Input Read (CKSUM) Error

A sample input routine is:

```
100 INPUT#+1,AS:IF ERR=0 THEN
  GOTO 130
110 IF ERR=1 THEN CLOSE#+1:PRINT
  "END OF FILE, RUN":END
120 IF ERR=4 THEN ?"READ ERROR":
  CLOSE#+1:END
130 remainder of program goes here.
```

Listing continued

```
01540 EI: RET ;ENABLE INT IF DISK
01550 ; RETURN IF NON-DISK SYSTEM
01560 RET
01570 CKCKS EQU $
01580 CALL CKSUM ;A=CKSUM OF BLOCK
01590 LD B,A ;SAVE IT
01600 LD A,(RCK) ;A=CKSUM READ
01610 CP B ;EQUAL
01620 LD A,0 ;SET A=0
01630 RET Z ;YES
01640 LD A,4 ;SET
01650 RET
```

```
00010 ; ROUTINE: CLOSE TAPE FILE
00020 ; THIS ROUTINE WRITES OUT ANY UNFILLED BUFFER AND
00030 ; THEN WRITES A TRAILER BLOCK.
00050 ;
00060 TCLOSE EQU $
00070 CALL CHECK2 ;IS IT TAPE
00080 JP NZ,VCLOSE ;NO
00090 CALL SELCT2 ;SET FILE # TO CLOSE
00100 DEC HL ;BACK UP
00110 DEC HL ;TO BEFORE ':'
00120 JR Z,CLOSIN ;INPUT
00130 LD A,(IX+5) ; DATA LEFT TO WRITE?
00140 CP 0 ;CHECK IT
00150 LD (BLINE),HL ;SAVE ADDR(BLINE)
00160 CALL NZ,WRITEP ;YES-WRITE IT OUT
00170 LD (IX+5),02H ;BDW=2
00180 LD (IX+6),X'F0' ;RDW=F0
00190 LD (IX+7),X'0F' ;DATA=0F
00200 CALL WRITEP ;WRITE IT OUT
00210 LD HL,(BLINE) ;RELOAD BASIC LINE
00220 CLOSIN EQU $
00230 RES 7,(IX+3) ;SET STATUS=CLOSED
00240 RES 3,(IX+3) ;RESET EOF
00250 RES 5,(IX+3) ;SET NOT MOUNTED
00260 CALL ADVLIN ;ADVANCE TO END
```

Listing continues

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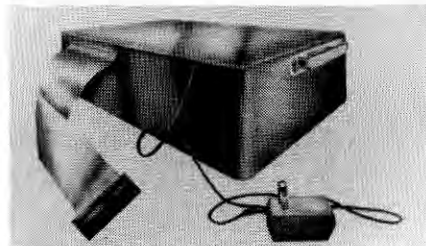
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Listing continued

```

00270      RET
-----
00010      ;      ROUTINE:      INPUT TAPE VARIABLE
00020      ; THIS ROUTINE WILL READ A VARIABLE FROM TAPE INTO THE
00030      ; BASIC VARIABLE(S) LISTED IN THE INPUT STATEMENT UNTIL
00040      ; END OF FILE. BASIC 'IF ERR=1'
00050      ;
00060      TINPUT EQU      $
00070      CALL  CHECK2      ;IS IT TAPE OPERATION
00080      JP    NZ,VINPUT   ;NO-GO TO ORIG VECTOR
00090      CALL  SELECT2    ;SELECT 2
00100      JP    NZ,BFM     ;BAD FILE MODE
00110      RPTIN EQU      $
00120      CALL  LUVAR      ;LOOKUP VARIABLE
00130      LD    (BLINE),HL ;SAVE BASIC LINE
00140      CALL  READV      ;READ VARIABLE
00150      LD    HL,(BLINE) ;RELOAD BASIC LINE
00160      CALL  ADVLIN     ;NEXT VARIABLE
00170      JR    NZ,RPTIN   ;DO NEXT ONE
00180      POP  BC          ;REM RET TO KEYBD INPUT
00190      RET
00200      READV EQU      $
00210      BIT  3,(IX+3)    ;IS IT AT EOF
00220      RET  NZ          ;YES
00230      LD  B,(IX+4)    ;B= READ INDEX
00240      LD  A,(IX+5)    ;LOAD BDW
00250      CP  B           ;COMPARE TO BDW
00260      CALL Z,READP   ;YES-READ BLOCK
00270      RET  Z          ;END OF FILE
00280      CALL  SETBUF     ;HL=BUFFER
00290      PUSH DE         ;SAVE DE
00300      LD  E,(IX+4)    ;PU READ INDEX
00310      LD  D,0          ;SET D=0
00320      ADD HL,DE       ;HL=ADDR(NEXT DATA)
00330      LD  A,(HL)       ;PU RDW
00340      POP  DE         ;RESTORE VAR PTRS
00350      LD  B,A         ;SAVE RDW
00360      LD  A,(TYPE)    ;LOAD VAR TYPE

```

Listing continues

Blocking for Efficiency

You can use TFM blocking to your advantage. TFM stores data on tape by storing an RDW in the buffer for each data string to be written. Therefore, to use TFM blocking efficiently, do not write large variables, such as 255-byte strings, to tape. You will get only one variable per I/O if you write 255-byte strings. However, if you are writing smaller strings, such as 50 bytes, you will get five variables output per physical block. The algorithm for output blocking is as follows:

If the current block length plus LEN(V1\$) plus one is greater than 255, then the buffer is written to tape. Otherwise, the data and RDW is added to the current end of the buffer and the current block length is adjusted to reflect the new length.

TFM does not close any open files unless told to do so. So, if you edit your program with tape files open, they will remain open even after the edit. ■

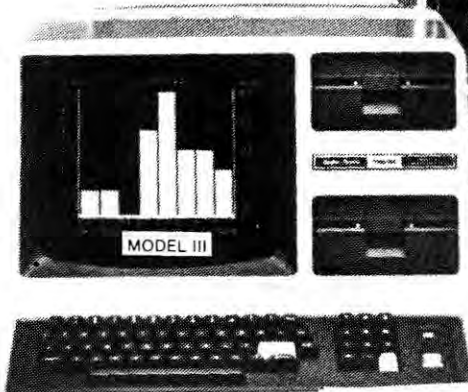
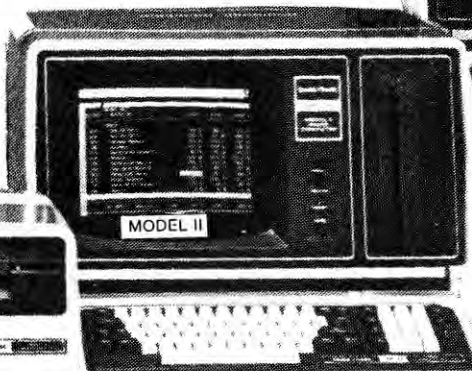
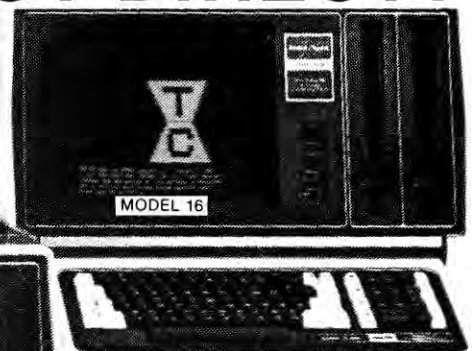
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```

00370 CP 3 ;IS IT STRING
00380 JR Z,STR$ ;YES - STORE STRING
00390 CP B ;IS LENGTH(DATA)=TYPE
00400 JP NZ,VTMM ;NO. VAR TYPE MISMATCH
00410 INC HL ;SKIP RDW
00420 LD C,B ;LEN IN C
00430 LD B,0 ;B=0
00431 LDIR ;MOVE DATA INTO VAR
00432 JR NEWRIX ;MAKE NEW READ INDEX
00433 STR$ EQU $
00434 LD A,B ;RESTORE LEN
00440 LD (DE),A ;SET NEW LEN
00450 INC HL ;ADD OF TEXT
00460 INC DE ;ADV TO ADD OF STR
00470 LD (ISA),DE ;STORE ADDR OF TEXT
00480 ISA EQU $+1
00490 LD (ISA),HL ;STORE ADDR OF TEXT
00491 NEWRIX EQU $
00500 LD B,(IX+4) ;RELOAD READ INDEX
00510 ADD A,B ;ADD LEN TO IT
00520 INC A ;STORE INDEX OF NEXT
00530 LD (IX+4),A ;STORE NEW INDEX
00540 RET
00550 READP EQU $
00560 BIT 3,(IX+3) ;IS IT AT EOF
00570 RET NZ ;YES
00580 PUSH HL ;SAVE HL
00590 PUSH DE ;SAVE DE
00600 CALL SETBUF ;SET BUFFER INTO HL
00610 CALL MOUNT ;MOUNT TAPE
00620 CALL RDLDR ;READ LEADER
00630 CALL RTAPE ;READ BDW
00640 LD (IX+5),A ;STORE IT
00650 LD B,A ;SET READ LOOP
00660 RT1 EQU $
00670 CALL RTAPE ;READ BYTE
00680 LD (HL),A ;STORE IT
00690 INC HL ;NEXT ONE
00700 DJNZ RT1 ;REPEAT IF MORE
00710 CALL RTAPE ;READ CKSUM
00720 LD (RCK),A ;STORE READ CKSUM
00730 CALL STOFTP ;STOP TAPE
00740 CALL CKCKS ;CHECK CKSUM
00750 LD (ERR),A ;SET STATUS
00760 POP DE ;RESTORE DE
00770 POP HL ;RESTORE HL
00780 LD A,0 ;SET READ
00790 LD (IX+4),A ;INDEX TO 0
00800 ; THE FOLLOWING CODE CHECKS FOR EOF ;
00810 LD A,(IX+5) ;LOAD BDW
00820 CP 2 ;IS IT TRAILER
00830 RET NZ ;RETURN IF NOT TRAILER
00840 LD A,X'F0' ;LOAD F0
00850 CP (IX+6) ;IS IT
00860 RET NZ ;RETURN IF NOT
00870 LD A,X'0F' ;IS IT X'0F'
00880 CP (IX+7) ;TRAILER??
00890 RET NZ ;NO
00900 SET 3,(IX+3) ;SET EOF
00910 LD A,1 ;SET END OF FILE
00920 LD (ERR),A ;IN ERR
00930 RET

```

```

00010 ; ROUTINE: TPRINT DATA TO TAPE
00020 ; THIS ROUTINE WILL TAKE THE VAR(S) OR "STR" FROM
00030 ; THE PRINT#+D,V1,V2,V3 INSTRUCTION AND PUT INTO
00040 ; THE TAPE OUTPUT BUFFER UNTIL THE CURRENT BUFFER
00050 ; LENGTH + STR LENGTH > 255, THEN THE ENTIRE BUFFER
00060 ; IS WRITTEN OUT.
00070 ;
00080 TPRINT EQU $
00090 CALL CHECK2 ;IS IT TAPE OPER
00100 JP NZ,VPRINT ;NO
00110 CALL SELCT2 ;SET IT
00120 JP Z,BFM ;BAD FILE MODE
00130 TPRI EQU $
00140 LD A,(HL) ;PU BYTE
00150 CP 22H ;IS IT LITERAL
00160 CALL Z,BDPTR ;BUILD POINTER
00170 CALL NZ,LUVAR ;LOOKUP VARIABLE
00180 LD (BLINE),HL ;SAVE ADDR(BLINE)
00190 CALL WRITEL ;WRITE VARIABLE
00200 LD HL,(BLINE) ;RELOAD ADDR(BLINE)
00210 CALL ADVLIN ;ADVANCE TO NEXT/END
00220 JR NZ,TPRI ;NEXT VARIABLE
00230 POP BC ;REM RET TO PRINT RTN

```

Listing continues

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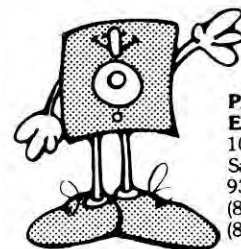
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```

00240 RET
00250 EQU $
00260 WRITEL LD C,(IX+5) ;LOAD BDW
00270 LD A,(DE) ;PU VAR LEN
00280 CP X'FF' ;IS IT MAX
00290 JR NZ,NORMCK ;NO-NORMAL CK
00300 LD A,0 ;SET A=0
00310 CP C ;ANY DATA TO WRITE
00320 CALL NZ,WRITEP ;YES
00330 LD A,X'FF' ;RELOAD LEN
00340 JR NOWRC
00350 NORMCK EQU $
00360 ADD A,C ;ADD LEN OF BDW TO IT
00370 JR C,WRC ;WRITE BUFFER (FULL)
00380 INC A ;ADD 1 TO A
00390 WRC EQU $
00400 CALL C,WRITEP ;BUFFER FULL-WRITE OUT
00410 NOWRC EQU $
00420 CALL SETBUF ;HL=BUF
00430 LD C,(IX+5) ;LOAD BDW
00440 LD B,0 ;B=0
00450 ADD HL,BC ;ADD BDW TO BUFFER
00460 LD A,(DE) ;RELOAD LEN
00470 ADD A,C ;ADD TO A
00480 INC A ;ADD 1 MORE
00490 LD (IX+5),A ;STORE NEW BDW
00500 LD A,(DE) ;RELOAD STR LEN
00510 LD (HL),A ;STORE RDW
00520 OR A ;IS IT NULL STRING
00530 JR Z,NULLST ;YES
00540 LD C,A ;SET LEN IN C
00550 INC DE ;ADV TO ADDR(STR)
00560 LD (LDDEL),DE ;SET ADDR TO LOAD FROM
00570 LD DE,(LDDEL) ;DE=ADDR(STR)
00580 LDDEL EQU $-2
00590 INC HL ;NEXT ONE
00600 EX DE,HL ;SWAP DE/HL
00610 LDIR ;MOVE STRING INTO BUFFER

00620 NULLST EQU $
00630 LD A,(IX+5) ;PU BDW
00640 CP 0 ;IS IT ZERO
00650 CALL Z,WRITEP ;WRITE OUT IF ZERO
00660 RET
00670 WRITEP EQU $
00680 CALL CKSUM ;CALC CKSUM
00690 LD (RCK),A ;STORE WRITE CKSUM
00700 CALL SETBUF ;SET BUFFER INTO HL
00710 CALL MOUNT ;MOUNT TAPE
00720 LD A,(NUMZ) ;PU NUM OF FOOT'S
00730 LD B,A ;PUT INTO B
00740 SRL B ;B/2
00750 WL1 EQU $
00760 LD A,X'F0' ;REPEAT
00770 CALL WTAPE ;X'F0F'
00780 LD A,X'0F' ;INSTEAD OF X'0000'
00790 CALL WTAPE ;FOR SYNC
00800 DJNZ WL1 ;LEADER
00810 LD A,X'A5' ;SYNC BYTE
00820 CALL WTAPE ;WRITE IT
00830 LD A,(IX+5) ;LOAD BDW
00840 LD B,A ;SET LOOP
00850 CALL WTAPE ;WRITE IT
00860 WT2 EQU $
00870 LD A,(HL) ;PU BYTE OF BUFFER
00880 CALL WTAPE ;WRITE IT
00890 INC HL ;NEXT
00900 DJNZ WT2 ;REPEAT
00910 LD A,(RCK) ;LOAD WRITE CKSUM
00920 CALL WTAPE ;WRITE IT OUT
00930 CALL STOPTH ;STOP TAPE
00940 LD A,0 ;SET
00950 LD (IX+5),A ;NEW BDW=0
00960 RET

```

```

00010 ; ROUTINE: ERROR ROUTINES
00020 ; THESE ARE THE ERROR ROUTINES.
00040 ;
00050 IFNO EQU $ ;INVALID FILE NUMBER
00060 LD HL,ERRBPN
00070 ERREXX EQU $
00080 CALL ERROR
00090 JP EDIT
00100 FAOP EQU $ ;FILE ALREADY OPEN
00110 LD HL,ERRFO
00120 JR ERREXX

```

Listing continues

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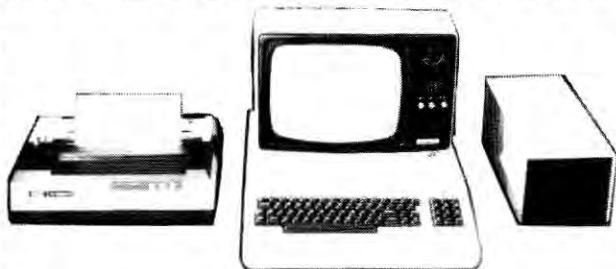
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```

00130 BDN EQU $ ;BAD DRIVE NUMBER
00140 LD HL,ERRBDN
00150 JR ERREXX
00160 IFO EQU $ ;INVALID FILE OPTION (I/O)
00170 LD HL,ERRIFO
00180 JR ERREXX
00190 VTMM EQU $ ;VARIABLE TYPE MISMATCH
00191 OR 30H ;SET PRINTABLE DEC
00192 LD (VARTYP),A ;VARIABLE TYPE
00193 LD A,B ;SET TAPE TYPE
00194 OR 30H ;SET PRINTABLE
00195 CP 3AH ;COMPARE TO 3A
00196 JR C,OKTPRT ;OK TO PRINT
00197 LD A,33H ;SET STRING
00198 OKTPRT EQU $
00199 LD (DATYP),A ;STORE TAPE TYPE
00200 LD HL,ERRTMM
00210 JR ERREXX
00220 VTL EQU $ ;VARIABLE TOO LONG
00230 LD HL,ERRVTL
00240 JR ERREXX
00250 FC EQU $ ;FILE ALREADY CLOSED
00260 LD HL,ERRFC
00270 JR ERREXX
00280 BFM EQU $ ;BAD FILE MODE
00290 LD HL,ERRBFM
00300 JR ERREXX
00310 FNF EQU $ ;FILE NOT FOUND
00320 LD HL,ERRFNF
00330 ERX2 EQU $
00340 RES 5,(IX+3)
00350 JR ERREXX
00360 NDF EQU $ ;NOT DATA FILE
00370 LD HL,ERRNDF ;ERROR MESSAGE
00380 JR ERX2
00390 EDIT EQU $
00400 LD HL,(40A2H) ;PU CURRENT LINE
00410 LD DE,X'FFFF' ;SET DE=FFFF
00420 RST 18H ;COMPARE HL TO DE
00430 JP BEDIT ;JUMP TO BASIC EDIT

```

```

00010 DSEG
00020 NOPEN: JP TOPEN ;NEW
00030 NCLOSE: JP TCLOSE ;TAPE
00040 NINPUT: JP TINPUT ;MANAGEMENT
00050 NPRINT: JP TPRINT ;VECTORS
00060 VOPEN: DS 3 ;OLD OPEN VECTOR
00070 VCLOSE: DS 3 ;OLD CLOSE VECTOR
00080 VINPUT: DS 3 ;OLD INPUT VECTOR
00090 VPRINT: DS 3 ;OLD PRINT VECTOR
00100 ERRFO: DB 'FILE ALREADY OPEN',0
00110 ERRFC: DB 'FILE ALREADY CLOSED',0
00120 ERRTMM: DB 'VARIABLE TYPE MISMATCH. VAR-'
00121 VARTYP: DB 32H,' ',DATA-
00122 DATYP: DB 30H,0
00130 ERRVTL: DB 'VARIABLE TOO LONG',0
00140 ERBBFM: DB 'BAD FILE NUMBER',0
00150 ERRFNF: DB 'FILE NOT FOUND',0
00160 ERRBDN: DB 'BAD DRIVE NUMBER',0
00170 ERRIFO: DB 'INVALID FILE OPTION(I/O)',0
00180 ERBBFM: DB 'BAD FILE MODE',0
00190 ERRNDF: DB 'NOT DATA FILE',0
00200 DUMLEN: DB 00H ;LEN FOR DUMMY STRING
00210 DUMADD: DW 0000H ;ADDR OF STRING TEXT
00220 BLINE: DW 0000H ;HOLD AREA FOR MOST
00230 ;CURRENTLY SAVED HL
00240 RCK: DB 00H
00250 NUMZ: DB 00H
00260 FILEI EQU $
00270 REPT 2
00280 DB 00H ;FILE VAR LEN
00290 DW 0000H ;FILE NAME ADDRESS
00300 DB 00000000B ;FILE STATUS BYTE
00310 ;BIT MEANS
00320 ; 7 0-CLOSE,1-OPEN
00330 ; 6 RESERVED
00340 ; 5 MOUNTED 0-NO,1-YES
00350 ; 4 0-INPUT,1-OUTPUT
00360 ; 3 1-INPUT AT EOF
00370 ; 2 RESERVED
00380 ; 1 LOGICAL FILE NUMBER
00390 ; 0 DRIVE NUMBER
00400 DB 00H ;READ INDEX FOR BUFFER
00410 DB 00H ;BLOCK DESCRIPTOR
00420 DS 256 ;I/O BUFFER
00430 ENDM
00440 END ENTRY

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DROSSDOS/8E

DROSSDOS/8E
 Kitchen Table Inc.
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David D. Busch
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 Ravenna, OH 44266

*DROSSDOS banner design
 by Dave McGlumphy*

Kitchen Table Inc. has just released an early version of its disk operating system, DROSSDOS/8E. The new DOS is compatible with the Basic Misinterpreter, reviewed in *80 Micro* in April 1982.

DROSSDOS reacts, in varying degrees, to 41 different DOS commands. Type Verify, for example, and the program asks for your name twice. If both answers are the same it reports "That is correct." Ask to kill a file, and it playfully responds it accidentally destroyed the wrong file. Those wishing to invoke PROT are informed that access is denied because they are deemed not intelligent enough to understand that command. When using Free, the operator is charged \$5 by the computer. Copy checks to see if the program being duplicated is copyrighted, and I won't even tell you what happens when you type Debug.

How it Works

Like most modern disk operating systems, DROSSDOS does not reside entirely in the computer's memory at one time. Instead, it pulls in a series of System overlays

to accomplish commands. Writing these System programs is very time-consuming. The Kitchen Table programmers were tempted to take some small short cuts. Thus was born DROSSDOS/8E, which uses NEWDOS80 for most of its routines.

For example, there are two ways of providing a user with a disk directory. One method would be to write a long disk I/O routine. But DROSSDOS accomplishes the same task with a single, elegant command:

CMD"DIR." The only drawback is that you must own NEWDOS80 to use this version of DROSSDOS. Many of the functions work under TRSDOS, LDOS or earlier versions of NEWDOS. Many will not. But considering the general confusion surrounding KTI products, the programmers did not feel this was much of a limitation.

Recognized commands are stored in data lines and read into a string array, CM\$(n). The DROSSDOS/8E Ready prompt

Program Listing. DROSSDOS/8E and ?BASIC

```

1 ' *****
  *
  *                               DROSSDOS
  *
2 ' *                               By: David D. Busch
  *                               515 E. Highland Ave.
  *                               Ravenna, Ohio 44266
  *
3 ' *****

10 CLEAR 8000
15 DEFINT A-Z
20 DIM CM$(50)
25 DIM E$(18),CP$(200),SP$(18)
30 : FOR N=1 TO 41
40 :   READ CM$(N)
50 :   NEXT N
60 DATA APPEND,ATTRIB,AUTO,BASIC,BLINK,BOOT,BREAK,CHAIN,CHNON,CL
EAR,CLOCK,CLS,COPY,CREATE,DATE,DEBUG,DIR ,DO,DUMP,ERROR,FORMAT,F
REE,HIMEM,JKL,KILL,LC,LCDVR,LIB,LIST,LOAD,PAUSE,PDRIVE,PRINT,PRO
T,PURGE
70 DATA RENAME,ROUTE,SYSTEM,TIME,VERIFY,WRDIRP
71 DATA 191,131,131,189,32,191,131,131,189,32,190,131,131,189,32
,190,131,131,32,190,131,131,32,32,32,32,184,135,32,191,131,131,1
89,32,190,131,131,189,32
72 DATA 190,131,131,32,32,32,75,73,84,67,72,69,78
73 DATA 191,32,32,191,32,191,131,175,145,32,191,32,32,191,32,178

74 DATA 131,171,148,178,131,171,148,32,160,158,129,32,32,191,32,
32,191,32,191,32,32,191,32,178,131,171,148
75 DATA 32,32,32,32,84,65,66,76,69
76 DATA 131,131,131,129,32,131,32,32,131,32,130,131,131,129,32,1
30,131,131,32,130,131,131,32,32,131,32,32,32,32,131,131,131,32,3
2,130,131,131,129,3
,130,131,131,32,32,32,32,32,73,78,67,46
79 CLS:FOR N=1 TO 53:READ A:POKE N+15360,A:NEXT N:FOR N=65 TO 11
6:READ A:POKE N+15360,A:NEXT N:FOR N=129 TO 180:READ A:POKE N+15
360,A:NEXT N
80 PRINT @ 256,"";
90 PRINT"DROSSDOS/8E READY"
    
```

Listing continues

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is displayed, and the user's command input in line 100. A For...Next loop checks for the presence of each of the valid commands (through INSTR, line 120). If one is present, control jumps to line 150, the world's longest On...GOTO statement. If no recognized command is found, the computer responds with a helpful "Huh?"

The rest of the program consists of the computer's response to the commands. In some cases user input (A\$) is paired with CMD so the DOS function can be carried out from Disk Basic. In other cases, the command is refused, with a plausible excuse given. Other routines perform some task designed to discourage the user from ever employing that command again.

How to Combine with Basic Misinterpreter

DROSSDOS/8E can be used alone, or, following the instructions with this review, merged with ?BASIC to provide an ersatz operating combination. Then you may travel between DROSSDOS and ?BASIC, using CMD"S" and BASIC. Or, invent a command of your own. Unlike other software, Kitchen Table programs are remarkably forgiving. Because it is written in Basic, DROSSDOS is probably the easiest DOS to debug.

If you have ?BASIC, remove the Clear statement, the DIM statement and renumber so the lowest line number is 10000. Use 10-line increments, so there will be room for additional routines.

Save the program using the A option

(SAVE"BASIC/BAS",A") and then merge it with DROSSDOS/BAS. Next, add this line: 10195 BFLAG = 1. Make sure program control in line 905 passes either to line 10190 or whatever line in your renumbered program is after the array reading statements in ?BASIC.

Finally, add a CMS"S" command to the program to allow going back to DROSSDOS as necessary. Use a line like this:

```
10232 Y$ = "CMD" + CHR$(34) + "S": IF LEFT$(A$,5) = Y$
      THEN CMD"VERIFY":CLS:GOTO 100
```

When CMD"S" is entered from ?BASIC, the system will first activate the disk drives through the Verify command, chosen because it starts up the drives without printing anything to the screen. A POKE could also be used, but it was quicker to type Verify than look up the correct location in a memory map. Next, the screen will clear and control will transfer back to DROSSDOS.

Jumping from DROSSDOS to ?BASIC has already been taken care of. When Basic is entered, control passes to line 900, where the sneaky Verify command is carried out, and an imaginative "?BASIC by Kitchen Table, Inc" is printed.

I hope you enjoy this Basic version of DROSSDOS/8E as much as I enjoyed sneaking it past Kitchen Table Inc.'s security guards. In the future, I may be able to leak Basic versions of SUPERDUPERZAP and other utilities which are not powerful or elegant, but will be very, very cheap. ■

Listing continued

```
100 LINEINPUT A$
110 : FOR E=1 TO 41
120 : IF INSTR(A$,CM$(E)) <> 0 GOTO 150
130 : NEXT E
140 PRINT"HUH?":GOTO 100
150 ON E GOTO 160,170,180,190,200,210,220,230,240,250,260,270,280,330,340,350,460,490,500,510,520,530,540,550,560,590,600,610,630,640,650,720,730,740,750,770,800,810,820,830,870

155 ' ***** DOS STATEMENTS AND ROUTINES *****

160 PRINT"SORRY. APPEND DOES NOT WORK WELL. TRY ";CHR$(34);" MERGE";CHR$(34):GOTO 100
170 PRINT CHR$(34);"ATTRIB";CHR$(34);"-- WHERE LOU GRANT WORKS.":GOTO 100
180 PRINT"SORRY. COMMAND TEMPORARILY OUT OF ORDER. PLEASE NUMBER PROGRAM LINES YOURSELF.":GOTO 100
190 GOTO 900
200 FOR G=1 TO 10:PRINT CHR$(23):FOR H=1 TO 10:NEXT H:CLS:PRINT "*" :NEXT G:CLS:GOTO 100
210 PRINT"NO":GOTO 100
220 CLS:FOR N=1 TO 1024 STEP 65:POKE 15360+N,191:NEXT N:PRINT @ 800,"":GOTO 100
230 PRINT"CHAINING NOT ALLOWED DURING EVEN NUMBERED YEARS":GOTO 100
240 PRINT "USELESS COMMAND":GOTO 100
250 FOR N=1 TO 4:PRINT STRING$(255,191);:NEXT N:GOTO 100
260 FOR G=1 TO 10:FOR Y=1 TO 59:PRINT @ 53,"00:00:":Y;:NEXT Y:NEXT G:PRINT:PRINT"MY HOW TIME FLIES WHEN YOU'RE HAVING FUN!":GOTO 100
270 GOTO 250
280 PRINT "IF, DURING COPY, THIS PROGRAM IS DETERMINED TO BE"
290 PRINT" COPYRIGHTED, YOUR NAME WILL BE FORWARDED TO THE"
300 PRINT" PROPER AUTHORITIES. YOU HAVE BEEN WARNED."
310 CMD A$
320 GOTO 100
330 PRINT"OKAY":GOTO 100
340 PRINT"DATING SERVICE CLOSED":GOTO 100
350 FOR G=1 TO 5
360 FOR T=64 TO 120
```

Listing continues

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LD H,C
LD (HL),E
LD (HL),C
LJF
JK N4,5+5 ", etc.?
```

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Listing continued

```
370 PRINT @ T,CHR$(32);"*****O";
380 NEXT T
390 PRINT @ 120,STRING$(8,32);
400 NEXT G
410 FOR N=1 TO 5
420 PRINT @ 120,STRING$(8,191);
430 PRINT @ 120,STRING$(8,32);
440 NEXT N
450 GOTO 100
460 PRINT"GOOD IDEA! I'M CURIOUS, TOO."
470 FOR G=1 TO 100:NEXT G
480 CMD A$:GOTO 100
490 PRINT"NO CHAINING ALLOWED DURING EVEN MONTHS":GOTO 100
500 PRINT"OOPS. CODE HAS BEEN COMPLETELY DUMPED FROM MEMORY":GOT
O 100
510 PRINT "EROR":GOTO 100
520 PRINT"WORST CASE FORMAT COMING UP. ARE YOU IN FOR A SURPRISE
":CMD A$:GOTO 100
530 CMD A$:PRINT "THAT WILL BE $5.00 PLEASE":GOTO 100
540 PRINT "YOU'VE GOT TO BE KIDDING":CMD A$:GOTO 100
550 CMD A$:CMD A$:PRINT"EXTRA PRINTOUT FREE OF CHARGE":GOTO 100
560 CMD A$:PRINT"OOPS. I THINK I JUST KILLED THE WRONG FILE."
570 PRINT"HOW FAMILIAR ARE YOU WITH THE HASH INDEX TABLE?"
580 GOTO 100
590 PRINT"USELESS COMMAND":GOTO 100
600 GOTO 590
610 CMD A$:PRINT"OVERDUE","CHECKOUT","REFERENCE ONLY"
620 GOTO 100
630 PRINT" 1 -- LOAF BREAD":PRINT" 2 -- QUART MILK":PRINT" 3
-- PICK UP JIMMY AT CUB SCOUTS":GOTO 100
640 CMD A$:PRINT"WARNING! FILE LOADED INTO ROM!":GOTO 100
650 T$="PAUSE"
660 FOR G=1 TO 5
670 PRINT MID$(T$,G,1);
680 FOR N=1 TO 200:NEXT N
690 NEXT G
700 PRINT
710 GOTO 100
720 CMD A$:PRINT"DO YOU HAVE A PDRIVER'S LICENSE?":GOTO 100
730 PRINT "NO. MY SCREEN IS SORE TODAY":GOTO 100
740 PRINT"ACCESS DENIED. YOU ARE NOT SMART ENOUGH TO USE THIS C
OMMAND":GOTO 100
750 PRINT" PURGE MODULE:"
760 PRINT "ENTER NAME OF PERSON TO BE BLACKLISTED":GOTO 100
770 PRINT "SURPRISE! I RENAMED THE FILE AND WON'T TELL YOU"
780 PRINT "WHAT I NAMED IT. HOPE YOU DIDN'T NEED IT FOR SOMETHI
NG"
790 GOTO 100
800 PRINT"BAD PLAN. PLEASE RECONSIDER":GOTO 100
810 PRINT"I HOPE YOU KNOW WHAT YOU ARE DOING":CMD A$:GOTO 100
820 PRINT" REAL TIME CLOCK HAS STOPPED. PLEASE WIND IT UP":GOTO
100
830 INPUT "ENTER YOUR NAME";C$
840 INPUT "PLEASE RE-ENTER YOUR NAME";D$
850 IF C$=D$ THEN PRINT "THAT IS CORRECT" ELSE PRINT"SOMETHING I
S WRONG HERE"
860 GOTO 100
870 PRINT"IF YOU UNDERSTAND THIS COMMAND, PLEASE NOTIFY"
880 PRINT"KITCHEN TABLE IMMEDIATELY!"
890 GOTO 100
900 CMD"VERIFY":CLS:PRINT"?BASIC BY KITCHEN TABLE,INC.":PRINT
905 IF BFLAG=1 GOTO 10190
```

```
1000 '          END OF DROSSDOS
          ?BASIC APPENDED
          FOR DEMONSTRATION
```

```
10010 WRDS=18
10020 LS=200
10040 Q$=CHR$(34)
10050 C$=CHR$(58)
10060 SP$=CHR$(32)
10080 ' ***** READ WORDS INTO ARRAY *****
```

```
10090 : FOR N=1 TO WRDS
10100 : READ SPAN$(N)
10110 : READ E$(N)
10120 : E$(N)=SP$+E$(N)
10130 : SPAN$(N)=SP$+SPAN$(N)
10140 : NEXT N
10150 GOTO 10190
```

```
10160 DATA IF,OF,RUN,RAN,INPUT,IMPURT,LIST,LAST,END,FIN,PRINT,PLI
MT,READ,REED,DATA,DADA,THEN,THAN,FOR,FAR,STOP,STEP,NEXT,NKET
10170 DATA CLS,CSL,GOTO,GOOT,RESTORE,RESTART,GOSUB,GSUNK,RETURN,
RETRNU,ON.IN
```

Listing continues

Listing continued

```
10180 ***** INPUT PROGRAM LINE *****

10190 PRINT ">";
10195 BFLAG=1
10200 B2=0
10210 LINE INPUT A$

10220 ***** CHECK FOR 'COMMAND' *****

10230 IF LEFT$(A$, 4)="LIST" GOTO 10900
10231 Y$="CMD"+CHR$(34)+"S"
10232 IF LEFT$(A$,5)=Y$ THEN CMD"VERIFY":GOTO 80
10240 IF LEFT$(A$, 4)="SAVE" GOTO 10710
10250 IF LEFT$(A$,4)="LOAD" GOTO 10830
10260 IF LEFT$(A$,3)="RUN" THEN RUN
10270 IF LEFT$(A$,3)="NEW" THEN RUN
10280 IF LEFT$(A$,5)="PRINT" GOTO 11270
10290 IF LEFT$(A$,4)="EDIT" GOTO 11310
10300 IF A$="" :GOTO 10190

10310 ***** CHECK FOR QUOTES OR COLONS *****

10320 A$=A$+CHR$(32)
10330 B=INSTR(A$, Q$)
10340 C=INSTR(A$, C$)
10350 IF C=0 AND B=0 GOTO 10460
10360 IF B=0 GOTO 10440

10370 ***** FIND POSITION OF SECOND QUOTATION MARK *****

10380 W$=MID$(A$, B+1)
10390 B2=INSTR(W$, Q$)+B
10400 IF C<B GOTO 10440
10410 IF C>B2 GOTO 10440
10420 GOTO 10460

10430 ' ***** IF COLON OUTSIDE QUOTES - TWO STATEMENTS *****

10440 IF C<>0 THEN PRINT"ONLY ACCEPTING ONE STATEMENT PER LINE T
ODAY":GOTO 10190

10450 ***** CHECK FOR BEGINNING LINE NUMBER *****

10460 TST$=""
10470 : FOR T=1 TO LEN(A$)
10480 : IF MID$(A$, T, 1)=CHR$(32) GOTO 10520
10490 : TST$=TST$+MID$(A$, T, 1)
10500 : NEXT T

10510 ' ***** IF LINE NUMBER VALID, ASSIGN TO ARRAY POINTER LN
*****

10520 LN=VAL(TST$)
10530 IF LN>LS THEN LN=LS-9
10540 IF LN<1 PRINT "HUH?":GOTO 10190

10550 ***** LOOP TO SEARCH FOR ALL KEYWORDS *****

10560 : FOR G=1 TO WR
10570 : Y=INSTR(A$, SPAN$(G))
10580 : IF Y>0 GOTO 10640
10590 : NEXT G

10600 ***** ASSIGN LINE TO FINISHED PROGRAM ARRAYS *****

10610 CP$(LN)=A$
10620 GOTO 10190

10630 ***** CHECK TO SEE IF KEYWORD IN QUOTES *****

10640 IF Y<B GOTO 10670
10650 IF Y>B2 GOTO 10670
10660 GOTO 10590
10670 L=LEN(E$(G))
10680 ' ***** SUBSTITUTE PHONEY KEYWORD *****

10690 MID$(A$, Y, L)=E$(G)
10700 GOTO 10590

10710 ***** SAVE PROGRAM TO DISK *****

10720 GOSUB 10730:GOTO 10760
10730 NE$=MID$(A$, INSTR(A$, CHR$(34))+1)
10740 IF RIGHT$(NE$,1)=Q$ THEN NE$=LEFT$(NE$, (LEN(NE$)-1))
10750 RETURN
10760 OPEN "O",1, NE$
10770 : FOR N=1 TO LS
```

Listing continues

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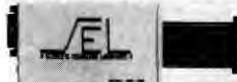
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Listing continued

```
10780 : PRINT #1, CP$(N); CHR$(13);
10790 : NEXT N
10800 CLOSE 1
10810 GOTO 10190
```

```
10820 ***** LOAD PROGRAM FROM DISK *****
```

```
10830 GOSUB 10730
10840 OPEN "I",1, NE$
10850 : FOR N=1 TO LS
10860 : LINE INPUT #1, CP$(N)
10870 : NEXT N
10880 CLOSE 1
10890 GOTO 10190
```

```
10900 ' ***** LIST SUBROUTINE *****
```

```
10910 C4=INSTR(A$, "-");IF C4<1 GOTO 11130
10920 C3=INSTR(A$, "LIST")
10930 ST$=MID$(A$,C3+4)
10940 L1=VAL(ST$)
10950 IF L1>LS THEN L1=LS-10
10960 C5=INSTR(ST$, "-")
10970 ST$=MID$(ST$,C5)
10980 IF LEN(ST$)=1 THEN L2=LS:GOTO 11090
10990 ST$=RIGHT$(ST$, (LEN(ST$)-1))
11000 L2=VAL(ST$)
11010 IF L2>LS THEN L2=LS-5
11020 GOTO 11090
11030 : FOR N=1 TO LS
11040 : IF CP$(N)<>" " PRINT CP$(N)
11050 : NEXT N
11060 PRINT
11070 GOTO 10190
```

```
11080 ' ***** LIST LINE NUMBER RANGE *****
```

```
11090 : FOR N=L1 TO L2
11100 : IF CP$(N)<>" " PRINT CP$(N)
11110 : NEXT N
11120 GOTO 10190
```

```
11130 ' ***** LIST SPECIFIC LINE OF PROGRAM *****
```

```
11140 V=INSTR(A$, SP$)
11150 IF V=0 GOTO 11220
11160 V2$=MID$(A$, V)
11170 V3=VAL(V2$)
11180 IF V3>0 THEN PRINT CP$(V3) ELSE GOTO 11220
11190 PRINT
11200 GOTO 10190
```

```
11210 ' ***** LIST ALL PROGRAM LINES *****
```

```
11220 CLS
11230 : FOR N=1 TO LS
11240 : IF CP$(N)<>" " PRINT CP$(N)
11250 : NEXT N
11260 GOTO 10190
11270 S$=MID$(A$,INSTR(A$, "PRINT")+5)
11280 PRINT S$
11290 GOTO 10190
```

```
11300 ' ***** EDIT LINE *****
```

```
11310 LN=VAL(MID$(A$, (INSTR(A$, "EDIT")+4)))
11320 IF CP$(LN)<>" " GOTO 11350
11330 PRINT "UNDEFINED LINE NUMBER"
11340 GOTO 10190
11350 PRINT LN;
11360 CU=INSTR(CP$(LN), CHR$(32))
11370 I$=INKEY$:IF I$="" GOTO 11370
11380 IF VAL(I$)>0 THEN NU=VAL(I$)
11390 IF I$="C" GOSUB 11460
11400 IF I$="D" GOSUB 11460
11410 IF I$="I" GOSUB 11460
11420 IF I$=CHR$(8) GOSUB 11520
11430 IF I$=CHR$(32) PRINT MID$(CP$(LN), CU,1);:CU=CU+1
11440 IF I$=CHR$(13) PRINT:GOTO 10190
11450 GOTO 11370
11460 R$=INKEY$:IF R$="" GOTO 11460
11470 IF R$=CHR$(27) GOTO 11490
11480 MID$(CP$(LN), CU,1)=R$
11490 PRINT CHR$(8);
11500 CU=CU+1
11510 RETURN
11520 PRINT CHR$(8);:RETURN
```

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Changing Color Basic's ubiquitous prompt.

When OK Isn't

Ed Deming
1839 Pine Cone Circle
Clearwater, FL 33520

I am impressed with the TRS-80 Color Computer but bored with Basic's prompt. The blinking cursor makes me nervous when I am thinking.

In addition, even though space is tight in the Color Basic

ROM, three more bytes would have provided a slightly more informative prompt than the terse OK we now have. Exactly what is okay about spending four hours entering a Lunar Lander program only to get—

```
?OM ERROR IN LINE 843
OK
```

I thought it impossible to

change a computer's ROM until discovering the jump table in RAM containing vectors to other ROMs or RAM. Color Basic has a jump table at decimal addresses 350-424, with decimal 57 in each location. Decimal 57 is the microprocessor op code for return from subroutine (RTS).

When Color Basic jumps to a subroutine in this area, it im-

mediately returns from the subroutine.

Extended Color Basic changes the contents of thirty locations in the jump table. These changes are of the form:

126, MSB, LSB

where decimal 126 is the microprocessor op code for jump (JMP), MSB is the most significant byte of the jump address and LSB is the least significant byte. When Extended Color Basic jumps to a subroutine at one of these locations, it jumps to a routine in the Extended Color Basic ROM.

Just prior to outputting a character, the Color Computer jumps to a subroutine located at decimal address 359. When the normal prompt is about to be displayed, the X register of the microprocessor contains

Program Listing

```
10 REM***CHANGE PROMPT AND CURSOR***
20 'by Ed Deming 11/81
30 '
40 A=PEEK(39)*256+PEEK(40)-326:REM Highest address for BASIC
50 CLEAR 255,A
60 A=INT((PEEK(39)*256+PEEK(40)+326)/1000)*1024-1:REM Top RAM address
70 CLS:PRINT@6,"NEW CURSOR AND PROMPT":PRINT@40,"FOR COLOR BASIC"
80 INPUT"CURSOR CHARACTER";C$
90 C=PEEK(1106):REM Get cursor from screen
100 PRINT"YOUR NEW PROMPT IS:"
110 LINE INPUT P$
120 B=A-77-LEN(P$):REM Start address for machine language program
130 FOR X=B TO A
140 READ D
150 IF D>300 THEN 200
160 POKE X,D
170 NEXT
180 GOSUB 290
190 EXECB:END
200 ON D-300 GOTO 210,230,280
210 POKE X, C:REM POKE Cursor character
220 GOTO 170
230 FOR Y=X TO X+LEN(P$)-1:REM Once for each character in P$
240 P=Y-X+1:REM Character position in P$
250 POKE Y, ASC(MID$(P$,P,1)):REM POKE each character value
```

Listing continues

The Key Box

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Color Computer
4K RAM

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decimal 44015, and the sub-routines are nested four deep.

In Table 1, lines 220-280 list the machine language program I came up with to change the prompt. It is position independent, locatable anywhere in memory.

When the Color Computer goes to get a character, it first jumps to a subroutine located at decimal address 362. Lines 170-210 of Table 1 list the machine language program for changing the cursor to any character. A routine to initialize the computer for the other two routines is in lines 0A0-160.

The Extended Color Basic program (Program Listing) will provide you with a new cursor character, a new prompt and will POKE it into protected memory. It then saves the machine language program on tape and runs the initialization routine. Be aware that successive runs of this program will nibble away at available memory.

To get the same cursor character and prompt the next

time you turn on your computer, protect enough memory (Clear), load the machine language program and enter EXEC.

Modifications of the Table 1 machine language routines for those of you without Extended Color Basic are provided in Table 2. Color Basic should be able to run the program in Listing 1 by modifying lines 100-110 and the data statements, and by deleting lines 180 and 280-330.

OK. ■

Listing continued

```

260 NEXT
270 X=Y-1:GOTO170:REM Update X; return to main loop
280 PRINT"ERROR":STOP
290 LINE INPUT"HIT ENTER WHEN TAPE IS READY";RS
300 CSAVEM"PRT/CURS",B,A,B:REM Save machine language program
310 INPUT"ANOTHER COPY";R$
320 R$=LEFT$(R$,1)
330 IF R$="Y"THEN290ELSE RETURN
340 DATA142, 1,103,204,126,301,167,128, 51,140, 49,239,129,167,128
350 DATA 51,140, 15,239,129,215,148,204, 0,200, 52, 6, 48,140, 2,
    126,174, 90
360 DATA 15,112, 13,111, 39, 3,126,140,241, 50, 98, 52, 20,214,148,
    231,159, 0,136,189,161,193, 39,251,126,161,185
370 DATA140,171,239, 38, 8, 48,140, 7, 50,102,126,172,121,126,130,
    115,302, 13, 0,303
  
```

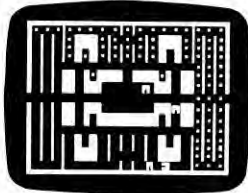
010	CCRPOS	EQU	88		
020	CURHLD	EQU	94		
030	DEVNUM	EQU	6F		
040	EXGET	EQU	8CF1		
050	EXPRTN	EQU	8273		
060	GRTN	EQU	A1B9		
070	POLCAT	EQU	A1C1		
080	PRTCLR	EQU	AE5A		
090	WRMSTR	EQU	AC79		
	Initialize				
0A0	8E0167	LDD	#167	Jump table address	
0B0	CC7E7E	LDD	#7E7E	Jump in A; Cursor in B	
0C0	A780	STA	,X+	Store jump; advance	
0D0	338C31	LEAU	PROMPT, PCR	Address of Prompt	
0E0	EF81	STU	,X++	in jump table; advance	
0F0	A780	STA	,X+	Store jump; advance	
100	338C0F	LEAU	CURSOR, PCR	Address of Cursor	
110	EF81	STU	,X++	in jump table; advance	
120	D794	STB	\$CURHLD	Store Cursor	
130	CC00C8	LDD	#C8	String space	
140	3406	PSHS	B,A	Save it	
150	308C02	LEAX	END, PCR	Top of Basic memory	
160	7EAE	JMP	\$\$PRTCLR	CLEAR and return to Basic	
5A		END			
170	0F70	CURSOR	CLR	\$70	
180	0D6F		TST	\$DEVNUM	Are we on text screen?
190	2703		BEQ	GETCHR	Yes
1A0	7E8CF1		JMP	\$\$EXGET	No
1B0	3262	GETCHR	LEAS	2,S	Clear bad return address
1C0	3414		PSHS	X,B	Save registers
1D0	D694		LDB	\$CURHLD	Get cursor value
1E0	E79F0088		STB	[CCRPOS]	Store it on screen
1F0	BDA1C1	LOOP	JSR	\$\$POLCAT	Poll keyboard
200	27FB		BEQ	LOOP	No key seen
210	7EA1B9		JMP	\$\$GRTN	Got one; return to Basic
220	8CABEF	PROMPT	CMPX	#ABEF	Compare X to OK address
230	2608		BNE	EXIT	Not OK address
240	308C07		LEAX	DATA,PCR	New prompt address
250	3266		LEAS	6,S	Clean stack
260	7EAC79		JMP	\$\$WRMSTR	Print new prompt
270	7E82	EXIT	JMP	\$\$EXPRTN	Normal return
73		DATA			
280	52454144				
	5920464F				READY FOR ENTRY ED.
	5220454E				
	54525920				
	45442E0D				
	00				

Table 1. All numbers are in hex

0D0	338C2F		LEAU	PROMPT, PCR	Address of Prompt
1A0	39	EXIT	RTS		No
230	26D8		BNE	EXIT	Not OK address
240	308C04		LEAX	DATA, PCR	New prompt address
260	7EAC		JMP	\$\$WRMSTR	Print new prompt
79		DATA			
270			DELETE		

Table 2. Modifications For Color Basic

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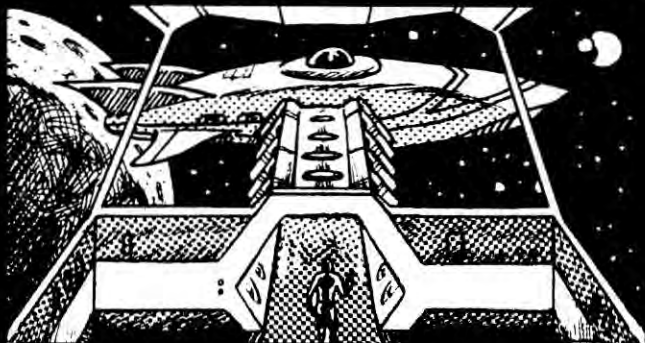


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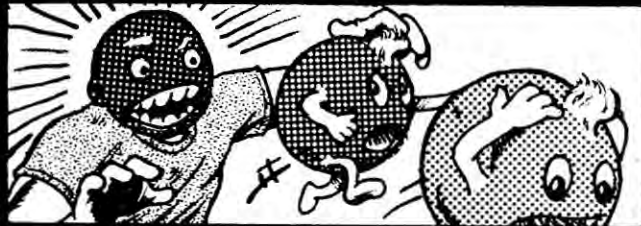
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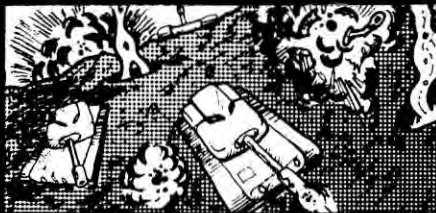
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BASTEP is a debugging tool for Level II and DOS Basic. When it is run, it implements two new Basic commands—

CMD" B" and CMD" Q"—which may be used anywhere in a Basic program or in command mode. CMD" B" activates a single-step mode for running Basic. The system halts before executing each line, displays its number at the bottom of the screen, and waits for a key to be pressed before proceeding. This mode may be terminated at any time by CMD" Q" or use of break.

Assembly-language programmers often use debugging monitors (e.g. TRSDOS Debug) to enter the single-step mode. This allows progressive monitoring of a program run, one instruction at a time, and provides a trace of logic path. While Basic debugging is not normally fraught with the same level of complexity, a single-step capability can, at times, be distinctly useful. BASTEP provides significant advantages over normal Basic debugging commands. Unlike TRON, it doesn't print line numbers all over the screen,

nor does it repetitively output the same line number in the case of a line like 100 IF IN-KEY\$=" " THEN 100. And unlike Stop, it doesn't need a CONT to resume execution. It effectively provides a new debugging tool at the cost of about 200 bytes of RAM space.

**"BASTEP
implements two
new Basic
commands—
CMD" B" and
CMD" Q" . . . "**

BASTEP is really two programs, since it is a Basic program that incorporates a machine-language program in data statements. BASTEP first modifies the Memory Size? setting to protect the top 203 bytes of RAM and then POKES the machine code into that area. (The machine code is relocatable, so it can be located at the top of a 4K, 16K, 32K, or 48K machine.) Finally, intercepts

Program Listing 1. BASTEP Basic listing

```
10 DATA E5CD3723E5CDD7,29235E2356EB2B,D77E9FE422809FE,512810E1E1C
300,00216B**3EC3CD,F9**E1D1C9CDED,**18F8FFFF2300,00000000007EB7,
207BD58D5B62**,DF2872E5C523ED,5BA440131AB728,644F1BDF28051A,5F51
18F12B2262,**2323235E2356,ED532141060048
20 DATA 2165**CD2F13AF,329C402A2040E5,3AA640F521F23F,2220402164*
*CD,A728F132A640E1,222040CD490021,F23FF5CD7C0501,A942CD60002136,
40711137400E06,EDB0F1FE012003,CDED**C1E1D100,000021FFFF2262,**2A
EB**3AEA**,32C44122C541C9
30 CP = PEEK(16756) + PEEK(16757)*256 :REM "CMD" POINTER
40 BS = PEEK(16548) + PEEK(16549)*256 :REM BASIC START POINTER
50 CLS :PRINT@ 322, CHR$(23); "BUILDING 'BASTEP' MACHINE CODE"
60 IF CP < BS THEN 90 :REM ABORT IF BASTEP ALREADY LOADED
70 PRINT@ 320, "CMD INTERCEPTS ALREADY INSTALLED" :END
80 REM SET MEM SIZE TO PROTECT MACH CODE; MS = MSB OF ENTRY PNT
90 POKE 16561,50 :CLEAR 50 :DEFINT A-Z :MS = PEEK(16562)
100 REM CALCULATE START ADDRESS OF MACH CODE
110 IF MS>127 THEN AD = MS*256-65483 ELSE AD = MS*256+53
120 ST = AD :FL = ASC("***) :QU$ = CHR$(34) :REM FL = FLASHING *
130 FOR X=29 TO 1 STEP-1 :REM THERE ARE 29 X 7 MACH CODE BYTES
140 READ CD$:PRINT@ 540, CHR$(FL) :FL = (NOT FL)+75
150 FOR Y=1 TO 13 STEP2 :REM 7 BYTES = 14 HALF-BYTES
160 BY=0 :BY$ = MID$(CD$,Y,2) :REM GET NEXT BYTE
170 IF BY$="**" THEN BY=MS :GOTO 230 :REM RELOCATION
180 FOR N=1 TO 2
190 HB$ = MID$(BY$,N,1) :REM GET EACH HALF-BYTE
200 IF HB$>"9" THEN HB = ASC(HB$)-55 ELSE HB=VAL(HB$)
210 BY = BY*16+HB :REM ACCUMULATE ASCII VALUE OF BYTE
220 NEXT N
230 POKE AD+(Y-1)/2, BY :REM STORE MACH CODE AT TOP OF RAM
240 NEXT Y
250 IF X>1 THEN AD = AD+7 :REM STEP ADDRESS POINTER
260 NEXT X
270 REM INSTALL CMD & 'LINE INTERCEPT' ADDRESSES
280 FOR X=0 TO 1 :POKE ST+27+X,PEEK(16756+X) :NEXT X
290 FOR X=0 TO 2 :POKE ST+181+X,PEEK(16836+X) :NEXT X
300 POKE 16756,53 :POKE 16757,MS :REM POINT CMD TO ENTRY POINT
310 PRINT@ 194, "BASTEP CODE BUILT AT " :MS*256+53
320 PRINT " MEM. SIZE WAS SET TO " :MS*256+52
330 PRINT@ 706, "CMD"; QU$;"B"; QU$; " = BASTEP (IE ACTIVATE)"
340 PRINT " CMD"; QU$;"Q"; QU$; " = QUIT (IE DEACTIVATE)" :PRINT
```

Program Listing 2. BASTEP Assembly listing

```
001100 ;ASSEMBLER ROUTINE PERFORMING "BASTEP" FUNCT
ION
BF35 00110 ORG 0BF35H ;(LOAD ADDR VARIES W
ITH MEMSIZE)
BF35 E5 00120 CMDIN PUSH HL ;SAVE ORIGINAL HL
BF36 CD3723 00130 CALL 2337H ;EVALUATE PARAM & PO
INT TO COLON
BF39 E5 00140 PUSH HL ;SAVE COLON POINTER
BF3A CDD729 00150 CALL 29D7H ;POINT HL TO 3-BYTE
```

Listing 2 continues

The Key Box

Cassette or Disk Basic
Model I
16K-48K RAM

and links are installed which effectively make this code an extension of the Basic interpreter. The new commands, CMD"B" and CMD"Q", are now active.

How to Use BASTEP

First, key in the Basic program (Listing 1) and save to tape or disk. You may omit the REMs, but take a few minutes to carefully check the Data lines (10 and 20). You should have 29 items, each 14 characters in length.

On power-up (Level II) or Basic/BASICR entry (DOS), reply <enter> to Memory Size? (BASTEP does its own setting of this value). Now load and run BASTEP. It will take about 28 seconds, during which the message "Building BASTEP Machine Code" will be displayed on the screen with a flashing asterisk.

When the run finishes, BASTEP will display the start address of the machine code and the new memory size setting.

Next, load the Basic program you wish to test. Type CMD"B" and Run. A number will appear at the bottom right corner of the screen. If the first line in the program is 10, you'll see #00010. Touch any key and line 10 will be executed, and the next line will be displayed in the same spot. Each time a line number is displayed, the system will halt execution until you touch a key, then proceed with that line.

As soon as you touch a key to proceed with the displayed line number, say 1250, the #01250 is erased from the screen. That tells you that line 1250 is executing. If you don't see a new line number within a reasonable period of time, line 1250 may be looping within itself. In such cases, BASTEP deliberately avoids re-displaying the line number after the first time.

BASTEP differentiates between a quick touch (one fourth second or less) and holding a key down. If you do the latter, BASTEP allows that keystroke to be passed to Basic when execution resumes. In most cases, Basic will ignore it anyway, but this can be a useful feature if you're about to

Listing 2 continued

```

STRING POINTER
BF3D 23      00160      INC   HL      ;POINT TO STRING ADD
RESS
BF3E 5E      00170      LD    E,(HL) ;STRING ADDRESS TO D
E
BF3F 23      00180      INC   HL
BF40 56      00190      LD    D,(HL)
BF41 EB      00200      EX    DE,HL  ;STRING ADDRESS TO H
L
BF42 2B      00210      DEC   HL      ;STEP BACK
BF43 D7      00220      RST   10H    ;INC HL & FIND FIRST
NON-BLANK
BF44 7E      00230      LD    A,(HL) ;FIRST CHARACTER TO
A
BF45 FE42    00240      CP    'B'    ;CMD"B"? (BASTEP ACT
IVATE)
BF47 2809    00250      JR    Z,CMDB ;BRANCH IF YES
BF49 FE51    00260      CP    'Q'    ;CMD"Q"? (QUIT BASTE
P)
BF4B 2810    00270      JR    Z,CMDQ ;BRANCH IF YES
BF4D E1      00280      POP   HL      ;CLEAR STACK
BF4E E1      00290      POP   HL      ;RESTORE ORIGINAL HL

BF4F C30000  00300  EXIT   JP    0      ;(JUMP ADDRESS EX 41
74/5H)
BF52 216BBF  00310  CMDB  LD    HL,ENTPT ;GET ENTRY POINT AD
DRESS IN HL
BF55 3EC3    00320      LD    A,0C3H ;"JP" OP-CODE IN A
BF57 CDF9BF  00330      CALL CMDINT ;SET INTERCEPT IN 41
C4-6H
BF5A E1      00340  CMDB1  POP   HL      ;RESTORE HL
BF5B D1      00350      POP   DE      ;CLEAR STACK
BF5C C9      00360      RET                    ;RETURN TO BASIC INT
ERPRETER
BF5D CDEDBF  00370  CMDQ  CALL  DEACT   ;DEACTIVATE BASTEP
BF60 18F8    00380      JR    CMDB1   ;BACK TO BASIC

```

Listing 2 continues

execute a line that does a quick INKEY\$ scan before rushing off to do other things.

There are two methods to switch from single-stepping to normal running. First, a CMD"Q" encountered anywhere in the program (or entered in command mode during a break in execution) does the task, as does pressing break while BASTEP is displaying a line number. Used at any other time, break works normally, and BASTEP remains active. As with other keys, the length of depression of break makes a difference—a quick touch deactivates BASTEP, but does not interrupt execution (the program then proceeds at normal speed); holding down the Break key deactivates BASTEP, then breaks Basic execution also. Use CMD"B" and CMD"Q" at appropriate points throughout so that you BASTEP only the lines that interest you.

One more point before we examine some of the techniques involved. If Tandy issues a new release of TRSDOS in which CMD"B" or CMD"Q" has been implemented for some other

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Listing 2 continued

```

BF62 FFFF      00390 LNSV   DEFW   0FFFFH ;LINE POINTER SAVE A
REA
BF64 23        00400 ASCLN  DEFB   '#'    ;FOR OUTPUT OF LINE
NUMBER
0006          00410 ASCLN1  DEFS   6
BF6B 7E        00420 ENTPT  LD     A,(HL) ;(ENTERED BY JP AT 4
1C4H)
BF6C B7        00430      OR     A     ;DOES HL POINT TO A
ZERO BYTE?
BF6D 207B      00440      JR     NZ, LNINT ;BRANCH IF NO (DON'
T INTERCEPT)
BF6F D5        00450      PUSH  DE     ;SAVE DE
BF70 ED5B62BF  00460      LD     DE,(LNSV) ;GET PREVIOUS LINE
POINTER
BF74 DF        00470      RST   18H    ;COMPARE HL WITH DE
BF75 2872      00480      JR     Z, ENTPT4 ;BRNCH IF EQUAL (DO
N'T INTERCEPT)
BF77 E5        00490      PUSH  HL     ;SAVE HL
BF78 C5        00500      PUSH  BC     ;SAVE BC
BF79 23        00510      INC   HL     ;STEP HL
BF7A ED5BA440  00520      LD     DE,(40A4H) ;LOAD DE WITH 'BA
SIC START' PTR
BF7E 13        00530 ENTPT1  INC   DE     ;STEP TO MSB OF BASI
C LINE PTR
BF7F 1A        00540      LD     A,(DE) ;END OF PROGRAM IN C
ORE?
BF80 B7        00550      OR     A
BF81 2864      00560      JR     Z, ENTPT3 ;BRANCH IF YES (DON
'T INTERCEPT)
BF83 4F        00570      LD     C,A   ;MSB OF LINE POINTER
TO C
BF84 1B        00580      DEC   DE     ;STEP DE BACK
BF85 DF        00590      RST   18H    ;COMPARE HL WITH DE
BF86 2805      00600      JR     Z, ENTPT2 ;BRANCH IF EQUAL (I
NTERCEPT)
BF88 1A        00610      LD     A,(DE) ;LSB OF LINE POINTER

```

Listing 2 continues

purpose, just change the relevant byte for each in the data statements to something more suitable. As an example—perhaps you wanted to use CMD“X” to activate BASTEP (instead of CMD“B”), and CMD“Y” to deactivate it (instead of CMD“Q”). Edit line 10 and change the 42 (i.e. “B”) in the middle of Data item three to 58 (i.e. “X”). Remember, these are hexadecimal values, not ASCII.

Also, change the 51 (i.e. “Q”) at the beginning of Data item four to 59 (i.e. “Y”).

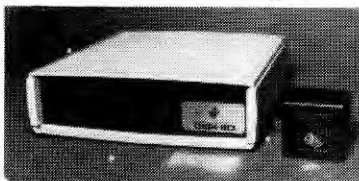
The Program

Lines 10 to 20 are the machine code (in hexadecimal), grouped in 29 seven-byte items (see later in this article for an Assembly listing of this code). Some bytes are coded as “”. These are relocatable bytes whose contents will vary depending on your RAM size.

In line 30, locations 16756/7 (X'4174/5') contain the branch address to which control is

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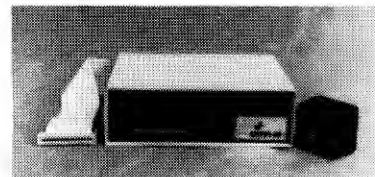
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```

TO E
BF89 5F      00620      LD      E,A
BF8A 51      00630      LD      D,C      ;MSB OF LINE POINTER
TO D
BF8B 18F1    00640      JR      ENTPT1 ;STEP TO NEXT LINE I
N CORE
BF8D 2B      00650 ENTPT2 DEC      HL      ;STEP HL BACK TO ORI
GINAL
BF8E 2262BF  00660      LD      (LNSV),HL ;SAVE POINTER IN L
NSV
BF91 23      00670      INC     HL      ;STEP HL TO LINE NUM
BER
BF92 23      00680      INC     HL
BF93 23      00690      INC     HL
BF94 5E      00700      LD      E,(HL) ;LINE NUMBER TO DE
BF95 23      00710      INC     HL
BF96 56      00720      LD      D,(HL)
BF97 ED532141 00730      LD      (4121H),DE ;LINE NO. TO BASI
C ACCUM AREA
BF9B 0600    00740      LD      B,0      ;ZEROISE B & C
BF9D 48      00750      LD      C,B
BF9E 2165BF  00760      LD      HL,ASCLN1 ;POINT HL TO OUTPU
T AREA
BF A1 CD2F13 00770      CALL   132FH ;CONVERT LINE NUMBER
TO ASCII
BFA4 AF      00780      XOR     A      ;INDICATE VIDEO OUTP
UT
BFA5 329C40  00790      LD      (409CH),A
BFA8 2A2040  00800      LD      HL,(4020H) ;SAVE CURSOR POIN
TER
BFAB E5      00810      PUSH   HL
BFAC 3AA640  00820      LD      A,(40A6H) ;SAVE TAB POINTER
BFAF F5      00830      PUSH   AF
BFB0 21F23F  00840      LD      HL,3FF2H ;CURSOR TO BOTTOM O
F SCREEN
BFB3 222040  00850      LD      (4020H),HL
BFB6 2164BF  00860      LD      HL,ASCLN ;POINT HL TO ASCII
LINE NUMBER
BFB9 CDA728  00870      CALL   28A7H ;OUTPUT TO SCREEN
BFB C F1      00880      POP     AF      ;RESTORE TAB POINTER

BFB D 32A640  00890      LD      (40A6H),A
BFC0 E1      00900      POP     HL      ;RESTORE CURSOR POIN
TER
BFC1 222040  00910      LD      (4020H),HL
BFC4 CD4900  00920      CALL   0049H ;WAIT FOR KEY TO BE
TOUCHED
BFC7 21F23F  00930      LD      HL,3FF2H ;POINT HL TO LINE #
ON SCREEN
BFCA F5      00940      PUSH   AF      ;SAVE INPUT CHARACTE
R (REG A)
BFCB CD7C05  00950      CALL   057CH ;CLEAR LINE # FROM S
CREEN
BFCE 01A942  00960      LD      BC,17065 ;DELAY 0.25 SECOND
BFD1 CD6000  00970      CALL   0060H ; (17065*14.65
MSECS)
BFD4 213640  00980      LD      HL,4036H ;CLEAR KEYBOARD ARE
A (4036-C)
BFD7 71      00990      LD      (HL),C ; (I/P CHAR PA
SSED TO
BFD8 113740  01000      LD      DE,4037H ; BASIC ONLY
IF HELD
BFDB 0E06    01010      LD      C,6 ; DOWN PAST T
HIS POINT)
BFDD EDB0    01020      LDIR
BFDF F1      01030      POP     AF      ;RESTORE INPUT CHARA
CTER
BFE0 FE01    01040      CP      1 ;WAS IT BREAK KEY?
BFE2 2003    01050      JR      NZ,ENTPT3 ;BRANCH IF NO
BFE4 CDEDBF  01060      CALL   DEACT ;DEACTIVATE BASTEP I
F BREAK
BFE7 C1      01070 ENTPT3 POP     BC ;RESTORE BC
BFE8 E1      01080      POP     HL ;RESTORE HL
BFE9 D1      01090 ENTPT4 POP     DE ;RESTORE DE
0003 01100 LNINT DEFS   3 ;INSTRUCTION EX 41C4
-6 SET UP HERE
BFED 21FFFF  01110 DEACT LD      HL,0FFFFH ;RESET LINE PTR SA
VE AREA
BFF0 2262BF  01120      LD      (LNSV),HL
BFF3 2AEBBF  01130      LD      HL,(LNINT+1) ;GET ORIGINAL C
ONTS OF 41C4-6
BFF6 3AEABF  01140      LD      A,(LNINT)
BFF9 32C441  01150 CMDINT LD      (41C4H),A ;SET UP 41C4-6
BFFC 22C541  01160      LD      (41C5H),HL
BFFF C9      01170      RET
0000 01180      END
00000 TOTAL ERRORS

```

transferred when a CMD statement is encountered. On Level II machines, it points straight to the L3 Error routine.

In line 40, locations 16548/9 (X'40A4/5') point to the start of the Basic program area in RAM.

Lines 60 to 70 check that BASTEP is not already installed before proceeding. If it is, and this program was run a second time, we'd pick up our own intercepts as system pointers.

Locations 16561/2 (X'40B1/2') in line 90 contain the Memory Size? value. By modifying that value and issuing a Clear, we can protect the top 203 bytes of RAM. The value obtained in AD in line 110 must be the start address of the machine code. Since POKE requires addresses above 32767 to be expressed as (address-65536), we need to check for these.

Lines 130 to 260 are a series of For...Next loops which take the machine code from the data statements, convert it to ASCII, and POKE into the appropriate locations.

Line 280 transfers the normal CMD vector address locations 16756/7 (X'4174/5') to the appropriate exit point in the machine code, because we'll still need to be able to handle DOS commands like CMD"R", CMD"T", CMD"E" etc.

In lines 290 to 300, location 16836 (X'41C4') is an address to which the Basic interpreter jumps prior to starting a new line. This is the key to the operation of BASTEP. By saving its contents and putting into 16756/7 an intercept which points to BASTEP in high memory, we've just extended the interpreter!

All CMD statements are routed to label CMDIN. CMDs other than CMD"B" and CMD"Q" are passed back to Basic at the jump labeled Exit.

Each time Basic is about to begin a new line, the intercept at 16836 (X'41C4') passes control to ENTPT. The 3-byte instruction at label LNINT is initialized with the original contents of locations 16836-8 (X'41C4-6'), so we can hand back to Basic when required. Extensive use is made of ROM routines to do various tasks. ■

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The input of single-channel analog data into a micro-

computer is relatively simple, and any number of effective designs are available. While these can be cheaply built, a single channel isn't very versatile. When National Semiconductor introduced its ADC0816 16-channel data acquisition chip a few years ago, I expected to see a design or two making use of its capabilities. A design hasn't surfaced (so far as I'm aware),

so I was obliged to make up my own.

The ADC0816 is a CMOS, 16-channel, multiplexed, eight-bit, successive-approximation A/D converter. Low-powered (15 mW at 5V) supply, Tri-State outputs and latched addressing make microprocessor interfacing a breeze. Though the conversion time of about 100 microseconds is slow, this isn't likely to be a serious problem. The chip architecture is ingenious. (See *Electronics* April 27, 1978, for a brief description.) This isn't important in order to use it for a data acquisition system—what is important is that the control signals, Read, Write and EOC are compatible with 8080, 8085, Z80, SC/MP and 6800 processors with little or no external logic.

I wanted to interface a TRS-80 with a view to such grandiose schemes as the simultaneous monitoring of a freezer temperature, three inside room temperatures, two outside temperatures, humidity and sunshine levels, wind speed, furnace stack and burner temperatures and oil consumption rate. This leaves four channels open for a

game of Pong!

My TRS-80 ADC interface (see Fig. 1) is port mapped, which is a little simpler than memory mapping. It's also easier to make subsequent changes to an eight-bit port address than to a 16-bit memory address. The analog channel is selected by writing to port OFEH the four-bit channel selector (D0-D3). With a clock frequency of about 300 KHz, provided by IC7, a 555 timer, it may take as little as four microseconds to output EOC (pin 13 of IC6) after channel selection and then perhaps a further 250 microseconds before EOC signals that the data are valid and may be read at port OFEH. Both these times are variable and it isn't possible to ensure the first transition is detected at higher clock frequencies. This should be borne in mind if changes are made to the ADC or processor clocks.

The Programs

Program Listing 1 shows a simple means of reading channel 0 (for example) into register A. The 100-microsecond loop ensures the above-mentioned EOC

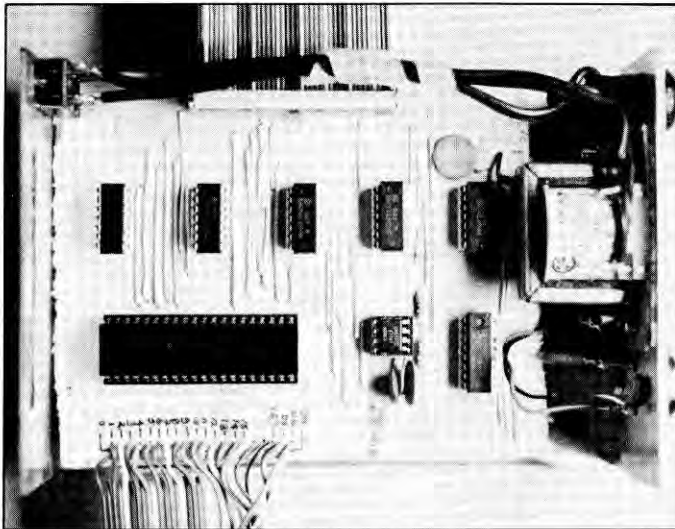


Photo 1. TRS-80 ADC

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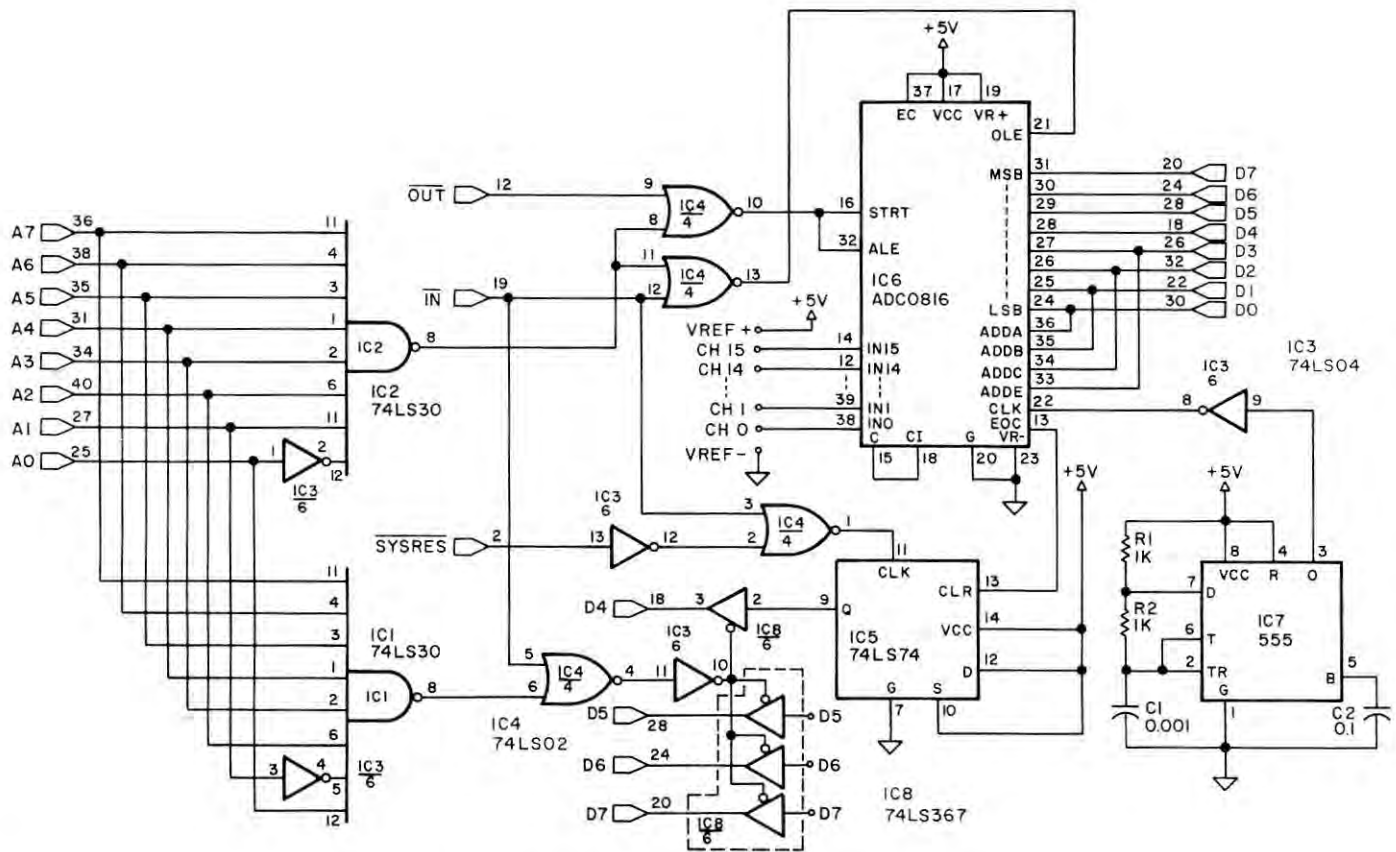


Fig. 1. Schematic for 16 Channels of TRS-80 ADC

delay time is well past before looking for EOC, latched into D4 at port OFDH. Listing 1 also shows the corresponding Basic routine. In this case the problem doesn't arise because the interpreter runs so slowly.

The EOC on D4 may be used to signal an interrupt if desired, in which case minor circuit changes will be required. Alternatively, D5, D6 or D7 can be used quite effectively in a polling system to indicate that updates are available for up to eight of the 16 input channels. As an example, Fig. 2 shows a circuit enabling one to sample the discharge rate of a capacitor. If R equals 25K, and T in 25-ms units measures the time for the voltage to fall to 1.85V (37 percent or 95/256 of 5V), then T equals C in microfarads. The TRS-80 expansion interface's 25-ms interrupt can be used for timing, and Program Listing 2 is a simple Basic program showing how to check the performance of capacitors from about five to 250 microfarads using this system.

A 40-Hz rate is too slow for many purposes and an external

clock must be supplied for sampling up to the maximum rate of about 4 KHz (for a single channel). Program Listing 3 shows how to sample 256 data from a waveform at channel 0, using the external clock applied at D5 with an upper limit of about 2.5 KHz.

It appears that the ADC08616 was designed specifically for ratiometric conversion, since reference and input voltages are equal. Any of the 16 analog inputs can be used as position sensors by connection to the wiper of a potentiometer which has the reference voltage applied across it. A position sensor has a host of potential applications, with one of the more obvious being a two-channel joystick interface—allowing up to eight participants.

Program Listing 4 shows a simple application of a joystick interface in which a jump to the interrupt service routine is placed into an interrupt vector at 4012H, used by the TRS-80's expansion interface. The interrupt service routine (ISR) relates the joystick's two channels to the positioning of a "*" cursor,

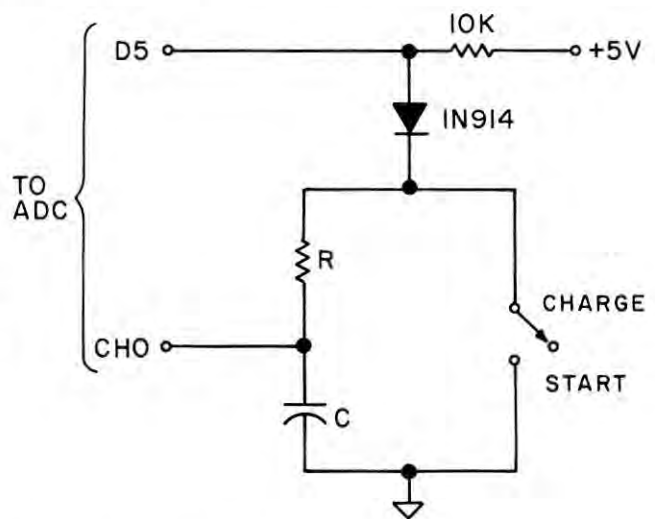


Fig. 2. Circuit to sample the discharge rate of a capacitor: D5 is used for the "look at me" signal

```

00100 ;READ DATA FROM PORT 0FEH
00110 ;ADC STATUS FROM PORT 0FDH
0000 3E00 00120 LD A,0 ;SELECT CHANNEL 0
0002 D3FE 00130 OUT (0FEH),A ;START CONVERSION
0004 0607 00140 LD B,7 ;7 LOOPS FOR .1 MS
0006 10FE 00150 TEOC DJNZ TEOC ;WAIT PAST TEOC
0008 DBFD 00160 TC IN A,(0FDH) ;GET ADC STATUS
000A CB67 00170 BIT 4,A ;EOC HIGH?
000C 28FA 00180 JR Z,TC ;NO, WAIT FOR TC
000E DBFE 00190 IN A,(0FEH) ;YES, GET DATA
0000 00200 END
00000 TOTAL ERRORS
10 OUT(254),0:REM SELECT CHANNEL 0
20 A=INP(254):REM READ INPUT DATA

```

Program Listing 1. Reading channel zero: assembly language and the equivalent Basic routines

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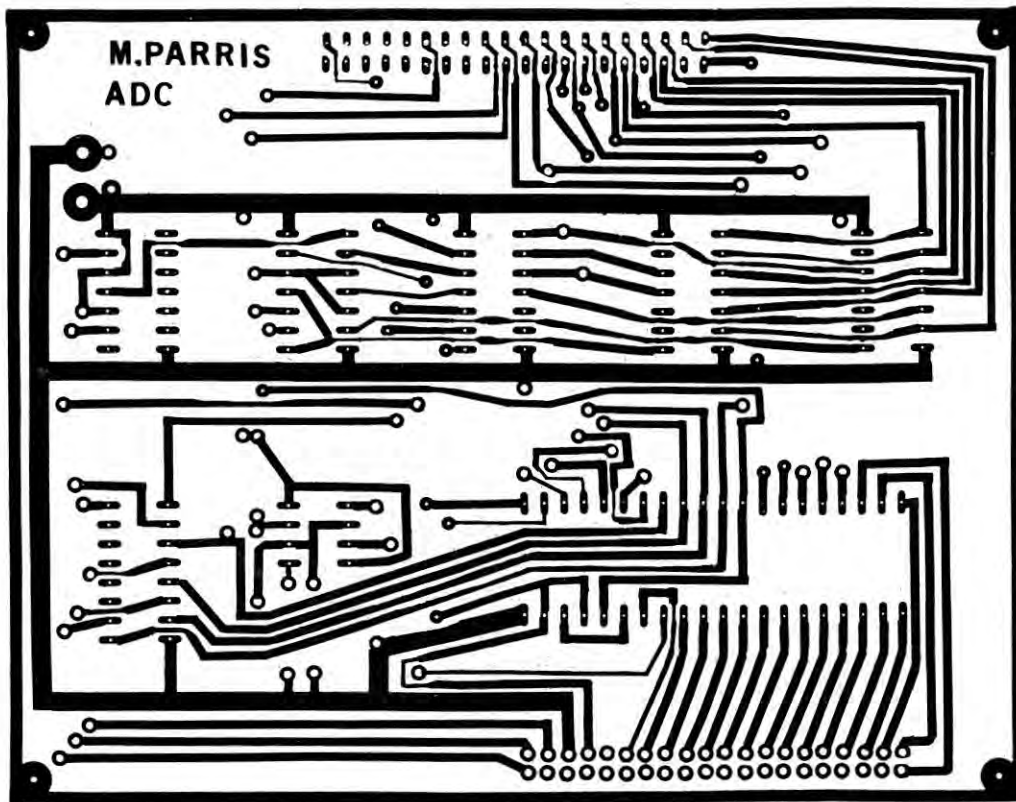
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enabling one to steer this over the screen with a smoothly updated (40 Hz) motion and insignificant slowing of a Basic program's execution. This is a valuable facility for non-keyboard instructional interaction; and is easily adapted to games of Pong or Battleship, maze threading and the like. Bear in mind that cassette transfers, being timing sensitive, will be precluded once the contents of 4012-4014H have been replaced, so Basic program loading must take place before running Program Listing 4.

This versatile chip is available for \$12 from Jameco. The circuit of Fig. 1 isn't difficult to wire-wrap, but for a neater job use a five by four-inch circuit board (see Fig. 3) matching a 40-pin header plug. I can supply the circuit board for \$6.50 plus \$2.00 postage (Ontario residents please add tax). ■

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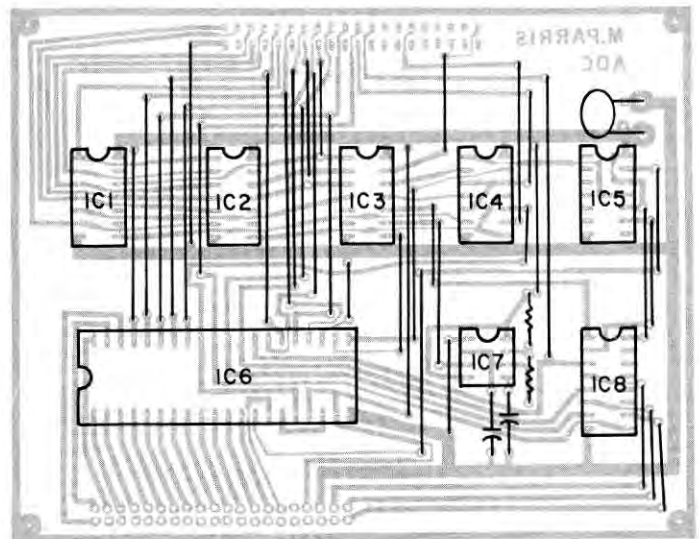


Fig. 3. a. Circuit-board pattern b. Component placement diagram

```

10 CLS
20 IF INP(253)=255 THEN 40
30 PRINT @ 320,"START SWITCH UP":GOTO 20
40 PRINT @ 384,"CHARGING":OUT(254),0
45 IF INP(254)<254 THEN 40
50 IF INP(253)=223 THEN 70
60 PRINT @ 448,"START SWITCH DOWN":GOTO 50
70 POKE 16448,0:REM ZERO THE TIMER
80 A=PEEK(16448):OUT(254),0
85 IF INP(254)>95 THEN 80
90 PRINT @ 512,"CAPACITY =" ;A;" MICROFARADS"

```

Program Listing 2. A Basic program to monitor a capacitor's discharge rate using the circuit of Fig. 2

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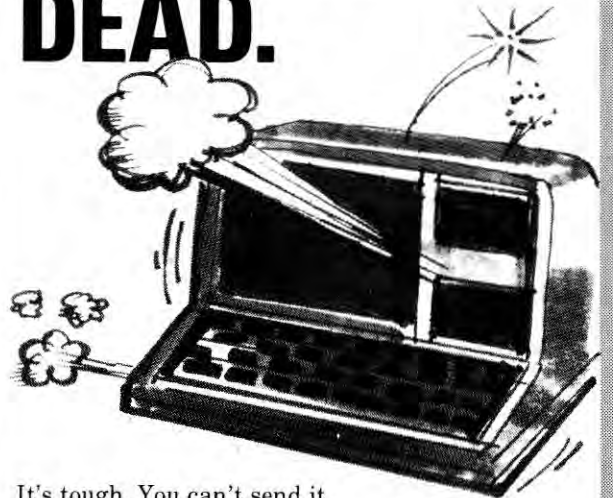
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```

0000      00100 ;COLLECT 256 BYTES FROM ADC
0000      00110      ORG 5000H      ;MUST START PAGE
0100      00120 STORE DEF5 256      ;WHOLE PAGE USED
5100 210050 00130 START LD HL,STORE
5103 0E20 00140      LD C,20H
5105 DBFD 00150 TIME IN A,(0FDH) ;GET THE CLOCK
5107 E620 00160      AND 20H      ;ON D5
5109 47 00170      LD B,A      ;STORE IT
510A A9 00180      XOR C      ;TIME YET?
510B 28F8 00190      JR Z,TIME ;NOT YET
510D 48 00200      LD C,B      ;YES, UPDATE IT
510E 3E00 00210      LD A,0      ;CHANNEL IS 0
5110 D3FE 00220      OUT (0FEH),A ;LOOK FOR DATA
5112 0607 00230      LD B,7      ;100 MICROSEC
5114 10FE 00240 TEOC DJNZ TEOC ;UNTIL VALID
5116 DFDD 00250 TC IN A,(0FDH) ;TO LOOK FOR
5118 CB67 00260      BIT 4,A ;LOC ON D4
511A 28FA 00270      JR Z,TC ;NOT YET
511C DBFE 00280      IN A,(0FEH) ;YES, GET DATA
511E 77 00290      LD (HL),A ;STORE IT
511F 2C 00300      INC L ;UPDATE STORE
5120 20E3 00310      JR NZ,TIME ;UNTIL NEW PAGE
5122 C3191A 00320      JP BASIC ;THEN EXT.
1A19 00330      EQU 1A19H ;FOR PROCESSING
0000      00340      END
00000 TOTAL ERRORS

```

Program Listing 3. An Assembly-language routine for fast ADC using an external clock applied at D5

```

5000      00100      ORG 5000H      ;MEM SIZE 20479
5000 003C 00110 STORE2 DEF5 3C00H ;VIDEO START
5002 20 00120 STORE1 DEF5 20H ;UPPER LEFT CHAR
5003 F3 00130 ISR DI
5004 E5 00140      PUSH HL
5005 F5 00150      PUSH AF
5006 C5 00160      PUSH BC
5007 D5 00170      PUSH DE
5008 3AE037 00180      LD A,(37E0H)
500B CB77 00190      BIT 6,A
500D 2043 00200      JR NZ,PDC
500F CB7F 00210      BIT 7,A
5011 2836 00220      JR Z,XIT
5013 AF 00230      XOR A ;GET HOR DATA
5014 CD5750 00240      CALL ADC
5017 1F 00250      RRA ;/4
5018 1F 00260      RRA
5019 E63F 00270      AND 3FH ;COLUMN
501B 263C 00280      LD H,3CH
501D 6F 00290      LD L,A
501E 3E01 00300      LD A,1 ;GET VERT DATA
5020 CD5750 00310      CALL ADC
5023 1F 00320      RRA ;/16
5024 1F 00330      RRA
5025 1F 00340      RRA
5026 1F 00350      RRA
5027 E60F 00360      AND 0FH ;ROW
5029 A7 00370      AND A
502A 2807 00380      JR Z,MARK
502C 47 00390      LD B,A
502D 114000 00400      LD DE,40H ;64 PER ROW
5030 19 00410 NEXTX ADD HL,DE
5031 10FD 00420      DJNZ NEXTX
5033 ED4B0050 00430 MARK LD BC,(STORE2) ;PREVIOUS PLACE
5037 220050 00440      LD (STORE2),HL ;THIS PLACE
503A 3A0250 00450      LD A,(STORE1) ;PREVIOUS CHAR
503D 60 00460      LD H,B
503E 69 00470      LD L,C
503F 77 00480      LD (HL),A ;PUT IT BACK
5040 2A0050 00490      LD HL,(STORE2)
5043 7E 00500      LD A,(HL)
5044 320250 00510      LD (STORE1),A ;THIS CHAR
5047 362A 00520      LD (HL),'*' ;MARK IT
5049 3AE037 00530 XIT LD A,(37E0H)
504C D1 00540      POP DE
504D C1 00550      POP BC
504E F1 00560      POP AF
504F E1 00570      POP HL
5050 FB 00580      EI
5051 C9 00590      RET
5052 3AEC37 00600 FDC LD A,(37E0H)
5055 18F2 00610      JR XIT
5057 D3FE 00620 ADC OUT (0FEH),A
5059 0607 00630      LD B,7
505B 10FE 00640 TEOC DJNZ TEOC
505D DBFD 00650 TC IN A,(0FDH)
505F CB67 00660      BIT 4,A
5061 28FA 00670      JR Z,TC
5063 DBFE 00680      IN A,(0FEH)
5065 C9 00690      RET
5066 F3 00700 START DI
5067 ED56 00710      IM 1
5069 FB 00720      EI
506A C3191A 00730      JP BASIC
1A19 00740 BASIC EQU 1A19H
4012 00750      ORG 4012H
4012 C30350 00760      JP ISR
0000 00770      END
00000 TOTAL ERRORS

```

Program Listing 4. An interrupt-driven Assembly-language routine to interface a simple joystick-controlled * cursor with the Basic interpreter

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CALENDAR

January

- 17-18 IEEE Computer Society, Silver Spring, MD. **Winter Simulation Conference** Holiday Inn at the Embarcadero, San Diego, CA.
- 17-20 IEEE Computer Society, Silver Spring, MD. **Optical Storage of Digital Data** Lake Tahoe, CA.
- 18-20 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education** Tallahassee, FL.
- 31-2 Future Computing Inc., Richardson, TX. **UCSD p-System Industry Forum** Loews Anatole, Dallas, TX.

February

- 7-9 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education** Washington, DC.

14-17 IEEE Computer Society, Silver Spring, MD. **Computer Science Conference** Orlando, FL.

16-18 IEEE Computer Society, Silver Spring, MD. **International Solid State Circuits Conference** New York, NY.

16-18 TALMIS, Oak Park, IL. **3rd Annual Software Publishers and Computer-based Training Conference** Ambassador West, Chicago, IL.

17-19 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education** New York, NY.

21-23 American Federation of Information Processing Societies Inc., Philadelphia, PA. **Office Automation Conference** Philadelphia Civic Center.

23-25 Future Computing Inc., Richardson, TX. **Personal Computer Retail Forum** Loews Anatole, Dallas, TX.

March

1-3 IEEE Computer Society, Silver Spring, MD. **COMPCON Spring '83** San Francisco, CA.

8 IEEE Computer Society, Silver Spring, MD. **MICRODELCON** Newark, DE.

10-12 The Council for Exceptional Children, Reston, VA. **Use of Microcomputers in Education** Hartford, CT.

16-18 IEEE Computer Society, Silver Spring, MD. **16th Annual Simulation Symposium** Tampa, FL.

17-19 Arizona State University, Tempe, AZ. **Microcomputers in Education** ASU campus.

29-31 IEEE Computer Society, Silver Spring, MD. **Workshop on Computer System Organization** New Orleans, LA.

31-1 IEEE Computer Society, Silver Spring, MD. **International Symposium on VLSI Technology and Systems** Taipei, Taiwan.

Coming Next Month

February's issue shows just what kids and computers can do. The Young Programmer's Contest has been a hit and next month's 80 contains the contest's winning entries. The complexity and number of contestant entries have sur-

prised us all, and we are sure they will amaze you.

Also within February's covers is a set of articles aimed at the younger. These educational programs can be used by

children with little or no supervision. Our new learning games teach math, spelling, the primary colors, our state capitals, and more. And some of these games are just plain fun!

TOOLS & TECHNIQUES FOR ELECTRONICS—by A. A. Wicks is an easy-to-understand book written for the beginning kit-builder as well as the experienced hobbyist. It has numerous pictures and descriptions of the safe and correct ways to use basic and specialized tools for electronic projects, as well as specialized metal-working tools and the chemical aids which are used in repair shops. \$4.95.* BK7348

HOBBY COMPUTERS ARE HERE! If you want to come up to speed on how computers work—hardware and software—this is an excellent book. It starts with fundamentals and explains the circuits and the basics of programming, along with a couple of TVT construction projects, ASCII, Baudot, etc. This book has the highest recommendations as a teaching aid. \$2.97.* BK7322

THE NEW HOBBY COMPUTERS—This book takes up from where *Hobby Computers Are Here!* leaves off, with chapters on Large-Scale Integration, how to choose a microprocessor chip, an introduction to programming, low-cost I/O for a computer, computer arithmetic, checking memory boards... and much, much more! Don't miss this tremendous value! BK7340 Only \$2.97.*

**BOTH
VOLUMES FOR \$4.95!
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KILOBAUD KLASROOM—by George Young and Peter Stark. Learning electronics theory without practice isn't easy. And it's no fun to build an electronics project that you can't use. *Kilobaud Klassroom*, the popular series first published in *Kilobaud Microcomputing*, combines theory with practice. This is a *practical* course in digital electronics. It starts out with very simple electronics projects, and by the end of the course you'll construct your own working microcomputer!

Authors Young and Stark are experienced teachers, and their approach is simple and direct. Whether you're learning at home or in the classroom, this book provides you with a solid background in electronics—and you'll own a computer that you built yourself! BK7386 \$14.95

AN INTRODUCTION TO MICROCOMPUTERS, VOL. 0—The Beginner's Book—Written for readers who know nothing about computers—for those who have an interest in how to use computers—and for everyone else who must live with computers and should know a little about them. The first in a series of 4 volumes, this book will explain how computers work and what they can do. Computers have become an integral part of life and society. During any given day you are affected by computers, so start learning more about them with Volume 0. BK1130 \$12.50.*

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AN INTRODUCTION TO MICROCOMPUTERS, VOL. 1—NEW 3rd Edition! Dedicated to the basic concepts of microcomputers and hardware theory. The purpose of Volume 1 is to give you a thorough understanding of what microcomputers are. From basic concepts (which are covered in detail), Volume 1 builds the necessary components of a microcomputer system. This book highlights the difference between minicomputers and microcomputers. BK1030 \$15.95

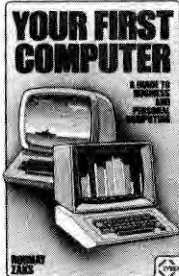
NEW NEW NEW

INTRODUCTION TO WORD PROCESSING by Hal Glatzer. This book explains in plain language what a word processor can do, how to use one, how it improves productivity—especially in businesses that handle lots of words—and how to buy one wisely. No technical knowledge required, for all first-time users and those considering purchasing a word processor. BK1238 \$12.95

A USER GUIDE TO THE UNIX SYSTEM by Jean Yates and Rebecca Thomas. Here at last is a clearly written book that allows you to use the Unix operating system easily, and at a fraction of the time it previously took. If you're using, evaluating or simply curious about this system, this is your book. BK1242 \$15.99

WORDSTAR MADE EASY by Walter A. Ettlin. Now WordStar is as simple to learn as it is easy to use. This book teaches WordStar in 14 easy lessons, saving hours of hard work. It comes with a convenient pull-out Command Card. BK1239 \$11.95

TRS-80 DATA COMMUNICATIONS SYSTEMS—by Frank J. Derfler. If you are interested in using the TRS-80 as a terminal or message system, this is the book to buy. It covers communications, technical material, software and hardware for the entire TRS-80 family of machines. BK1245 \$12.95

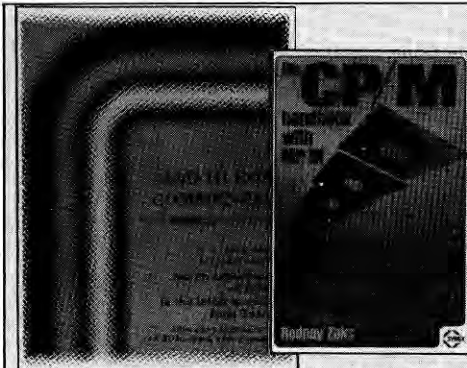


SOME OF THE BEST FROM KILOBAUD/MICROCOMPUTING—A collection of the best articles that have recently appeared in *Kilobaud/MICROCOMPUTING*. Included is material on the TRS-80 and PET systems, CP/M, the 8080/8085/Z80 chips, the ASR-33 terminal. Data base management, word processing, text editors and file structures are covered too. Programming techniques and hardware construction projects for modems, high speed cassette interfaces and TVTs are also included in this large format, 200 plus page edition. BK7311 \$10.95.*

DON'T (or How to Care for Your Computer)—by Rodney Zaks. In plain language, with numerous illustrations, this book tells all the do's and don't's of the care, preservation and correct operation of the small computer system. Specific chapters cover each piece of hardware and software, as well as safety and security precautions and help for problem situations. Have your computer work right the first time and keep it working. No technical background required. For all computer users. BK1237 \$11.95.

YOUR FIRST COMPUTER—by Rodney Zaks. Whether you are using a computer, thinking about using one or considering purchasing one, this book is indispensable. It explains what a computer system is, what it can do, how it works and how to select various components and peripheral units. It is written in everyday language and contains invaluable information for the novice and the experienced programmer. (The first edition of this book was published under the title "An Introduction to Personal and Business Computing".) BK1191 \$8.95*

MICROPROCESSOR INTERFACING TECHNIQUES—by Austin Lessea & Rodney Zaks—will teach you how to interconnect a complete system and interface it to all the usual peripherals. It covers hardware and software skills and techniques, including the use and design of model buses such as the IEEE 488 or S-100. BK1037 \$17.95.*



DOS RANDOM ACCESS & BASIC FILE HANDLING—By H.J. Muller. This book was written for the nonprogrammer. It is ideal for the businessman or professional who needs to solve and write special programs for in-house business problems, or the hobbyist who wants to go beyond the cassette recorder and into disk storage and file manipulation. It is written as a self-instruction tutorial and will provide anyone with some Level II experience with the ability to write special programs for inventories, mailing list, work scheduling, record keeping, research project data manipulation, etc. 150 pages. BK1236 \$29.50

TRS-80 DISK AND OTHER MYSTERIES—by Harvard C. Pennington. This is the definitive work on the TRS-80 disk system. It is full of detailed "How to use," information with examples, samples and in-depth explanations suitable for beginners and professionals alike. The recovery of one lost file is worth the price alone. BK1181 \$22.50.*

MICROSOFT BASIC DECODED AND OTHER MYSTERIES—by James Farvour. From the company that brought you *TRS-80 DISK AND OTHER MYSTERIES*. Contains more than 6500 lines of comments for the disassembled Level II ROMs and six additional chapters describing every BASIC subroutine, with assembly language routines showing how to use them. Flowcharts for all major routines give the reader a real insight into how the interpreter works. BK1186 \$29.50.*

Special Interests

MOD III ROM COMMENTED—Soft-Sector marketing, 1981. This book is not an instruction course on machine language, but rather an information source that you can use time and time again for writing your own program or patching old Mod I machine language programs. It contains an explanation of ROMs in the latest machine from Tandy, with most every location of the 14K ROMs listed, with comments. BK1235 \$22.50.

THE CUSTOM TRS-80 AND OTHER MYSTERIES—by Dennis Kitz. More than 300 pages of TRS-80 customizing information. With this book you'll be able to explore your computer like never before. Want to turn an 8 track into a mass storage unit? Individual reverse characters? Replace the BASIC ROMs? Make Music? High speed, reverse video, Level I and Level II? Fix it if it breaks down? All this and much, much more. Even if you have never used a soldering iron or read a circuit diagram, this book will teach you how! This is the definitive guide to customizing your 80! BK1218 \$29.95.*

BASIC FASTER AND BETTER AND OTHER MYSTERIES—by Lewis Rosenfelder. You don't have to learn assembly language to make your programs run fast. With the dozens of programming tricks and techniques in this book you can sort at high speed, swap screens in the twinkling of an eye, write INKEY routines that people think are in assembly language and add your own commands to BASIC. Find out how to write elegant code that makes your BASIC really hum, and explore the power of USR calls. BK1221 \$29.95.*

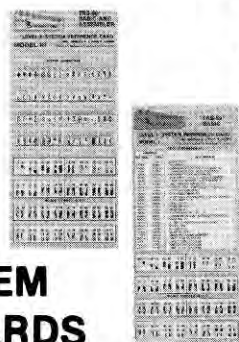
THE CP/M HANDBOOK (with MP/M)—by Rodney Zaks. A complete guide and reference handbook for CP/M—the industry standard in operating systems. Step-by-step instruction for everything from turning on the system and inserting the diskette to correct user discipline and remedial action for problem situations. This also includes a complete discussion of all versions of CP/M up to and including 2.2, MP/M and CDOS. BK1187 \$14.95.*

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Model III: BASIC only FC1004	\$3.95
Model III: BASIC and Assembler FC1003	\$5.95
Color: BASIC and Extended FC1006	\$4.95
ZX80, ZX81 and Timex Sinclair 1000 FC1012	\$5.95
Apple II: BASIC & 6502 FC1008	\$4.95

Z80

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INSIDE LEVEL II—For machine language programmers. This is a comprehensive reference guide to the Level II ROMs, allowing easy utilization of the sophisticated routines they contain. It concisely explains set-ups, calling sequences, variable passage and I/O routines. Part II presents an entirely new composite program structure which unloads under the SYSTEM command and executes in both BASIC and machine code with the speed and efficiency of a compiler. Special consideration is given to disk systems. BK1183 \$15.95.*

Z-80 ASSEMBLY LANGUAGE PROGRAMMING—by Lance A. Leventhal. This book thoroughly covers the Z-80 instruction set, abounding in simple programming examples illustrating software development concepts and actual assembly language usage. Features include Z-80 I/O devices and interfacing methods, assembler conventions, and comparisons with 8080A/8085 instruction sets and interrupt structure. BK1177 \$16.99.*

TRS-80 ASSEMBLY LANGUAGE—by Hubert S. Howe, Jr. This book incorporates into a single volume all the pertinent facts and information you need to know to program and enjoy the TRS-80. Included are clear presentations of all introductory concepts, completely tested practical programs and subroutines, details of ROM and RAM and disk operating systems, plus comprehensive tables, charts and appendices. Suitable for the first time user or more experienced users. BK1217 \$9.95.*

PROGRAMMING THE Z-80—by Rodney Zaks. Here is assembly language programming for the Z-80 presented as a progressive, step-by-step course. This book is both an educational text and a self-contained reference book, useful to both the beginning and the experienced programmer who wish to learn about the Z-80. Exercises to test the reader are included. BK1122 \$15.95.*

6809 MICROCOMPUTER PROGRAMMING AND INTERFACING—by Andrew C. Staugaard, Jr. Getting involved with Tandy's new Color Computer? If so, this new book from the Blacksburg Group will allow you to exploit the awesome power of the machine's 6809 microprocessor. Detailed information on processor architecture, addressing modes, register operation, data movement, arithmetic logic operations, I/O and interfacing is provided, as well as a review section at the end of each chapter. Four appendices are included covering the 6809 instruction set, specification sheets of the 6809 family of processors, other 6800 series equipment and the 6809/6821 Peripheral Interface Adapter. This book is a must for the serious Color Computer owner. BK1215 \$13.95.*

MICROCOMPUTING CODING SHEETS *Microcomputing's* dozen or so programmers wouldn't try to work without these handy scratch pads, which help prevent the little errors that can cost hours and hours of programming time. Available for programming is Assembly/Machine Language (PD1001), which has columns for address, instruction (3 bytes), source code (label, op code, operand) and comments; and for BASIC (PD1002) which is 72 columns wide, 50 sheets to a pad. \$2.39.*



WAYNE GREEN BOOKS

SELECTRIC INTERFACE—by George Young You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. **SELECTRIC™ INTERFACE**, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Classroom" series, offers a low-cost alternative to buying a daisy wheel printer. **SELECTRIC INTERFACE** includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With **SELECTRIC INTERFACE** and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included. BK7368 (125 pages) \$12.97

TEXTEDIT—A Complete Word Processing System in Kit Form

by Irwin Rappaport
TEXTEDIT is an inexpensive word processor that can be adapted to suit your differing needs—from form letters to lengthy texts. Written in TRS-80 Disk BASIC, the system consists of several modules, permitting the loading and use of only those portions needed. A disk is also available which provides the direct loading of the modules, however the book is required for documentation. For Model I and III with TRSDOS CONVERT, one disk drive (2 disk drives or copy utility needed to transfer to system disk). Runs under TRSDOS 2.2/2.3. May not function under other systems. BK7367 (book, 90 pages) \$9.97 DS7367 (disk) \$19.97

THE NEW WEATHER SATELLITE HANDBOOK—by Dr. Ralph E. Taggart WB8DQT. Here is the completely updated and revised edition of the best-selling *Weather Satellite Handbook*—containing all the information on the most sophisticated and effective spacecraft now in orbit. Dr. Taggart has written this book to serve both the experienced amateur satellite enthusiast and the newcomer. This book is an introduction to satellite watching, that tells you how to construct a complete and highly effective ground station. Not just ideas, but solid hardware designs and all the instructions necessary to operate the equipment are included. An entire chapter is devoted to microcomputers and the Weather Satellite Station, and for the thousands of experienced amateurs who are operating stations. *The New Weather Satellite Handbook* details all the procedures necessary to follow the current spacecraft. Weather Satellite contains Operation Satellite Systems, Antenna Systems, Weather Satellite Receivers, A Cathode Ray Tube (CRT) Monitor for Satellite Picture Display, A Direct-Printing Facsimile System for Weather Satellite Display, How to Find the Satellite, Test Equipment, Microcomputers and the Weather Satellite Station, Station Operations. BK7383 \$8.95.*

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Basic & Pascal



THE BASIC HANDBOOK—SECOND EDITION—by David Lien. This book is unique. It is a virtual ENCYCLOPEDIA of BASIC. While not favoring one computer over another, it explains over 250 BASIC words, how to use them and alternate strategies. If a computer does not possess the capabilities of a needed or specified word, there are often ways to accomplish the same function by using another word or combination of words. That's where the HANDBOOK comes in. It helps you get the most from your computer, be it a "bottom-of-the-line" micro or an oversized monster. BK1174 \$19.95.*

LEARNING TRS-80 BASIC—by David A. Lien. Dr. Lien, who is the author of THE BASIC HANDBOOK and the original Radio Shack LEVEL I USER'S MANUAL, has compiled a tutorial which includes portions of the original USER'S MANUAL, and most of LEARNING LEVEL II along with extensive additions. It will completely cover the TRS-80 Models I, II, III, and 16 (sorry, not the color or pocket computers). It is, of course, written in the easy learning style which readers of Dr. Lien's books have come to enjoy. BK1175 \$19.95.

BASIC BASIC (2ND EDITION)—by James S. Coan. This is a textbook which incorporates the learning of computer programming using the BASIC language with the teaching of mathematics. Over 100 sample programs illustrate the techniques of the BASIC language and every section is followed by practical problems. This second edition covers character string handling and the use of data files. BK 1026 \$11.50.*

BUSINESS SYSTEM BUYER'S GUIDE—By Adam Osborne with Steven Cook. When you enter the market place of small business computers, you face a bewildering array of products, prices, features and fables. This guide cuts through the jargon and unravels the task of buying the right computer system. This book provides solid information on how to determine your needs, how to choose software and hardware for all business applications, what to expect from vendors, what to avoid, and what questions you must ask. It also provides a wealth of detailed information on products, manufacturers, retailers and the whole microcomputer market. BK1229 \$9.95

SO YOU ARE THINKING ABOUT A SMALL BUSINESS COMPUTER—by Richard G. Canning and Nancy C. Leeper. For a well-organized manual on the process of selecting the right computer system for your small business, this text can't be excelled. Designed to introduce the novice in data and word processing to the real benefits of computerization, the book is filled with money- and time-saving tips, photos of equipment, lists of suppliers, prices, explanations of computer terminology, and helpful references to additional sources of information. Everyone contemplating a first computer installation should have this book. BK1222 \$14.00*

INTRODUCTION TO TRS-80 LEVEL II BASIC AND COMPUTER PROGRAMMING—by Michael P. Zabinski. Written by an experienced educator, this is the book for those beginners who want to learn about computers without having to become an expert. It has practical programs, useful line-by-line comments, excellent flowcharts accompanied by line numbers and over 200 exercises which help the reader assess progress, reinforce comprehension, and provide valuable practical experience. BK1219 \$10.95.*

50 BASIC EXERCISES—by J. P. Lamoitier. This book is structured around the idea that the best way to learn a language is through actual practice. It contains 50 completely explained exercises: statement and analysis of the problem, flowcharts, programs and actual runs. Program subjects include mathematics, business, games, and operations research, and are presented in varying levels of difficulty. This format enables anyone to learn BASIC rapidly, checking their progress at each step. BK1192 \$12.95*.

NEW REVISED EDITION

PROGRAMMING IN PASCAL—by Peter Grogono. The computer programming language PASCAL was the first language to embody in a coherent way the concepts of structured programming, which has been defined by Edsger Dijkstra and C.A.R. Hoare. As such, it is a landmark in the development of programming languages. PASCAL was developed by Niklaus Wirth in Zurich; it is derived from the language ALGOL 60 but is more powerful and easier to use. PASCAL is now widely accepted as a useful language that can be efficiently implemented, and as an excellent teaching tool. It does not assume knowledge of any other programming language and therefore suitable for an introductory course. BK1140 \$12.95.*

ADVANCED BASIC—Applications including strings and files, coordinate geometry, area, sequences and series, simulation and graphing and games. BK1000 \$11.50

INTRODUCTION TO PASCAL—By Rodney Zaks. A step-by-step introduction for anyone wanting to learn the language quickly and completely. Each concept is explained simply and in a logical order. All features of the language are presented in a clear, easy-to-understand format with exercises to test the reader at the end of each chapter. It describes both standard PASCAL and UCSD PASCAL, the most widely used dialect for small computers. No computer or programming experience is necessary. BK1189 \$15.95

Moneymaking

HOW TO MAKE MONEY WITH COMPUTERS—In 10 information-packed chapters, Jerry Felsen describes more than 30 computer-related, money-making, high profit, low capital investment opportunities. BK1003 \$15.00.*

HOW TO SELL ANYTHING TO ANYBODY—According to *The Guinness Book of World Records*, the author, Joe Girard, is "the world's greatest salesman." This book reveals how he made a fortune—and how you can, too. BK7306 \$2.25.*

THE INCREDIBLE SECRET MONEY MACHINE—by Don Lancaster. A different kind of "cookbook" from Don Lancaster. Want to slash taxes? Get free vacations? Win at investments? Make money from something that you like to do? You'll find this book essential to give you the key insider details of what is really involved in starting up your own money machine. BK1178 \$5.95.*

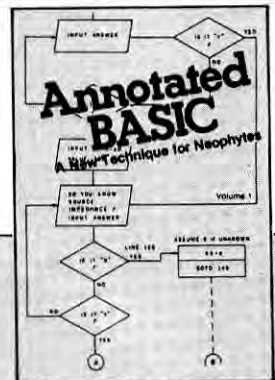
Business

SOME COMMON BASIC PROGRAMS—Published by Adam Osborne & Associates, Inc. Perfect for non-technical computerists requiring ready-to-use programs. Business programs, plus miscellaneous programs. Invaluable for the user who is not an experienced programmer. All will operate in the stand-alone mode. BK1053 \$14.99 paperback.

THEORY Z—How American Business Can Meet the Japanese Challenge—by William Ouchi. Why are the Japanese catching up and surpassing American industrial productivity? What allows Japanese industrialists to offer guaranteed lifetime employment to their workforce? This book will help you understand the Theory Z managerial philosophy and its implications for the American corporate future. Examples are given of the American industrial giants already operating under Z-style management, and the impact of this style on the quality of their executives and workers is explored. A must for the alert businessman, large or small. BK1226 \$12.95*

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ANNOTATED BASIC—A NEW TECHNIQUE FOR NEOPHYTES.—BASIC programming was supposed to be simple—a beginner's programming language which was so near to English that it could be easily understood. But, in recent years, BASIC has become much more powerful and therefore much more difficult to read and understand. BASIC simply isn't basic anymore.

Annotated BASIC explains the complexities of modern BASIC. It includes complete TRS-80™ Level II BASIC programs that you can use. Each program is annotated to explain in step-by-step fashion the workings of the program. Programs are flowcharted to assist you in following the operational sequence. And—each chapter includes a description of the new concepts which have been introduced.

Annotated BASIC deals with the hows and whys of TRS-80 BASIC programming. *How* is a program put together? *Why* is it written that way? By observing the programs and following the annotation, you can develop new techniques to use in your own programs—or modify commercial programs for your specific use. *Annotated BASIC* Volume 1 BK7384 \$10.95 *Annotated BASIC* Volume 2 BK7385 \$10.95 *Order Both Volumes and Save!* BK738402 \$18.95

Games

CAPTAIN 80 BOOK OF BASIC ADVENTURES—by Robert Liddil. This book contains 18 of the most popular Adventure programs available today; all in one easy to read book with listings ready to be keyed in to your computer. This unique book also contains an ADVENTURE GENERATOR program, not available from any other source. This generator program will actually write another BASIC ADVENTURE PROGRAM! Although specifically written for the TRS-80 Model I & III, these programs are adaptable to other computers using Microsoft BASIC. BK 1240 \$19.95.

40 COMPUTER GAMES FROM KILOBAUD MICROCOMPUTING—Forty games in all in nine different categories. Games for large and small systems, and even a section on calculator games. Many versions of BASIC used and a wide variety of systems represented. A must for the serious computer gamesman. BK7381 \$7.95.*

BASIC COMPUTER GAMES—Okay, so once you get your computer and are running in BASIC, then what? Then you need some programs in BASIC, that's what. This book has 101 games for you from very simple to real buggers. You get the games, a description of the games, the listing to put in your computer and a sample run to show you how they work. Fun. Any one game will be worth more than the price of the book for the fun you and your family will have with it. BK1074 \$7.50.*

MORE BASIC COMPUTER GAMES—Edited by David H. Ahl. More fun in BASIC! 84 new games from the people who brought you *BASIC Computer Games*. Includes such favorites as Minotaur (battle the mythical beast) and Eliza (unload your troubles on the doctor at bargain rates). Complete with game description, listing and sample run. BK1182 \$7.50.*

WHAT TO DO AFTER YOU HIT RETURN—PCC's first book of computer games... 48 different computer games you can play in BASIC... programs, descriptions and many illustrations. Lunar Landing, Hamurabi, King, Civel 2, Qubic 5, Taxman, Star Trek, Crash, Market, etc. BK1071 \$16.50.*

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NEWS THIS MONTH

RESISTANCE TO TANDY'S COLOR CLONE

There appears to be some grumbling among the handpicked distributors for the TDP-100, the first Tandy computer marketed outside the Radio Shack chain.

PAGE 374

PC INTO I PLUS III WILL GO

A California firm has a slavedriver that will make PC programs run on a TRS-80.

PAGE 376

THE NEW SOURCE

A cast of comic characters will be helping the "Avis" of the information utility business get its new system on the road to success.

PAGE 378

HARDWARE

Enter the Dragon

Will Tandy be a dragonslayer for this 6809-based import?

BY JOHN P. MELLO JR.

80 MICRO NEWS EDITOR

While industry observers level their steely eyes across the Pacific at Japan waiting for that nation to enter the low-end computer market, another invasion may be in the making on the other side of the Atlantic.

The low-end melee in America has spread to Her Majesty's isle and the results could be some tough competition in 1983 for the Color Computer. Its most formidable foe would be the Dragon 32 (see Jake Commander's col-

umn on page 37).

"The Dragon is probably our fiercest competitor," Tandy UK Managing Director John Sayers told *80 Micro*. "The VIC-20 and the Dragon are the two most aggressively marketed machines in

the United Kingdom.

The computer manufactured by Dragon Data Ltd., Swansea, Glamorgan, UK, has the same 8-bit microprocessor as the Color Computer (Motorola's 6809E). Standard equipment includes 32K of RAM, typewriter keyboard, Microsoft Extended Color Basic, and five octaves of sound (255 tones). It costs about \$350.

Sayers said about 80 percent of Tandy's ROM pack software will run on the Dragon. That surprised Dragon's sales and marketing director, Richard Wadman. "Do you mean to tell me that Tandy told you that 80 percent of their software will run on our machine?" he replied when informed by *80 Micro* of Sayer's comments. "That was nice of them."

"Being a 6809," Wadman explained, "if you write pure 6809 code and you go straight in, you've got no problems. It should run straight away. The problem is the Microsoft Basic we use is different than Tandy's. The routines are in different places."

He said about 30 programs are available for his micro, most of them games.

Although the Dragon is priced £40 below the Color Computer, Sayers said Tandy isn't waging a price war against it.

"I think the fact that has to be put



Tandy UK: 80 percent of the Color Computer's ROM packs will run on the Dragon 32.

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NEWDOS/80
Version 2.0

	Poor	Fair	Good	Excellent
Performance	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Documentation	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Ease of Use	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Error Handling	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



across," he noted, "is the Color Computer is £40 more, but for that £40 you get better support, better backup. You've got the ability to upgrade to any configuration you like, including disks. And that's the way we sell it."

However, the sting of the low-end war may have cracked Tandy's armored pricing policy. Sayers noted the Fort Worth firm may be manufacturing Color Computers in Korea next year. But the Tandy UK executive did not know what effect the move would have on the computer's price.

Another difficulty competing with Dragon, Sayers claimed, is the firm is subsidized by the government. Wadman denied that. "We have no subsidies from anywhere," he said.

Sayers also rapped the documentation for the Dragon: "What's happening, would you believe it, is the manual that's coming with the Dragon is pretty lousy and people are trying to buy the [Color Computer] manual off us."

Wadman countered: "We've had about 16 reviews in this country and only one of them has mentioned the documentation as being no good. It's not the

same documentation as the Tandy. It's a little more serious, but the British like to think that they're a little more serious than the Americans."

Dragon began selling its micro last August and by September it had sold 11,000 machines. "We've been pleasantly surprised by its sales," Wadman said. Production was about 7,000 units a month in 1982, but Wadman said it would be stepped up this year "because of interest in Europe."

Another low-end micro in the UK is the Color Genie marketed by Lowe Electronics Ltd. of Matlock, Derbyshire. According to Keith Bedford, Lowe's service and development manager, the Color Genie's edge in the crowded market is its Z80 microprocessor.

"The ordinary programs written for the TRS-80 Model I and Model III or Genie will run on the Color Genie," maintained Bedford. And since many software writers are familiar with the Z80, he said, the Color Genie has greater potential than other machines for getting software written for it.

At £199, the Color Genie is also priced below the Color Computer, but

Tandy's Sayers claimed the Lowe machine, manufactured by EACA International Ltd. of Hong Kong, isn't much of a threat to the Radio Shack micro: "The one from Lowe is not really in the business at all. We don't hear much of it. We don't see much of it."

But Bedford said the Color Genie has advantages over the Color Computer. "It's a lot easier to use," he said of the new Genie, "and it's got a lot more features on it." Those features include a typewriter keyboard, three-channel sound, four programmable function keys, and upper- and lowercase character display.

When will the British invasion take place? Apparently not soon.

"Officially," Dragon's Wadman said of his firm's micro, "we don't have any plans to market it there, but we are talking to people in the States."

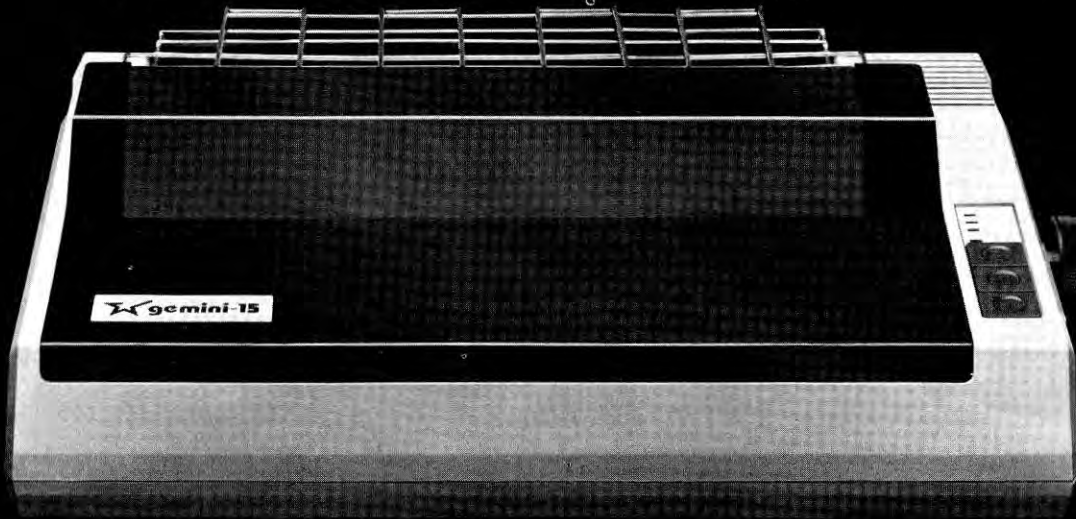
And at Personal Micro Computers Inc. of Mount View, CA, Lowe's American distributor, a spokesman said the company had been studying the Color Genie, but hadn't made a commitment to market the machine in the United States yet. ■

A glance at the **low-end warriors**

FEATURES	COLOR COMPUTER	DRAGON 32	COLOR GENIE
Microprocessor	6809E	6809E	Z80
Standard RAM	16K	32K	16K
Maximum RAM	32K	64K	32K
Display (characters by lines)	32 × 16	32 × 16	24 × 40
Resolution for Graphics	256 × 192	256 × 192	160 × 96
Typewriter Keyboard	NO	YES	YES
Upper and Lowercase	NO	NO	YES
RS-232C	YES	YES	YES
Sound	1 Channel	1 Channel	3 Channel
Baud Rate	1200	1500	1200
Colors	9	9	8



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Gemini's flexibility is embodied in its diverse specialized printing capabilities such as super/sub script, underlining, back-spacing, double strike mode and emphasized print mode. Another extraordinary standard

feature is a 2.3K buffer. An additional 4K is optional. That's twice the memory of leading, comparable printers. And Gemini is compatible with most software packages that support the leading printers.

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DOCUMENTATION

Set it by phone

Firms in California and Michigan pioneer typesetting by telephone.

By ERIC P. GREVSTAD
CONTRIBUTING EDITOR

Micro owners, your timeless writing can now be typeset by telephone. And at a price upsetting to your local print shop.

According to Marleen Winer, co-owner of TeleTypesetting Company of Ann Arbor, MI, her firm can typeset a user's copy at half the cost of commercial typesetting. A \$20 to \$30 job at the print shop, she said, costs \$6 per 8.5-by-11-inch page.

Users can earn "considerable savings" by phone typesetting, said Steve Westmoreland, vice president of Type Share in Downey, CA. His firm charges \$4 per foot of copy on 4-inch-wide paper and \$6 per foot on 8-inch-wide paper.

Users also pay telephone costs and overnight delivery charges. In the case of Type Share, CompuServe charges are involved.

Both companies offer a choice of type styles, number of columns, and other format options. The Michigan firm adds a free computerized spelling check.

Users can send Type Share copy to CompuServe at any time. TeleTypesetting, if called in advance, will leave its machines on overnight to receive material.

Despite its convenience and low cost, typesetting by phone hasn't birthed a bevy of cottage publishers.

"Our customers are businesses or those aspiring to be in business," said Winer of TeleTypesetting.

Westmoreland noted, "We have one lady who writes poetry," but many of

Type Share's users are "people in the printing business, who don't have a large need for typesetting but want to offer it as part of their service."

The typesetters supply users with codes for setting column widths, type-style, and other specifications. When word processing a document, the user imbeds the codes in it.

While sprinkling your words with codes takes some getting used to, Winer said, most customers take it in stride: "I give them a test paragraph and most of them don't even bother with it. . . We have people who get it right doing four- or five-page newsletters the first time."

After converting word-processed copy to ASCII, TeleTypesetting users phone their copy directly to that firm. Type Share customers dump their ASCII copy into CompuServe, where it is retrieved by the California company's computers.

When the firms' computers receive the copy, they run it through typesetting machines. The finished work is returned to the user by overnight carrier or the

United Parcel Service.

Westmoreland estimated 30 percent of his customers "never had a computer before" coming to Type Share for typesetting. For computer novices, the firm offers a \$775 starter package. It includes a VIC-20, modem, and typesetting manual.

Conventional rather than specialized work is phone typesetting's forte, Westmoreland contended: "If a guy is going to send one business card, he can probably get it done cheaper locally. [With] people sending three, four, or five pages [the service] starts to pay for itself."

It pays best for someone in business, he said. "One of the key things this does for someone with a computer is turn it into something they can make money at, make it really a practical-usage tool."

Winer added the novelty of computer typesetting has its own attractions: "The people who really like our service are those who think some way computers are neat, and this is one more neat thing they can do with their microcomputer." ■

BUSINESS

TDP resistance

Tandy's first-time scheme to go outside its Radio Shack system reportedly has encountered some distributor resistance.

Selling Color Computers outside Radio Shack stores reportedly has been met with resistance by some of the independent RCA distributors targeted to peddle the machine to their retail customers.

Some distributors have told the *Electronic News* they would not market the TDP-100 for Tandy.

Pricing, as some market analysts predicted (*80 Micro*, November 1980, p. 458), appears to be a monkey wrench in Tandy's outside distribution scheme.

Tandy sweetened the plan in October by chopping \$50 from the \$273 price distributors were slated to pay for the TDP-100. That cut, reportedly, would make the suggested retail price of the TDP \$379.

When asked by *80 Micro* about the reports of distributor resistance, Ron Stegall, Tandy's vice president for retail computer marketing, observed: "I'm not aware of that. I don't know why they would resist it. It's selling very well out there in 4500 [Radio Shack] stores."

But not well enough for Tandy to maintain its share of the market, several

analysts have maintained. They see the Fort Worth firm's outside distribution "experiment" as a concession its Radio Shack chain may be inadequate to retain its slice of the low-end pie.

One distributor challenged those analysts' contentions. The distributor, who requested anonymity, explained low prices aren't the only thing on a consumer's mind when making a purchase. "That's how you sell Buicks, Chevrolets and Cadillacs," he said.

He maintained many children work with Color Computers in school. If they have to choose between a TDP or some other brand, they'll choose what they're familiar with, he said.

Another reason consumers will buy the machine, he contended, is Tandy is recognized as a blue chip name in microcomputers.

But the computers sent to the in-

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Serial Line Analyzer
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dependent distributors will be marketed as TDP products—not Tandy's. That discouraged one distributor to pass up the chance to sell the computers.

"It was really the merchandising approach from Tandy Corporation that scared the living daylights out of us," said Dennis D'Angelo, general manager of the specialty products division of Raymond Rosen Company located in Philadelphia, PA.

"The only way to sell this product is to say, 'Hey, this is a product of the Tandy Corporation,'" he explained. "They're going to merchandise this as TDP electronics and advertise it as TDP electronics."

Retailers could be persuaded to sell the higher-priced TDP, he said. "It's not in discount stores hanging from fishwires a la Toys R Us." And with competitive pressure driving home computer prices down, he continued, merchants could make a little more money on a TDP.

"But we felt it was going to be a hard sell—especially at the retail price point they were at and not having a national program behind it," he said.

He noted, "They never presented to us any concrete program. They never said we're going to run so many ads to sell the TDP name."

The TDP's retail price wasn't the only pricing problem for D'Angelo's business: "They never gave us a commitment that we would be competitive with Radio Shack. There was always the

possibility Radio Shack would be lower than us."

"There's no price protection offered to a distributor," he said. "We felt that to take a lot of inventory would place us in a precarious position."

Another disadvantage Raymond Rosen Company found with the Tandy plan was it offered no room for expansion. "We were limited to Color Computers," D'Angelo said, "and we wanted to offer the II and III to our customers, too."

The current product line of D'Angelo's firm doesn't include microcomputers. "We were going to enter the business through the TDP," he noted. "Now we're just dragging our feet. We're talking with some people and will probably get into business some time in 1983."

Although Raymond Rosen won't be carrying the Color Computer clone, D'Angelo had kudos for the micro: "The machine is a great machine. No doubt about it. It's probably a better machine than a lot of the personal computers out there today.

"It was the merchandising approach that went behind it that we were concerned with. We felt that in the long term we would be losers. And more importantly, our dealerships would be losers. We have to go back to those people and sell them a lot of other equipment. We can't burn our bridges behind us." ■

HARDWARE

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The device, called MicroMerlin, is a single-board micro that plugs into the Model III's 50-pin connector or the external bus connector of the Model I Expansion Interface.

"You don't have to open up anything," explained Manolito Aden, president of Micro Projects Engineering Company. "You just plug it in and your Radio Shack will be able to run programs written for the IBM PC as long as they use CP/M-86 function calls."

MicroMerlin contains an Intel 8088



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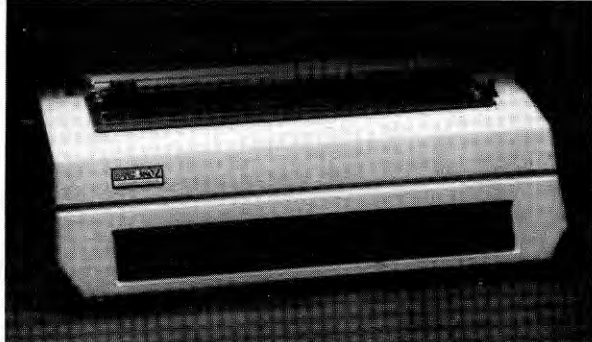
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chip, the microprocessor in the PC. Once you plug MicroMerlin into your TRS-80, you can boot a DOS in drive 0, insert a PC disk in drive 1, and Aden's gadget will run the IBM program.

When you run a PC program, MicroMerlin uses the TRS-80 as a slave. The two microprocessors, the Z80 and 8088, run independently, Aden said. The Radio Shack machine's Z80 does its thing—checking the keyboard, operating the disk drive, working the monitor—he explained, but it also responds to demands made on it by MicroMerlin.

With the addition of a disk controller, he noted, MicroMerlin can act as a stand-alone computer. In that mode, you can connect a dumb terminal to the box via its serial port.

"We've got a customer in Pennsylvania who wants a couple of hundred of these," Aden said. "He's going to supply his own terminals. We have a command in the operating system that switches control from the Radio Shack computer to the serial port. That customer will be able to run 80-column programs right away."

MicroMerlin, with 64K of random access memory and 8K of erasable programmable read-only memory, costs \$1195. CP/M-86 can be purchased from Aden's Culver, CA, enterprise for \$249. Other options include an expander card for additional memory (\$275) and RS-232 interface (\$89).

MicroMerlin's memory can be expanded to 256K. Aden's price for each 64K block of memory is \$189.

Aden said demand for his gadget has been brisk: "We've got our first month of production already booked." ■

COMMUNICATIONS

New Primes at Source

Will new \$5 million center put Source on top in info utility business?

BY ALAN ABBEY

SPECIAL TO 80 MICRO

Snoopy, Miss Piggy, and Garfield are helping The Source expand its on-line computing capacity by 10 times, so it can add more than 200,000 subscribers in a few years.

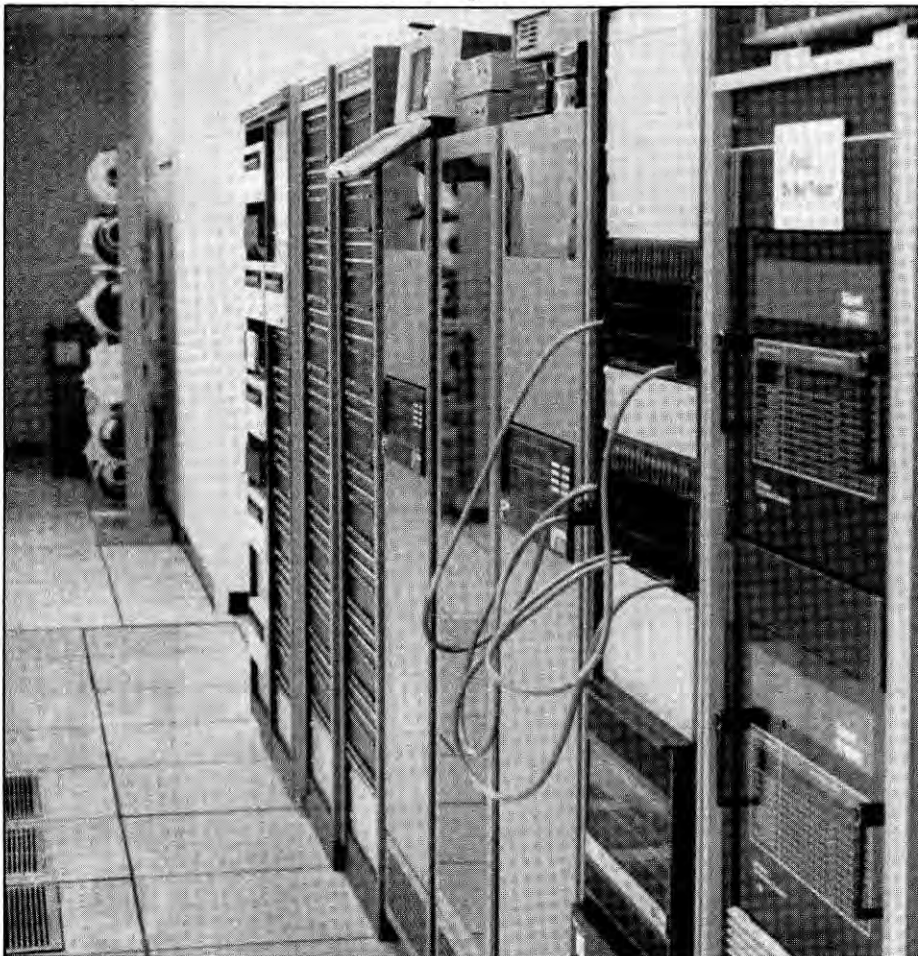


Photo by Allan Abbey

The cartoon characters and six other stuffed animals sit atop each of the seven new and two older Prime 750 computers The Source has installed in its basement computer center in spanking new offices in McLean, VA. The dolls identify each of the computers, so The Source's programmers can quickly identify which machines need attention.

The dolls add a humorous touch to what is a deadly serious step to greatly expand the company's capacity and thrust the three-year-old firm into the forefront of the information utility field.

The computers, along with a Telenet and Tymnet switching system to handle user calls, were unveiled at a glossy ceremony on Columbus Day at The Source's new headquarters. It was attended by industry, press, and politicians, including Virginia Governor Charles Robb and former Defense Secretary Melvin Laird.

The computing center represents a \$5 million investment and a vote of confidence in The Source by its parent company, the Reader's Digest Association, which bought the fledgling information utility two years ago. Until the expanded Prime 750 system went on line last September, The Source had been relying on a management firm across town from its old offices to operate and maintain its system of two Prime com-

The Source hopes its new Primes will end the sluggishness and slow response time of the old information system.

BEFORE YOU GET TOO EXCITED ABOUT LOBO'S NEW COMPUTER, THERE'S SOMETHING YOU SHOULD KNOW.

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- **All disk interfaces built in.** Plug in any combination of 5¼" floppies, 8" floppies, and Winchester disk.
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- **Plus:** numeric keypad with 4 function keys, software definable text and graphics characters, built-in clock/calendar with battery backup, and buffered I/O expander port.

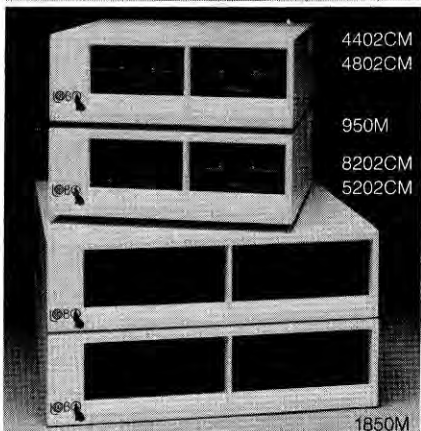
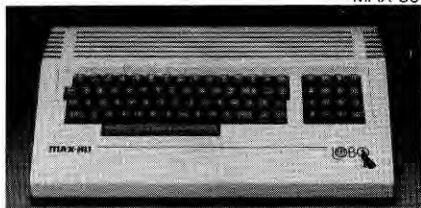
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LDOS operating system in addition to CP/M	\$ 69.00

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4402CM single-sided, 40 track; 180 kB per diskette	\$ 690.00
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5202CM double-sided, double density; 1155 kB per diskette	\$1,485.00
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950M 5¼" system: 4.8 MB hard disk plus 720 kB floppy	\$2,405.00

950MX same as 950M above but no floppy drive	\$2,100.00
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↪535



Photo by Allan Abbey

Virginia Governor Charles Robb (left), The Source's Chief Executive Officer, George Grune, and Defense Secretary Melvin Laird, now chief counsel for Readers Digest at dedication ceremonies for The Source.

puters. The outside firm also owned the software that ran the system, and The Source's electronic mail and bulletin board programs.

By the company's own admission, the early system was sluggish to respond to user calls and was vulnerable to power failures. The new computer center, with its expanded capacity, dedicated back-up computer, and on-site power supply, will answer both those problems, Source officials predict. "We will have more capacity and more reliable hardware and software," said Jeff Entwistle, the company's bearded director of systems development.

Clearly, reliability and room for expansion are chief among the new system's selling points. For now at least, there will be no new services added as the company tries to improve what it has on line for users. The company is still introducing its newly improved electronic mail, a service aimed at the business clients it is aggressively courting. Entwistle promises new offerings in the future, but said the company will keep them a surprise until they are ready for unveiling.

The Source is going for what it believes is a growing market of people and businesses who fall between the two universes of traditional timesharing users, the early hobbyists, and the original heavy number crunchers, such as banks.

To be prepared for its big push, The Source expanded its Prime 750 computer system. Each has a 3 million byte

capacity. They are supplemented by 19 disk drives, each of which has an additional 300 million bytes of storage, for a total of 5.7 billion bytes of storage memory.

As the tour guides said during the dedication ceremony, "The human mind still has 100 times more memory, but these can recall it faster." The system is designed for "virtually limitless growth," according to the company's effusive promotional literature.

Part of the new computing center will be used for storing tapes of users' files. That should please people who accidentally erase their files, because The Source is promising to replace them for them.

Key to the expanded operations are the Telenet and Tymnet systems that will handle all the incoming calls. It is composed of two Telenet TP's and a Tymnet engine. In about 400 metropolitan areas, you can reach The Source by dialing the local Telenet or Tymnet number. Other ways for you to access The Source include calling the company's toll-free WATS line, which has a \$15 per hour surcharge, dialing long distance, or calling on the firm's local line if you are in the Washington, DC, metropolitan area.

The Source is also signing Uninet for a trial run. This service is similar to Telenet and Tymnet, and is available in smaller cities than the other two. If it works out, the company will keep it on a permanent basis.

It has 100 incoming direct phone lines, and 14 WATS lines along with the

Telenet and Tymnet switching systems. The company believes it now has enough phone capacity so users will be able to call at any time.

With the new system in place, The Source will step up its drive to lure business customers. George Grune, the nattily dressed chief executive officer who came from Reader's Digest, talked optimistically of the future: "The Source has grown from a service for 5,000 to 6,000 hobbyists to a management service for professionals and proven decision makers who need its information to instantly make decisions."

The company said SourceMail, its electronic mail service, is the heart of its business programs. Others are PARTICIPATE, a computer conferencing network; CHAT, for terminal-to-terminal conversations; POST, for electronic messages and classified advertising; MGRAM, for sending Mailgram Messages from computer terminals; and PRIVATE SECTOR, which enables businesses to create specialized electronic communication products for their customers and members.

Data bases The Source has geared to businesses include stock and commodity reports, summaries of articles from leading business publications, and, for high-flying executives, airline schedules.

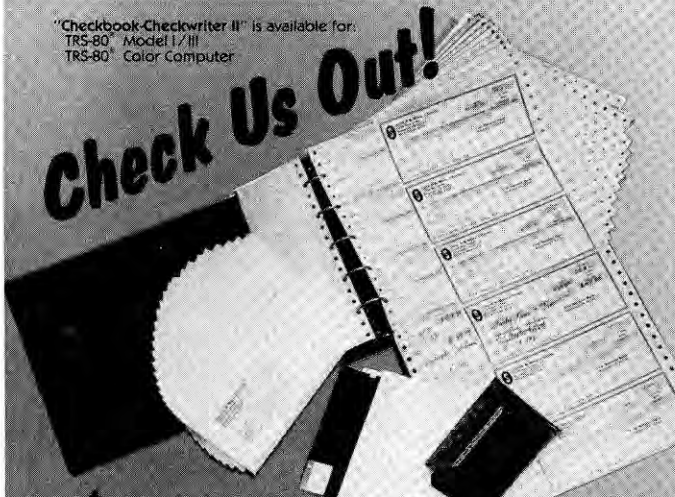
The fees for using The Source went up last August. According to a company spokesman, they will not go up again for a while. It costs \$100 to join. Hourly charges are \$20.75 during the day, \$7.75 in evenings and on weekends, and \$5.75 an hour after midnight. There is a \$10 monthly minimum.

Company public relations director Michael Rawl said The Source is ahead of its own projections for future profitability. He claimed it would have turned a profit last year if the Reader's Digest had not bought it and planned the major expansion of staff and computing capacity. The Digest is willing to sacrifice short-term profits for long-term growth and is gambling The Source will become number one in its field.

The company cemented its position in the growing northern Virginia circle of computer firms with a dedication speech from Gov. Robb. He called the opening of the new office and computer center "a celebration of the future." Laird, the senior counsel of Reader's Digest, was on hand to smile and shake hands at the dedication ceremonies, and did nothing more official than introduce Robb to the crowd of 100. ■

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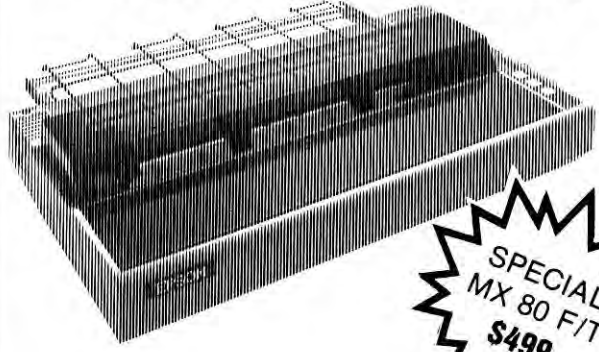


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BUSINESS

High tech health hazard

Survey of workers' perceptions shows belief computers cause health problems and reservations about women's movement.

Many office workers operating word processors feel the machines cause health problems.

That's one of the findings of a national study of office workers' attitudes sponsored by Verbatim Corporation of Sunnyvale, CA, the world's largest manufacturer of disks, minidisks, head-cleaning kits, and cassettes.

According to a summary of the study's findings, 68.2 percent of the workers responding to the survey felt using word processing equipment could result in health problems. Those problems include eyestrain and backstrain.

Nearly eight in 10 respondents, Verbatim said, called for better lighting for word processing workers and 78.8 percent wanted rest breaks.

Many workers also commented management seldom consulted office staff on the design of work space or the structuring of the work day to improve working conditions and minimize stress.

"The findings have revealed some of the real feelings and needs of office workers," Verbatim President Malcom Northrup said in a statement.

"Verbatim is not saying there is a health problem in the office," a spokesman for the company told *80 Micro*. "There are studies that have been done that say there is really no reason for concern about the equipment. But the fact remains that workers are concerned."

The survey also discovered many office workers have reservations about how much the women's movement has improved career opportunities.

About half of the office workers polled said career opportunities had been "somewhat" enhanced by female advocacy, Verbatim said, while a quarter thought career opportunities had been "greatly" enhanced.

One survey respondent noted, "Sexual prejudice is very much alive and well today, but at least now it cannot be flaunted openly."

Another said, "As a result of the women's movement, there seems to be token vice presidents whose duties are really that of an administrative assistant."

"Women's Lib opened the doors for women to get into management," a third worker observed, "but it has not done much for the advancement of secretaries to other positions. They are still regarded as someone's girl."

The survey, conducted by Group Attitudes Corporation, also found:

- Workers had a "strong desire" to participate in in-house discussion groups regarding the acquisition of new equipment, attend sales presentations by equipment vendors, and pass ideas to management via a suggestion box.

- Workers felt fewer demeaning tasks were demanded of word processing operators than secretaries.

- The office task workers liked best was typing, followed by telephone contacts and operating word processing equipment; and

- Better than three-fourths of the respondents felt automation had improved office efficiency.

According to the Verbatim spokesman, Donovan Neale-May, the firm commissioned the study to "heighten the awareness" of office managers to Verbatim products.

"Based on the input we have received from this study," Northrup stated, "we plan to launch a number of ongoing programs designed to improve the quality of life for these valuable personnel in tomorrow's automated office."

One of those programs, Neale-May said, will enlist the help of a local museum.

"We want to create a Verbatim art collection fund," he explained. "The San Francisco Museum of Modern Art will collect paintings from up-and-coming painters around the world. They will be reproduced in poster form and given away free to anybody who feels like they'd like to liven up their work space.

"The idea is to bring art into the workplace, a workplace that many feel is becoming a sterile environment."

Group Attitudes Corporation conducted the survey in July 1982. A sample of 1,263 secretaries, administrative assistants, and word processing operators in large, medium, and small companies in five major geographic regions responded to the 104-item, self-administered questionnaire. The sample was weighted to represent the 3.9 million secretaries estimated to be in the workforce and to reflect the geographic spread of those workers. ■

One survey respondent: "Sexual prejudice is very much alive and well today but at least now it cannot be flaunted openly."



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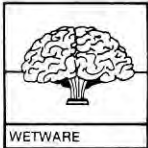
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*8" drive operation requires special cable, 8" double-density requires 3.55MHz CPU speed-up modification or LNW-80 4MHz computer.

PULSE TRAIN

PR director exits Tandy



Tandy Corporation's director of publicity has resigned his post to

start a public relations consulting firm.

Martin B. Winston, who has formed Winston and Winston with his wife, Judie, said some blue-chip silicon firms are interested in his services.

"I'm talking to all the heavies," he claimed, "Texas Instruments, Data General, DEC, Apple, IBM."

What can smooth-talking Winston provide his clients' PR departments? For one thing, a lube job. "I can act as Vaseline," the 34-year-old PR man said. "I can help make the whole contact business easier."

Before Winston left Tandy, he completed a promotional campaign expected to garner the Fort Worth firm 5 billion product exposures during the 1983-TV year.

The campaign, which cost Tandy no more than \$1,000, is aimed at getting the firm's products used as props for TV shows.

Shows agreeing to use the products include "Walter Cronkite's Universe," "Hill Street Blues," "The Devlin Connection," "St. Elsewhere," "Remington Street," "The New Bob Newhart Show," "The Greatest American Hero," and "Quest."

Winston told *Advertising Age* many of the products are "cosmetic" models. They look like working products, but have failed quality con-



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PENTHOUSE
THE INTELLIGENT DECISION

WOOING COMPUTER FIRMS *Penthouse* magazine, using what makes it popular—skin—has launched a campaign to persuade software firms to advertise in the Bob Guiccione publication. This ad, which ran from September to December in *The Sizzle Sheet*—a trade publication for marketers of computer and electronics, notes 23 percent of *Penthouse* readers own a home computer, 17 percent plan to buy home video games in 1983 and 13 percent plan to buy home computers. The ad originally ran in color.

trol. Tandy has found those products are less likely to be stolen from a set.

Winston, whose new firm will have offices in Fort Worth and Greenwich, CT, added, "You could say we're making Hollywood our junkyard."

What's in a logo? Plenty, says Tandy



The Bell System symbol has sparked skirmishing between the American Telephone and Telegraph Company and Tandy Corporation.

Radio Shack's parent has complained to the U.S. Justice Department about AT&T and the Bell Operat-

ing Companies using the bell-to-a-ring logo in their advertisements.

Letting AT&T and the companies use the logo makes a mockery of the antitrust settlement between Ma Bell and the department, Tandy contends.

By sharing the trappings of the Bell system with the operating companies, Tandy said in a letter to the department's antitrust division, AT&T intends to "unfairly enshrine in the minds of consumers the continuing 'oneness' of the Bell System."

That will give AT&T a competitive edge that undercuts the goal of the antitrust settlement, Tandy argued.

It maintained AT&T's reorganization plan should provide "the divested operating companies may have use

of the Bell name, the Bell symbol, and related trademarks, trademarks and marketing symbols as a package, while AT&T may not use any of these names, marks, logos, or marketing symbols for any purpose."

Unless those provisions are included in the plan, Tandy added, "At&T will divest the [operating companies], but it will be a divestiture in law, not in fact. Through massive advertising, AT&T will in effect tell consumers that the Bell System remains one—economically and operationally—and that it is business as usual.

"Competition, the whole purpose of the consent decree, will be the victim."

In a letter to the antitrust division, AT&T Vice President and General Counsel Howard J. Trienens said Tandy's request went beyond anything contemplated by the final judgement in *United States v. American Telephone & Telegraph Co., et al.*

As the issue got muddier and muddier, William F. Baxter, head of the antitrust division, attempted to clear the waters.

After divestiture, he wrote to Trienens, the division would see as violating the agreement "any use of the word Bell independently of a corporate name, as in the name of a product or service.

"We would also object to the use of a corporate name itself, such as American Bell, in such a fashion as to imply a relationship with the [operating companies]. . .

"Under this approach, for example, we would view as violative of the modification the use after divestiture of Bell Packet Switching Service or



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PULSE TRAIN



Bell Dimension PBX as the name for a product service."

After reading Baxter's letter, Trienen suggested everyone wait until the reorganization plan was filed with the department to iron out the nettlesome issue.

Tandy buys Datapoint's share of disk drive firm



Tandy Corporation has bought out Datapoint's interest in

Texas Peripherals, a disk drive manufacturer owned by the two firms.

According to *Electronic News*, the amount of cash Tandy would pay for Datapoint's 50 percent share in Texas Peripherals was undisclosed.

Tandy and Datapoint told *EN* the buy-out would not affect the companies' agreement, announced last June, to marry their technology for local area networking. The weekly said development of that service has been hampered by software problems.

Texas Peripherals, set up in 1980, has been making 5.25- and 8-inch drives. It has 325 employees and occupies a 50,000-square-foot former Sears Roebuck retail store in

Odessa, TX.

Garland Asher, Tandy's vice president of finance, told *EN*, "We've taken a majority of the production of that plant since Day One."

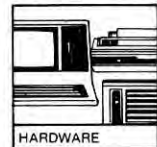
When the agreement was inked, he explained, it included procedures for one firm buying out the other.

Asher said Tandy decided to buy out Datapoint because "We want the production. We need the production. It makes sense all around."

He added the deal would not affect Tandy's agreements with other disk drive manufacturers.

In a related matter, Bill Meserve, a senior consultant for Arthur D. Little Company of Cambridge, MA, noted partnerships like the one between Tandy and Datapoint are necessary to survive the coming shakeout in the microcomputer industry.

When you talk to these cash registers, they talk back



Supermarket shoppers in Lexington, MA, don't want to talk about the Computer Age—especially with a computer. A Bay State supermarket chain, Stop & Shop, hoped to humanize the checkout lane by installing talking cash registers. Shoppers weren't enamored with the idea. Surveys indicated shoppers disliked hearing the price of hamburger coming out of black box at ear level.

A frequent complaint of shoppers was the machines, called Positalkers, created

high noise levels in the supermarket. Another gripe was the machines' Midwestern female voice was cold and unpleasant.

Shoppers also viewed the Positalkers as unnecessary and they suspected the cost of the boxes—\$300 each—was being passed on to them through higher food prices. Stop & Shop said that suspi-

cion was unfounded.

The chain finally pulled the boxes out of the Lexington store and returned to the cold, hard reality of the sales slip.

National Semiconductor Corporation, the California manufacturer of Positalker, said Stop & Shop is the first supermarket in the nation to have the machine removed.



HOT AIR ATTRACTION. Leading Edge Products Inc. of Canton, MA, has joined the fight against cancer in children in a big way. One cent from each floppy disk it sells goes to the Jimmy Fund, a Boston-based group funding programs in cancer research and treatment of children with cancer. This hot air balloon was one of many attractions at the First Annual Computer Fair sponsored by Leading Edge. The proceeds from the fair were donated to the Jimmy Fund as well as a check for \$6,700, the first installment on the Canton firm's one-cent campaign.

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Information retrieval programs for professionals use multiple keys, partial information or words to quickly search large TRS-DOS* data and text files no need to code information or establish fixed fields Softshell's Multiple Access Programs (MAP) use advanced hash coding techniques.

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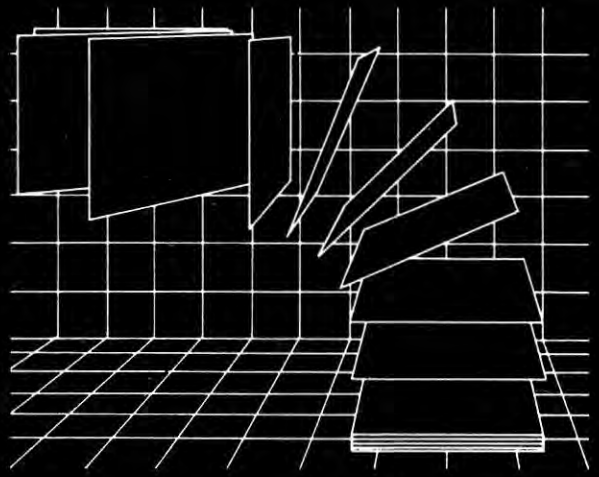
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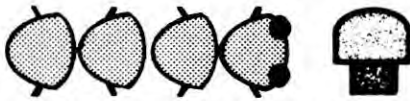
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PULSE TRAIN

E-papers no threat to real papers



"There is no clear and present danger to the American

newspaper industry from electronic delivery of information to the home."

That was one of the findings in a report on a two-year experiment by the Associated Press and 11 newspapers on the CompuServe Information Service (see *80 Micro*,

November 1982, p. 462).

The report—prepared by the AP and RMH Research Inc., a Fairlawn, NJ, subsidiary of Harte-Hanks Communications—added that any danger posed to newspapers by electronic information is in the future.

The New Jersey research firm found newspapers accounted for only 5 percent of the total usage on CompuServe.

Once the novelty wore off the experiment, access declined dramatically. From February 1982 to June 1982,

accesses dropped from 1,200 to 136. The average access time during that period was less than five minutes.

During the last eight months of the experiment, the AP reported, one-third of CompuServe's users looked at an electronic newspaper once; roughly one-fifth looked twice.

A control group of 100 households accessed the e-papers 30 percent more than CompuServe regulars—called "electros" in the test. Members of the control

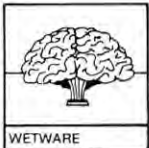
households—dubbed "real people"—accessed the news an average of 6.5 minutes.

But even for real people, the allure of the Network Nation wasn't news. They spent 40 percent of their time accessing CompuServe's CB and games.

Neither group would net a news organization a pile of money. At going rates, the AP said, an electro would gross an e-paper 8 cents; a real person would gross the paper 10.46 cents.

However, CompuServe does have its newspaper ad-

Anthem for a microcomputer



When Walt Disney Productions opened its Experimental Prototype Community of Tomorrow in Lake Buena Vista, FL, last October, it gave computerdom something it's been lacking for a long time—

an anthem.

Visitors entering Epcot's computer center will see Ken Jennings—straight from his role in *Sweeney Todd* as a Pearly (an early English street entertainer whose suit and hat were covered with pearl buttons)—flitting about singing "The Computer Song."

The song was written by Richard B. and Robert B. Sherman, creators of the score for *Mary Poppins*. Its lyrics go like this:

You see my friends
the computer
makes life easier
saves me time and headaches, too
He sorts things out
analyses in a shake
My enormous problem
to him's a piece of cake
He's got a great big memory like an elephant
utilizes knowledge without end
That's why I'm a rooter
for the computer
Ev'rybody needs a friend
When my work piles up and I'm seeing red
'cause I need five arms and an extra head
I find the computer
becomes me trouble shooter
He keeps miles and miles

of acts on file,
My wish is his command
Nothing is astuter, than a computer
when I need a helping hand.
Let me explain—They keep on top of
accomodations
record and update reservations
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and help plan energy conservation
They're really a great financial device
payroll service is kept precise
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on personnel, food and merchandise
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on matters of safety and fire prevention
They've given efficiency a new dimension
with number examples too many to mention
and that's why I'm a rooter
for the computer
Ev'rybody needs a friend
You see my friends, the computer does the
drudgery, leaves me free for the better things
I push some buttons and in 'alf a mo,
what was a sticky wicket becomes an easy go.
He's got a great big memory like an elephant
How he works is hard to comprehend
Complicated computations take him just a tick
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Ev'rybody needs a friend!
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Regular Stand (300010)	\$29.95
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203510	Model III Version	\$2549.95
15 Megabyte Winchester Fixed Disk		
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Upgrade Kit

Putting Disk drives into your TRS-80 Model III will turn it into the powerful computer it was designed to be. The B.T. Enterprises DISK DRIVE INSTALLATION KIT is easy to do and represents a substantial savings over the cost if done by Radio Shack.

The kit was designed to be installed by a non-technical person, and takes an average of 45 to 75 minutes to complete. The only tools necessary are a phillips and flat head screw driver and a pair of diagonal cutters. No cutting of traces or soldering is necessary.

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*Controller Board supports 8 inch external drives and extended density 5-1/4 inch drives (dual headed and 80 track)

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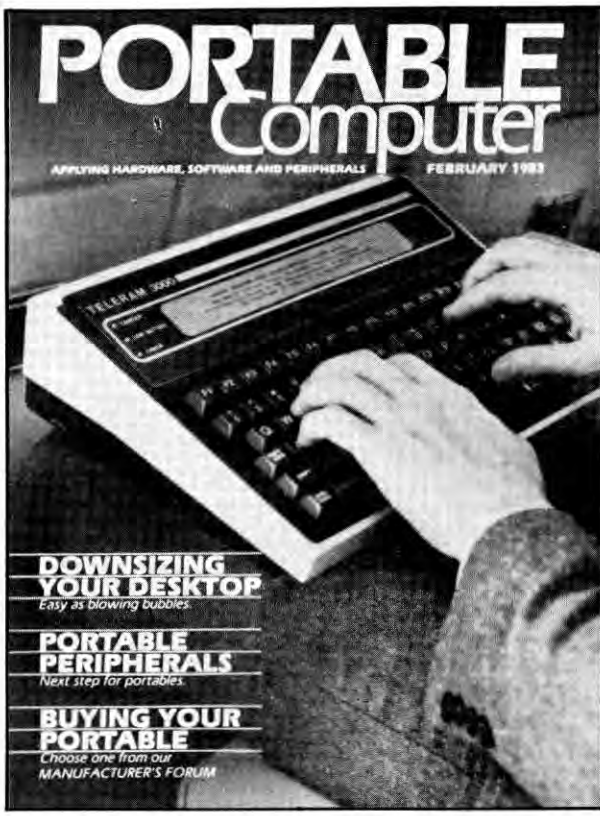
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dicts. The AP noted, "In an already demographically odd group of current customers...one out of 10 is odder still: a newspaper junkie, even though the fix is electronic."

Little tailoring for the electronic medium was done by the experimenters, RMH observed. That's something CompuServe hopes to address in its future news efforts.

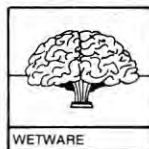
The information utility's senior vice president, George Minot, told *Editor & Publisher* the test has led CompuServe to start building a news component to its service.

The news model, he said, will be "fully interactive according to customer needs" and will allow a customer to create a news file of his own

design. Users will instruct the system to collect news stories on specific subjects and call them up on demand.

CompuServe news will be tailored to a videotext system, Minot said, and presented in "capsule" form. He added, "Videotext customers want and are willing to pay for up to the minute news."

Prez scoffs at shortage of programmers



Shortage of programmers? Not according to the president of Pan-

sophic Systems Inc. David Eskra, speaking at a software exposition in Chicago, called the highly

trumpeted programmer shortage "a sham."

The real problem, he reportedly said, is gaining access to that "ton of data that has the potential to solve all kinds of business problems."

New mag on portable micros



Portable computers will be the focus of a magazine scheduled for publication next month.

According to a statement from publisher Marshall W. Freeman, the new bimonthly will be totally devoted to developments and applications of the new wave of portable computers.

Many people need portability for their daily needs, the statement said. *Portable Computer* will focus on portable products and how to use them. Articles will be geared to the non-technical user.

Applications stories will review uses of portable computers in big business, small business, and in the home—except for games.

Circulation is "guaranteed" at 20,000, Freeman said. It will be distributed on a paid and controlled circulation basis. Subscription price for the magazine is \$12.50.

Portable Computer will be published by Miller Freeman publications. The San Francisco, CA, firm publishes 10 business magazines and six newsletters. The 80-year-old enterprises has offices in New York, Chicago, Atlanta, Portland, London and Brussels.

The editor of the new publication is Stephen J. Schneiderman.

Guide to software writers' markets



Eric Balkan, editor of *Software Wanted: How and Where to Sell Your Program*, has announced the release of the 1982-83 version of his guide to software markets.

Referring to an article on CompuServe's Software Author's special interest group (*80 Micro*, November 1982, p. 470), Balkan lamented, "I was pained to read that there is no neatly bound directory of writers' markets for microcomputer programmers."

He said he publishes such a reference book. The 1981-82 edition contained 75 listings. This year's will contain more than 140. The listings include information on royalties paid by publishers, programs needed by software houses, and tips on what to look for before signing a contract.

His book was favorably reviewed in *Creative Computing* in May 1982, he wrote.

For more than a year, Balkan has provided information on CompuServe for *The Micro Advisor* and *Information News and Views*. "I have yet to see any kind of decent money," he said. "I get a 12 percent royalty—which comes out to a penny a minute per user. That results in about \$70 a month. With that kind of remuneration, it doesn't pay to update the data bases very often."

Software Wanted costs \$25 and is available from Battery Lane Publications, PO Box 30214, Bethesda, MD 20814.

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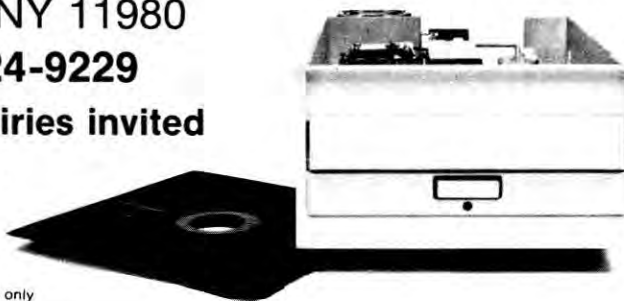
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PULSE TRAIN

Big Blue to be lion of desktop market by 1986



The Big Blue will dominate the desktop computer market by

1986, according to the president of the Yankee Group, a Boston, MA, consulting group.

Howard Anderson, in a report appearing in *Computerworld*, predicted International Business Machines would corner 19.2 percent of the desktop market by mid-decade.

Ways he said IBM would persuade 4 million users to buy its micros included marketing its Personal Computer through Sears Roebuck and Company and pumping \$1.6 billion into R&D for the PC.

The Big Blue will also keep the competition reeling, he said, with a new product announcement every month.

Apple would lose its front spot in the market by failing to introduce new products, he contended.

Both Apple and Tandy would be hurt by IBM using the PC under the firm's Systems Network Architecture. He explained it is difficult to connect foreign equipment to an IBM network.

Pricing will be another factor in IBM's dominance. Anderson said the enterprise would peg its prices to 115 percent of the lowest prices in the market.

"IBM is turning into a must carry for retail outlets," he observed. He added other vendors may find themselves paying for shelf space in retail stores and losing profits



TEACHING WITH TRON Walt Disney Educational Media Company has released a 16mm film, *Computers: The Friendly Invasion*, introducing students to computers. Not only can youngsters see how man is building a better world with computers, but they can also see some dazzling computer graphics from *TRON*. The 19.5 minute movie for grades 5 to 12 can be ordered from WDEMC, 500 South Buena Vista St., Burbank, CA 91521.

as a result.

In a related matter, Yankee released a report predicting what the home computer market will look like when the smoke clears in 1982.

The U.S. market for the micros will have increased 400 percent, to 1.76 million units worth more than \$1 billion, the report said. In 1981, it noted, 340,000 unit worth \$395 million were sold.

Yankee maintains sales of micros in the \$200 to \$500 and under \$200 range will continue to increase. Sales of micros over \$500 will decline,

it added.

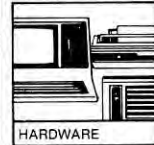
The report predicted \$200 to \$500 computers will have 53 percent of the home market in 1982 and 1983, the under \$200 micros 29 percent in 1982 and 34 percent in 1983. Over \$500 computers' market share will drop from 18 percent in 1982 to 13 percent in 1983.

In the top spot of the \$200 to \$500 group, Yankee forecasted a shift from Atari to Commodore or Texas Instruments. But it said Atari will bounce back in 1983, once it increases its production facil-

ities.

In 1981, Atari had 44 percent of the \$200 to \$500 market, Tandy 30 percent, TI 16 percent and Commodore 10 percent.

Generic R2D2



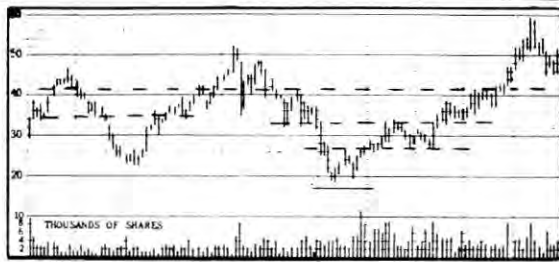
"The first manufactured intelligent robot for the home experimenter," the RB5X, has been announced by RB Robot Corporation of Golden, Co. (For related story, see *80 Micro* August 1982, p. 330.)

Looking like a generic R2D2 and priced at \$1195, the robot uses an INS 8073 microprocessor and a ring of "tactile sensors" (bumpers) to learn from its experience, detecting and responding to obstacles in its path. Once a random response proves successful, the droid remembers and repeats it when confronted with the same situation.

In the climax of its repertoire, the robot recharges its own batteries, sensing when the eight "C" and four "D" cells are low, finding its charger, and detaching itself when ready to roll again.

An RS-232 interface lets users transfer its memory to a microcomputer to study memory patterns and alter programs. The robot comes with three self-learning programs stored in 8K of RAM, (a \$295 option package adds 16K), a Polaroid sonar sensor, blinking lights. Its manufacturer promises game and equipment software and several more options in the near future, including a mechanical arm and a voice synthesizer.

Sales of between 300 and 1,000 units are forecast for the last quarter of 1982.



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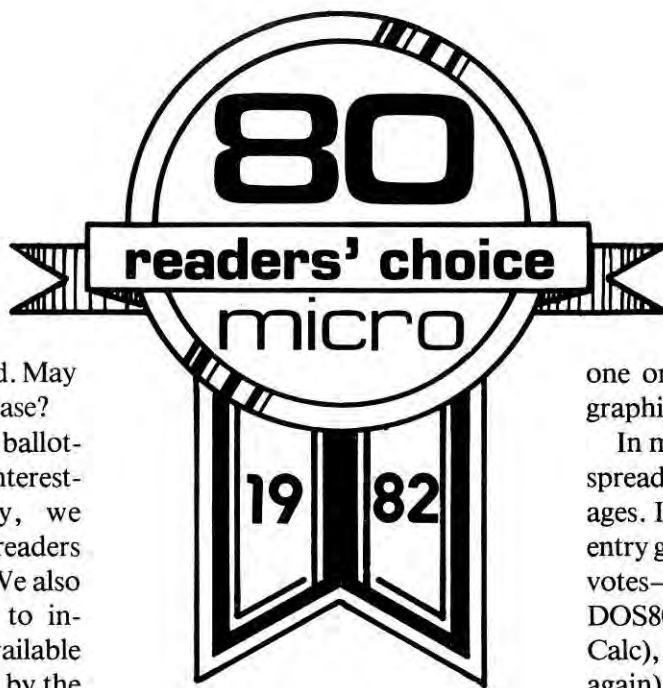
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The votes are in and counted. May we have the envelope, please?

Our first Readers' Choice ballotting was, to say the least, an interesting experience. Naturally, we learned which software our readers consider to be numero uno. We also learned that it's impossible to include all of the software available for the TRS-80, as evidenced by the large number of write-ins. And finally, we picked up some tips on how we can improve the Readers' Choice Awards this year.

As for the results, we found few surprises. Several write-ins made it to the final list, most notably VisiCalc. Radio Shack led the way with most winners—22 in all. Eleven of those finished first. It seems that despite the vast support industry that

has grown around the TRS-80, Radio Shack is still a primary source of software.

Generally, what you see here are the three top finishers in each category. The exceptions are when there were ties (such as for Model I/III games) or not enough entries to warrant publishing more than the top

one or two (e.g., Color Computer graphics, Model II accounting).

In most categories, the votes were spread over a large number of packages. In only four categories did one entry get more than 50 percent of the votes—Model I/III DOSes (NEW-DOS80), Model I/III Business (VisiCalc), Model II Business (VisiCalc again), and Color Computer DOSes (TRSDOS).

In terms of sheer numbers, the top three overall were Model I/III NEWDOS80, Model I/III Scripsit, and Model I/III VisiCalc.

We'd like to thank the many readers who took the time to fill out and send in ballots (not to mention tear a page from their *80 Micros*). Keep those pencils sharpened for this year's balloting. ■

Model I/III

Accounting

1. Accounts Payable System (RS)
2. General Ledger (RS) (write-in)
3. Accounts Receivable, Invoices (Tarranto & Assoc. Inc.)
Versa Ledger (Computronics)

Business

1. VisiCalc (VisiCorp) (write-in)
2. Budget Management (RS)
3. Easy Calc (Instant Software)

Data-Base Management

1. Maxi Manager (Adventure International)
2. Aids-III (Meta Tech)
Profile III Plus (RS, small Computer Co.)

Data Communications

1. ST80 (Small Business Systems)
2. Modem 80 (Alternate Source)
3. Omniterm (Lindbergh)

Disk Operating Systems

1. NEWDOS80 (Apparat)
2. DOSPLUS (Micro Systems)
3. TRSDOS (RS)

Education

1. Typing Teacher (Instant Software)
2. Typing Tutor (Microsoft) (write-in)
3. K-8 Math with Student Management (RS)

Games

1. Scarfman (Cornsoft Group)
2. Eliminator (Adventure International)
3. Sargon II (chess) (Hayden)
Star Fighter (Adventure International)

Spelling Checkers

1. Electric Webster (Cornucopia)
2. Scripsit Dictionary (RS)
3. Chertext (Apparat)

Utilities

1. Super Utility Plus (Breeze/QSD)
2. EDTASM (RS)
3. Tasmon (Alternate Source)

Word Processing

1. Scripsit System I/III (RS)
2. Newsprint (Prosoft)
3. Lazy Writer (Soft Sector)

Color Computer

Business

1. Spectaculator (RS)
2. Personal Finance (RS)
3. Stock Portfolio Management (MPP Graphics)

Data Communications

1. SuperColor Terminal (Nelson Software)
2. Colorcom/E (Eigen Systems) (write-in)

Disk Operating Systems

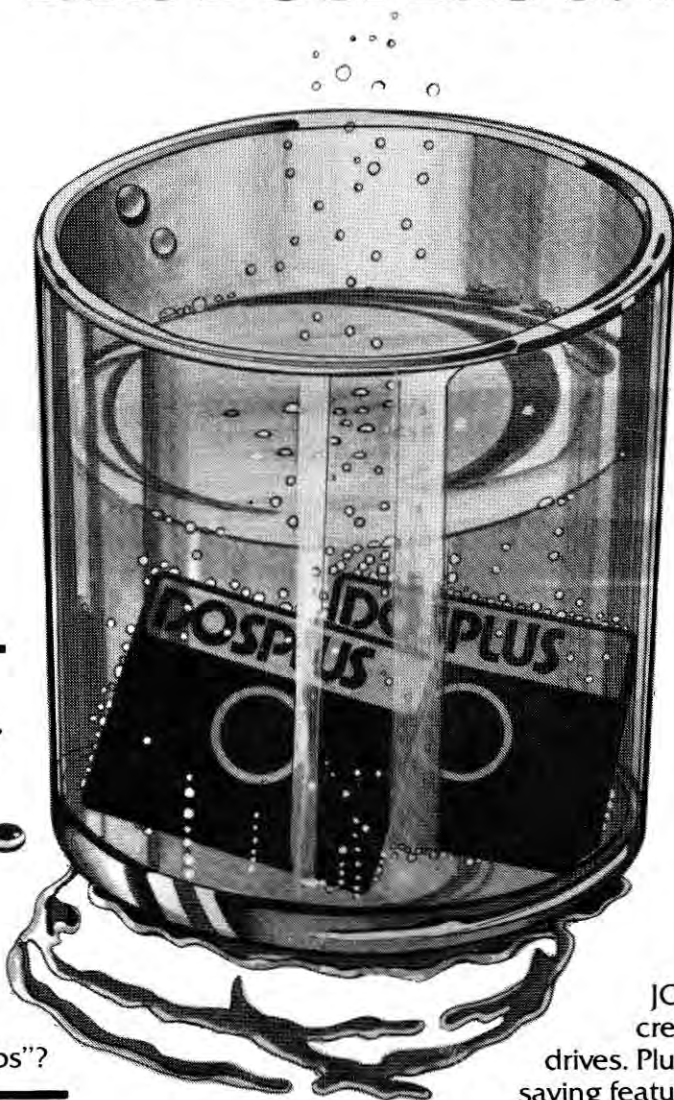
1. TRSDOS (RS)
2. CCMD + 9 (Cer-comp)
3. Flex (Frank Hogg Laboratory Inc.) (write-in)

Education

1. Typing Tutor (RS)
2. Geography Pack (Spectral Assoc.)
3. Math Tutor (Custom Software Engineering)
Spelling Tutor (Custom Software Engineering)

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Games

1. Color Pak Attack (The Micro Works)
2. Color Berserk (Mark Data)
3. Ghost Gobbler (Spectral Associates)

Graphics

1. MPP (MPP Graphics) (write-in)

Utilities

1. EDTASM+ (RS) (write-in)
2. CBUG (Micro Worker)
3. CCEAD (Eigen Systems) Sigmon (Data Soft) Editor/Assembler (Microworks)

Word Processing

1. Telewriter (Cognitec)
2. Color Scripsit (RS)
3. Super Color Writer II (Nelson Software)

Model II

Accounting

1. Accounts Receivable (RS)

2. Accounts Receivable, Balance Forward (Taranto & Assoc.)

Business

1. VisiCalc (VisiCorp)
2. Aids-III (Meta Tech.)
3. Inventory Control System (RS) Market Tracker (H & H Trading) SuperCalc (Sorcim) (write-in)

Data-Base Management

1. Profile II (RS)
2. Database Management (Inst. for Scientific Anal.)
3. Aids-III (Meta Tech.)

Data Communications

1. Model II Videotex (RS)
2. Binary Synchronous Communications (RS)
3. Smart Terminal (Small Business Systems)

Disk Operating Systems

1. TRSDOS (RS)
2. CP/M (Digital Research)

Education

1. Microtyping (Hayden)

Games

1. Sargon II (Hayden)
2. Hypergate (Synware)

Medical

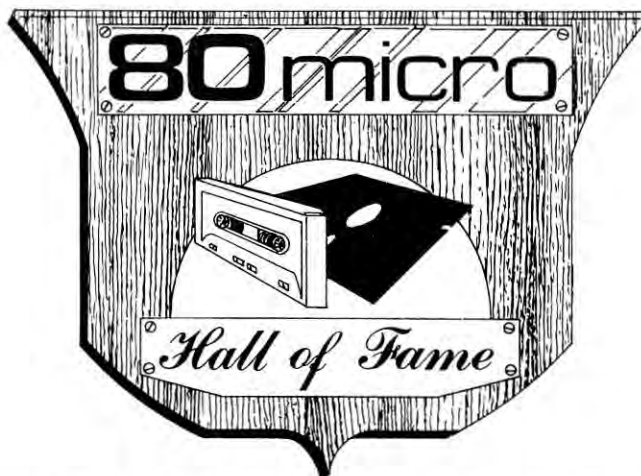
1. Medical Office Systems (Windham Software)
2. FMS 80 (Micro/Sys 80)
3. Medical Office Management (Charles Mann & Assoc.)

Utilities

1. Development Package (Racet Computes)
2. Extended Built-In Functions (Snappware)
3. RSMII (Small Systems Software)

Word Processing

1. Scripsit 2.0 (RS)
2. WordStar (Micro Pro)
3. Electric Pencil (IJG)



When six bedraggled editors get together to discuss software, you never know what's going to happen. And so it was when our ad hoc panel made its first selections for the *80 Micro* Hall of Fame.

The debate was lively, not only over the 12 packages that were nominated, but over the criteria for the honor. What features must a piece of software have before it can be considered one of the elite, one of the all-time greats? Mass appeal? Industry impact? Exceptional quality?

The answer was "all of the above"—with qualifications.

Some of us felt, for instance, that a program might deserve con-

sideration because it blazed trails or set trends in the TRS-80 world, even if it no longer was considered the best of its kind. Others felt that we had to consider extremely popular programs that, while they might not embody the highest level of quality or originality, are dependable and useful workhorses.

The process was further complicated by the fact that we agreed to operate by consensus—that is, everyone at the table had to say yes to a product before we inducted it.

We ended up with the five you see below.

Electric Pencil (IJG)

Electric Pencil caused quite a bit of debate, as one could expect from a

group of Scripsit users. We agreed that better word processors might be available (although that's largely a matter of personal preference and need), and that EP is not the most popular word processor on the market. But we also reached the conclusion that no word processor has had the impact that EP did when it first debuted in 1976. It demonstrated conclusively that a TRS-80 could be used for serious word processing, and was the model for later word processors.

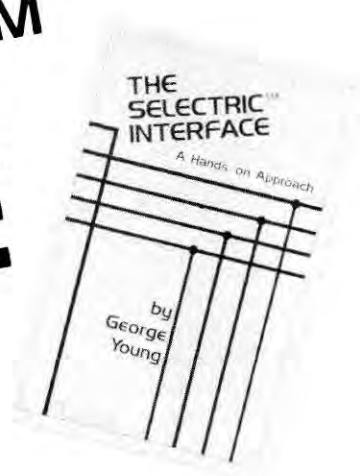
EP was a problem child for author Michael Shroyer at first, with 68 different versions for different machines, drivers, printers, and so on. Version 2.0, coauthored by IJG President Harvard Pennington, appeared in February of 1982. Pennington says over 50,000 copies—perhaps 5,000–7,000 of them actually bought—are in use.

"We felt it was a landmark piece of software, and it has fulfilled its expectations," says Pennington. "To some extent, all microcomputer word processors owe their success to Electric Pencil."

Scripsit (Radio Shack)

In the early stages of the selection process, a lively debate grew between champions of Electric Pencil and supporters of Scripsit. But it finally occurred to us that one did not necessarily have to be chosen to the exclusion of the other, simply because they were both word processors. And so Scripsit

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became a member of the *80 Micro* Hall of Fame.

Scipsit was not the first word processor, but it certainly has become the overwhelming choice of TRS-80 owners, and is the one to which all new entries are compared. It's now one of Radio Shack's best-selling programs. We chose Scipsit largely because of this universality. This popularity is reflected in the fact that Scipsit is modified by our readers far more than any other program

Scipsit was introduced in 1979. It received more in-house testing than most other Radio Shack programs, says Ed Juge, director of computer merchandising, because it was a program nearly everyone would use.

"It took off beautifully; it's been good to us," he says. "I think everyone has liked it in general."

Microsoft Basic (Microsoft)

Microsoft Basic was far and away the most obvious choice for the Hall of Fame. Hardly a TRS-80 owner lives who has not had some contact with this workhorse. Because it was an interpret-

ed language, it made editing and debugging a relative snap, and thus changed the face of microcomputer programming.

Microsoft Basic has been with microcomputers since the beginning, debuting on the Altair in 1975.

"We thought that micros could become pretty popular, and we wanted a language that was easy to use and that didn't have a lot of steps," says Bill Gates, Microsoft's executive vice president. Basic seemed like a good choice, so Microsoft wrote a version that would be appropriate to the microcomputer environment."

From the 4K models of those days, MBasic has grown to include graphics and other extensions. In the future, nonkeyboard input and even more graphics and business applications are likely.

"I think Microsoft Basic is running on more machines than any program around, and in some ways people take Basic for granted," says Gates. "I'm glad to see it getting recognition. If people still had to use machine language, it would be pretty bad."

How does Microsoft's position in the marketplace look?

"We are so dominant in Basic that I see us holding our position in that language," says Gates.

NEWDOS (Apparat)

"I feel like I just had a baby," Jason Matthews, manager of software research and development, said when we told him that NEWDOS had been elected to our Hall of Fame.

We chose NEWDOS because, as one of our panel said, "It wasn't the first DOS, but it was the first really usable one." Also, as our Readers' Choice results show, it has become the most popular.

NEWDOS was originally released in 1978 as a 35-track Model I DOS, written because TRSDOS 2.1 didn't function as most people expected an operating system to function. NEWDOS Plus upgraded the original, and added the Superzap utility. NEWDOS80 was introduced when the Model III began to supplant the Model I.

In the future, Apparat hopes to adapt NEWDOS for hard disks, as soon as the market indicates which one to support.

Creator and still sole author is "Sam Jones," who wishes to keep his privacy and avoid being swamped by

phone calls.

"But I'll call him as soon as we hang up, and I can guarantee you'll hear the 'Whoopie' clear out in New Hampshire," Matthews said.

Adventure (Microsoft), Adventureland (Adventure International)

This created the most controversy on our panel, for two reasons. First, the original adventure games were on mainframes, and the TRS-80 versions were derivatives. Second, the word "adventure" refers more to a genre than to a specific program.

But there can be no doubt about the impact adventure games have had on the TRS-80 world. They are often among the first programs novices use and beginning programmers write. In addition, they have also provided many computerphobes with a painless and pleasurable introduction to computers.

The origins of adventure games seem to be shrouded in the mists of computer lore. Adventure experts agree that they've been played on mainframes for years, but they took several paths to reach the land of the micros. But here's what several phone calls produced:


The progenitor of the adventure games was a mainframe adventure called Colossal Caves, written by William Crowther and Don Woods in the mid-70s on a DEC PDP. The first TRS-80 adventure, said Adventure International president Scott Adams, was his Adventureland, inspired by, but not based on, Colossal Caves. Adventureland came out in the summer of 1978, about six months before AI officially set up shop.

Meanwhile, Gordon Letwin, then with Heath and author of HDOS, was working on Adventure, completing it in 1979. Letwin said he took his game directly from the mainframe version (though he knew it not as Colossal Caves but as Adventure).

"We supported all the esoteric features, and even some of the original bugs, of the first version," he said.

He finally marketed the game through Microsoft, for whom he is now working.

At first, we didn't know whether to give our award to Adventure or Adventureland. We finally concluded that both deserved it equally, and have thus ushered them into the Hall of Fame as a tandem. ■



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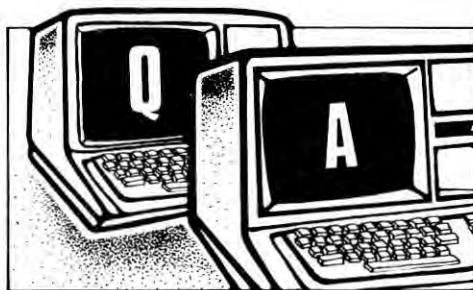
*TRS-80 is a trademark of the Radio Shack Division of Tandy Corp.

Send any questions or problems dealing with any area of TRS-80 microcomputing to Feedback Loop, 80 Micro, 80 Pine Street, Peterborough, NH 03458.

Regarding key repeat (T.B., Glendora, RCA, October issue), Byte magazine (4/82) has a machine-language program "Mod III, TRS-80 Model III features for your Model I," page 380, by Joe Rocke that might be what he's looking for. It works quite well on my Model I.

J.R.T.
Clinton, MA

True, but T.B. was asking for a program in Basic that would give him a flashing cursor (his letter was condensed to conserve column space).



Problems and solutions

Regarding the weather forecasting program requested by L.R. (September issue), enclosed is a program I wrote for that purpose. It was developed from information from a National Weather Bureau chart. The program is a computerized version of that chart.

A.P.
Kenosha, WI

Your program works pretty well. It's presented here as Program Listing 1.

Let me add to your answer to A. N. (October issue). It's possible to use upper and lowercase with Scripsit in a computer without the lowercase modification. Holding down the shift and Scripsit control key will give all lowercase letters ex-

```
100 CLEAR 500:DIM FCS(19),WDS(8),BTS(5)
110 FCS(1)="CONTINUED FAIR, NO DECIDED TEMP CHANGE"
120 FCS(2)="SLOWLY RISING TEMP AND FAIR FOR 2 DAYS"
130 FCS(3)="FAIR WITH SLIGHT TEMP CHANGES FOR 1 TO 2 DAYS"
140 FCS(4)="FAIR, FOLLOWED WITHIN 2 DAYS BY WARMER AND RAIN"
150 FCS(5)="WARMER WITH RAIN IN 24 TO 36 HOURS"
160 FCS(6)="RAIN WITHIN 24 HOURS"
170 FCS(7)="RAIN WITHIN 12 TO 18 HOURS"
180 FCS(8)="WARMER WITH RAIN IN 18 TO 24 HOURS"
190 FCS(9)="INCREASING WINDS, RAIN WITHIN 12 TO 24 HOURS"
200 FCS(10)="INCREASING WIND WITH RAIN, WITHIN 12 HOURS"
210 FCS(11)="SUMMER - WITH LIGHT WINDS, RAIN MAY NOT FALL FOR SEVERAL DAYS WINTER - RAIN WITHIN 24 HOURS"
220 FCS(12)="SUMMER - RAIN PROBABLE WITHIN 12 TO 24 HOURS WINTER - RAIN OR SNOW WITH INCREASING WINDS OFTEN OCCURS WHEN THE BAROMETER BEGINS TO FALL AND THE WIND SETS IN FROM THE NORTHEAST"
230 FCS(13)="CLEARING WITHIN A FEW HOURS, CONTINUED FAIR FOR SEVERAL DAYS"
240 FCS(14)="RAIN WILL CONTINUE FOR 1 TO 2 DAYS"
250 FCS(15)="RAIN WITH HIGH WINDS, FOLLOWED WITHIN 24 TO 36 HOURS BY CLEARING AND COOLER, COLDER IN WINTER"
260 FCS(16)="CLEARING AND COLDER"
270 FCS(17)="SEVERE STORM OF WIND WITH RAIN OR SNOW IMMINENT !!! FOLLOWED WITHIN 24 HOURS BY CLEARING AND COLDER"
280 FCS(18)="SEVERE NORTHEAST GALES AND HEAVY RAIN OR SNOW !!! FOLLOWED IN WINTER BY A COLD WAVE"
290 FCS(19)="TRANSITION PERIOD - RECHECK WITH LATER DATA"
300 BTS(1)="STEADY"
310 BTS(2)="RISING SLOWLY"
320 BTS(3)="RISING FAST"
330 BTS(4)="FALLING SLOWLY"
340 BTS(5)="FALLING FAST"
350 WDS(1)="NORTH"
360 WDS(2)="NORTH EAST"
370 WDS(3)="EAST"
380 WDS(4)="SOUTH EAST"
390 WDS(5)="SOUTH"
400 WDS(6)="SOUTH WEST"
410 WDS(7)="WEST"
420 WDS(8)="NORTH WEST"
430 CLS
440 PRINT "ENTER BAROMETER READING"
450 INPUT B
460 PRINT "ENTER NUMBER THAT DESCRIBES BAROMETER MOVEMENT TREND"

470 PRINT
480 PRINT "1 = STEADY"
490 PRINT "2 = RISING SLOWLY"
500 PRINT "3 = RISING FAST"
510 PRINT "4 = FALLING SLOWLY"
520 PRINT "5 = FALLING FAST"
530 INPUT C
540 CLS
550 PRINT "ENTER NUMBER THAT DESCRIBES WIND DIRECTION"
560 PRINT
570 PRINT "1 = NORTH"
580 PRINT "2 = NORTH EAST"
590 PRINT "3 = EAST"
600 PRINT "4 = SOUTH EAST"
610 PRINT "5 = SOUTH"

620 PRINT "6 = SOUTH WEST"
630 PRINT "7 = WEST"
640 PRINT "8 = NORTH WEST"
650 INPUT W: CLS
660 PRINT "INFORMATION ENTERED AS PRESENT CONDITIONS"
670 PRINT "BAROMETER READING: ";B
680 PRINT "BAROMETER MOVEMENT TREND: ";BTS(C)
690 PRINT "WIND DIRECTION: ";WDS(W)
700 PRINT
710 PRINTTAB(16) "***** HERE IS THE FORECAST *****"
720 IF (B>=30.2) THEN 760
730 IF (B>=30.1) AND (B<=30.2) THEN 850
740 IF (B>30) AND (B<30.1) THEN I=19: GOTO 1170
750 IF (B<=30) THEN 1000
760 IF (W=6) AND (W<=8) THEN 790
770 IF (W=2) OR (W=3) THEN 820
780 GOTO 1090
790 IF C=1 THEN I=1: GOTO 1170
800 IF C=4 THEN I=2: GOTO 1170
810 GOTO 1090
820 IF C=4 THEN I=11: GOTO 1170
830 IF C=5 THEN I=12: GOTO 1170
840 GOTO 1090
850 IF (W>=6) AND (W<=8) THEN 890
860 IF (W=4) OR (W=5) THEN 940
870 IF (W=2) OR (W=3) THEN 970
880 GOTO 1090
890 IF C=1 THEN I=3: GOTO 1170
900 IF C=3 THEN I=4: GOTO 1170
910 IF C=4 THEN I=5: GOTO 1170
920 IF C=5 THEN I=8: GOTO 1170
930 GOTO 1090
940 IF C=4 THEN I=6: GOTO 1170
950 IF C=5 THEN I=9: GOTO 1170
960 GOTO 1090
970 IF C=4 THEN I=7: GOTO 1170
980 IF C=5 THEN I=10: GOTO 1170
990 GOTO 1090
1000 IF (C=2) AND ((W=5) OR (W=6)) THEN I=13: GOTO 1170
1010 IF (C=4) AND ((W=2) OR (W=3) OR (W=4)) THEN I=14: GOTO 1170

1020 IF (B<=30) AND (B>29.8) THEN 1040
1030 IF (B<=29.8) THEN 1060
1040 IF (C=5) AND ((W=2)OR(W=3)OR(W=4)) THEN I=15: GOTO 1170
1050 GOTO 1090
1060 IF (C=3) AND (W=3) THEN I=16: GOTO 1170
1070 IF (C=5) AND ((W=4)OR(W=5)) THEN I=17: GOTO 1170
1080 IF (C=5) AND ((W=1)OR(W=2)OR(W=3)) THEN I=18: GOTO 1170
1090 PRINT "NO FORECAST FOR THE CONDITIONS ENTERED"
1100 PRINT
1110 PRINT "CHECK YOUR DATA TO SEE IF IT IS CORRECT. IF NOT,"
1120 PRINT "ENTER THE CORRECT DATA BEGINNING AT THE PROMPT AT THE BOTTOM OF THE SCREEN"
1130 PRINT "IF DATA IS CORRECT, PROBABLY GOING TO BE NICE ANYWAY"

1140 PRINT "IF YOU'RE REALLY CONCERNED, CHECK WITH THE WEATHER BUREAU"
1150 PRINT
1160 GOTO 440
1170 PRINT FCS(I)
1180 PRINT:PRINT:GOTO 440
```

Program Listing 1

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cept when you hold down the shift key. The drawback is that the lowercase letters will not be displayed. Instead, you get a different set of characters. Below is a list of the characters displayed and their lowercase equivalents:

```
! " # $ % & ' ( ) * + , - . / 0 1 2 3 4 5 6 7 8 9 0
a b c d e f g h i j k l m n o p q r s t u v w x y z
```

As you can imagine, your screen will look like it's filled with garbage and editing is quite difficult, but it does work.

J.D.D.
Galveston, IN

Regarding A.N. of the October issue, there is such a program. It was published in the May 1980 issue of 80 Microcomputing ("Basic Word Processor," page 50). This one program alone has paid for my subscription to date.

E.F.K.
Peru, IL

In answer to A.N., I do know of a patch to let you operate Scripsit in up-

percase/lowercase on an unmodified Model I.

An article of mine included a short 61-byte subroutine that converts all code sent to the video to uppercase, while leaving the code in your text buffer in lowercase. A different-shaped cursor informs the writer of the case of the letter he's examining.

The article is going to be published by 80 Micro in a book of Scripsit modifications, which will be released soon.

T.L.Q.
Burke, VA

I had the same problem as A.N.: My printer supported lowercase, but my Model I didn't. Since I couldn't find a program that would let me use my system as is, I wrote one. TRS-Ed, as it's called, is marketed by Single Source Solution, 2699 Clayton Rd., Concord, CA 94519.

E.S.
Rockville, MD

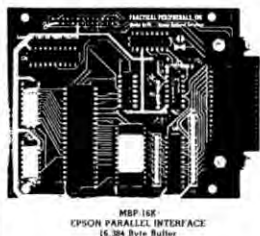
About A.N.'s question, my word

processor TXMODE, does store lowercase in the memory of a Model I with the lowercase display modification. TXMODE is a machine-language, tape-based word processor, and is sold by Tops Programming Enterprises (8990 S.W. Camille Terrace, Portland, OR 97223) and retails for \$29.95 plus \$2 for shipping.

S.E.
Portland, OR

Our program, The Word Machine, is the answer to A.N.'s problem of using his unmodified Model I for word processing. We have two versions of The Word Machine (which was reviewed in 80 Micro, September 1982). One supports the features of the Centronics printers (Radio Shack Line Printers), and the other supports Epson MX printers.

We believe that The Word Machine, at a price of \$35 plus \$2 shipping, represents the best value for the TRS-80 Models I and III (GB Associates, P.O.



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G.J.H.
Granada Hills, CA

Attached is an Assembly-language listing (see Program Listing 2) that lets you use Scripsit/LC on an unmodified Model I. All characters are displayed as uppercase, but printed properly in upper and lowercase as needed.

The program can be keyed in with either an Editor/Assembler or a machine-language monitor like Debug. When completed, store the routine on the same disk as Scripsit/LC with the following command:

DUMP WP/CMD (START = X'F000',END = X'F05D',TRA = X'F02F')

To execute the routine from TRSDOS, type in WP and press enter. The routine will load Scripsit/LC into memory, make the necessary patches, and then turn control over to Scripsit/LC.

T.E.C.
Charlotte, NC

```

00100 ; PRGM: WP/CMD
00110 ; BY: TED E. CASH
00120 ; DATE: 9/6/82
00130 ; PURPOSE: PATCH SCRIPSIT/LC TO DISPLAY UPPERCASE
00140 ; AND PRINT UPPERCASE/LOWERCASE
00150 ;
00160 ; ORG 0F000H ;ANYWHERE ABOVE 7AA5H
00170 LC DEFM 'SCRIPSIT/LC'

F000
F000 53
F001 43
F002 52
F003 49
F004 50
F005 53
F006 49
F007 54
F008 2F
F009 4C
F00A 43
F00B 03
0014 00180 DEFB 3
0014 00190 DEFS 14H
F020 C30252 00200 PAT1 JP 5202H ;PATCH AREA
F023 08 00210 PAT2 EX AF,AF' ;REPLACE CODE
F024 CB7F 00220 BIT 7,A ; IN PATCH AREA
F026 C2975F 00230 JP NZ,5F97H ;CONTINUE ON IF CNTL CHAR
F029 CD355A 00240 CALL 5A35H ;CONVERT LOWER TO UPPER
F02C C3AD5F 00250 JP 5FADH ;JUMP TO MAIN ROUTINE
F02F 1100F0 00260 START LD DE,LC ;GET ADDR OF PGM TO LOAD
F032 CD3044 00270 CALL 4430H ;TRSDOS LOAD ROUTINE
F035 C22040 00280 JP NZ,402DH ;IF ERROR RETURN TO OPSYS
F038 CD2844 00290 CALL 44BBH ;CLOSE DISK FILE
F03B 2120F0 00300 LD HL,PAT1 ;GET ADDR OF JUMP PATCH
F03E 11925F 00310 LD DE,5F92H ;POINT TO DEST.
F041 010300 00320 LD BC,3 ;BYTE COUNT
F044 EDB0 00330 LDIR ;MOVE IT
F046 2123F0 00340 LD HL,PAT2 ;GET ADDR OF PATCH
F049 110252 00350 LD DE,5202H ;PATCH AREA-RADIO SHACK
; COPYRIGHT STATEMENT
; BYTE COUNT
; MOVE IT
; GET ADDR OF PATCH
; PATCH AREA-RADIO SHACK
; COPYRIGHT STATEMENT
; BYTE COUNT
; MOVE IT
; FIX
; UP END TO
; RETURN TO
; TRSDOS - NOT REBOOT
; JUMP TO SCRIPSIT/LC
F04C 010C00 00370 LD BC,0CH
F04F EDB0 00380 LDIR
F051 3E2D 00390 LD A,2DH
F053 329565 00400 LD (6595H),A
F056 3E40 00410 LD A,40H
F058 329665 00420 LD (6596H),A
F05B C30052 00430 JP 5200H
F02F 00440 END START
00000 TOTAL ERRORS
    
```

Program Listing 2

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EXP. DATE _____



CL-183

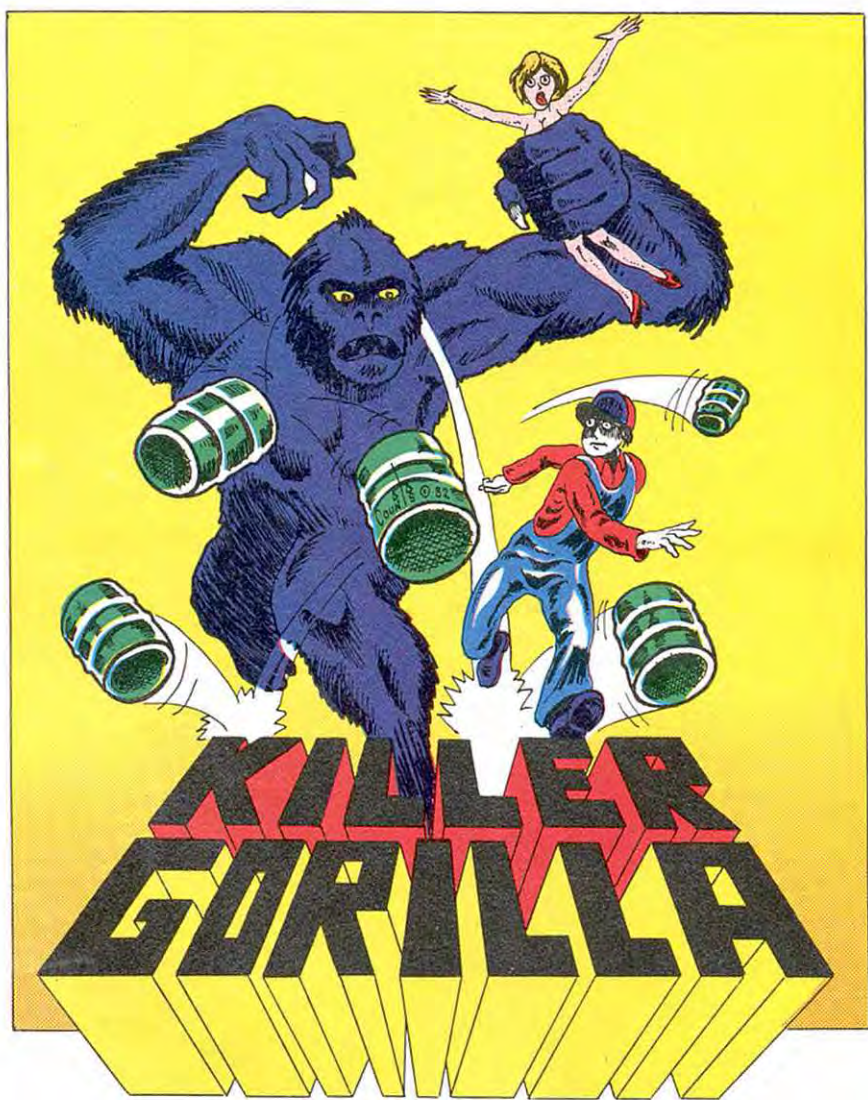
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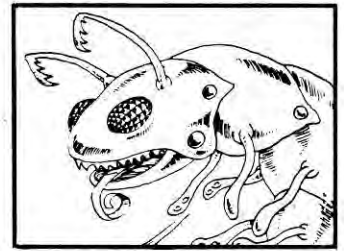


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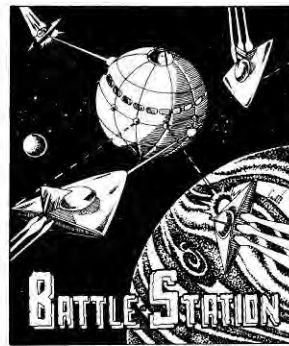
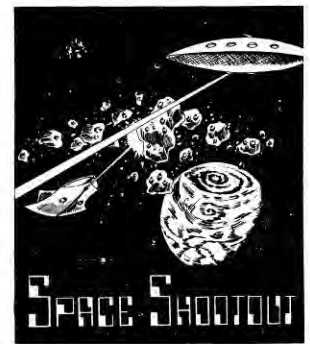


Insect Frenzy - Page 5

Volume 4

All The News That's Fit To ZAP!

Users vote no to the same OLD ARCADE GAMES



(DV 1982) Blurry eyed users have turned to **DISPLAYED VIDEO** to answer their need for new and exciting arcade games. In response, **DISPLAYED VIDEO** has announced eight new programs for the TRS-80* Models I-III. These arcade type games feature sound, graphics, joystick compatibility and are written in machine language for maximum speed! Both disk and tape versions allow the user to save high scores, a feature not usually found on cassette based games. Maze enthusiasts seem to like Ghost Hunter and Killer

Beetles, while gun slingers look toward Insect Frenzy, Jungle Raiders, Space Shootout, Alien Cresta and Battle Stations for excitement. A Game that does not fall into these categories is Hoppy. It features wild drivers, sinking turtles, and hungry alligators. These programs are distributed exclusively by **DISPLAYED VIDEO** and written by Dubois and McNamara. Pricing for these programs is \$15.95 for tape and \$19.95 for disk. Reliable sources inside the company indicate Killer Gorilla will be available by the time you read this.

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As you can see, A.N.'s request for help on using his unmodified Model I for word processing was amply answered. The first suggestion, using Scripsit with the punctuation and numeral characters displayed, is awkward and difficult. Few people have the patience to use it.

The second suggestion, using the Basic program published in *80 Micro* will work very well.

T.L.Q.'s patch to Scripsit sounds exactly like what A.N. wanted, a simple patch for his copy of Scripsit. If anyone's interested in the book of Scripsit Patches, watch this column and I'll let you know when it's available, and what it has. Fortunately, T.C. of Charlotte, NC, included a simple patch routine (Listing 2).

The last three readers offered programs that let you use an unmodified Model I for word processing. About their merits, since I haven't seen them I can't say, although the reviewer of *The Word Machine* in the September (page 112) issue seemed to like it.

If you have software or hardware that might be of interest to readers of this column, please let me know by sending advertisements, documentation. After all, if I don't know about it, how can I tell the readers?

I use a Microline 80 printer with my TRS-80. It works fine, but now it's time for me to change the ribbon. I tried the computer store where I purchased the printer, but was told they don't carry them. I asked the salesperson for the ribbon's specification, but was told they don't have them. What good is the printer without the ribbon? Can you help?

*E.W.
Charlotte, SC*

I called Okidata (609-235-2600), and found that you should use only Okidata or Okidata-approved ribbons. These ribbons contain a special lubricant that keeps the print head in optimal condition. Using a ribbon not approved by Okidata will severely degrade the life of your print head. You can get ribbons directly from Okidata (\$3.18 each) if you buy them in lots of 12 (\$38.16 total). If you want to buy them individually, contact a local distributor, which in your case would be either Ten-Tech Associates, Greensborough (919-852-6000), or Interact Company, Ashville (704-254-

1949). Individual ribbons should retail for under \$4.

(We inadvertently published the following letter with an incorrect solution in our November 1982 issue. Terry brought it to our attention, and has since provided us with the corrected version below.—Eds.)

I have a TRS-80 Model II, an Epson MX-80 printer, and Scripsit. I can't get the printer to print in the emphasized mode.

I've sent letters to both Radio Shack and Epson America, and it seems that they can't help me. I know nothing about programming.

*H.J.
Skokie, IL*

"Why doesn't my Epson MX-80 print head reset itself on the left margin?"

Your main problem is the word processor. The Epson printer can be made to print in the emphasized mode by sending it the proper escape code, followed by the code for emphasized printing. While the TRS-80 Model II can easily transmit any code generated by Scripsit, Scripsit itself can't generate the code required. If you were in Basic, you could use the CHR\$(x) command to send the proper codes to the printer via the LPRINT command, subsequent LPRINTs would be printed in the emphasized mode, until the printer is turned off or the escape code followed by the code to turn off the emphasized print mode is sent.

Unfortunately for Model II Scripsit users, Scripsit reinitializes the printer port when it loads into memory. If you had the Grafrax modification on your Epson, you could use one of the internal hardware switches to set the Epson to turn on in the emphasized mode. There's another switch you should check: Early model Epson printers have a switch labeled "TRS-80 Mode." If this switch (number 2-4) is set to on, you won't be able to use the emphasized mode. Check your manual and printer

to see if the switch is on or off.

Finally, if you're using condensed mode, you can't go into emphasized mode, they're mutually exclusive.

If nothing else works, you might consider getting Scripsit 2.0. It's supposed to let you embed printer codes in your text files.

My problem is with my tractor-feed Epson TX-80 printer, which is no longer made. When printing several sheets, the tractor-feed pins on the left belt begin to go off center, causing the paper to lag behind on the left side. If I maintain a steady pull on the paper, everything is okay, but if I don't, the paper jams. The paper is directly below the printer, so it can't be that the paper weight is too much. It seems as if the belt on the left side is slipping, but it's hard to notice.

*J.G.
Bergenfield, NJ*

I called the technical-support department of Epson America (213-539-9140). They told me that the left belt is probably stretched and not turning the pin-feed mechanism properly. Take the printer to a local support center and have them check out the tractor-feed mechanism (the problem could be the line feed motor). To get the name and address of the closest Epson support center (there are six in your state), call Epson's phone number and ask for the service department.

Why doesn't my Epson MX-80 print head reset itself on the left margin? Sometimes when I turn it on, it slowly slides left, then right, then left, then right, and so on.

*G.K.
Charlotte, NC*

Several things could be wrong: The head-home sensor, which detects when the print head has reached "home" (the left margin), could be bad; the PTS sensor, which tracks the head position on the print carriage, could be faulty; or any of the chips of the associated circuits on the previous two devices could be failing. Also, whether you have a Grafrax installed could make a difference.

Your best solution is to get in contact with The Computer Room (704-377-9821), the closest Epson America sup-

port center in your state, and have them take a look at it.

I have almost mastered Graftrax in my Epson MX-80, driven by a Model I 48K TRS-80.

I'm having a problem using the 480-dot graphics mode from Basic. Using the example in the manual, suppose I want to print 50 dots but want to start at the 14th dot column instead of the first printing position. If the offset equals six dots, or some multiple of six, I could position the print head at the desired place by using LPRINTTAB(x) before entering graphics mode. But if the offset isn't divisible by six, that won't work.

I have tried:

```
10 LPRINTCHR$(27)"K";
20 POKE 14312,14
30 IF PEEK(14312) <> 63 THEN 30
40 POKE 14312,0
50 IF PEEK(14312) <> 63 THEN 50
60 FOR I=1 TO 14
70 LPRINT " ";
80 NEXT
```

*The output was 14 dots!
Help!*

*R.F.
Rio de Janeiro, Brazil*

Graftrax-80 is supposed to automatically justify to the next tab position if you're mixing tabs and graphics. Graftrax-Plus doesn't do this.

I don't know the solution to that problem. A technical man at Epson said your program should work. He suggested you enter the bit-image mode and send 13 spaces as data, and then start sending the graphics data (put your PEEK-POKE combinations in a loop and send the blanks one at a time). If that doesn't work, tab to the closest dot position (as a multiple of six) before the position you want to start printing, and send the extra blanks you need to get to the correct position.

In any case, Epson will be sending you a free pamphlet, *Bit-Image Graphics on the Epson*, which should help you.

I purchased SuperScripts for my

48K, dual-disk TRS-80 Model III and Epson MX-80 FT with Graftrax printer. The problem is that the printing is in compressed mode only. Changing the Scripsit printer selection switches (DW2, LP4, LP8) doesn't help. The procedure described on page 120 of the SuperScripts manual also doesn't help. The people at the Radio Shack Computer Center suggested that I get a new printer driver, but I have no idea where to get one.

*G.O.
Phoenix, AZ*

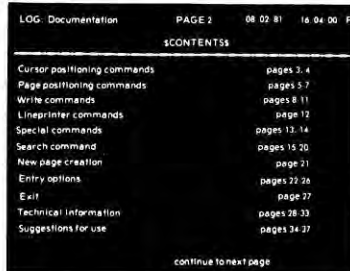
The author of SuperScripts, Sam Sauloman, decided that the best way to accommodate the variety of different printers on the market was to write it to use a separate printer driver. That way, any printer could be used with SuperScripts when the proper printer driver was used. What this means is that until a printer driver is written for any given printer, you must use SuperScripts with the drivers.

Unfortunately for Epson printer

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PROGRAM BY KSoft



One year old and a proven success! LOG for the TRS-80 (R) is still the only program on the market that addresses one very obvious problem: Despite data-base managers, word processors, and a dozen brands of spreadsheets, the fact is that most of the information people handle on a day-to-day basis just won't fit into fields, files, and codes.

LOG, on the other hand, is a program that 'thinks' like you do! LOG turns your video screen into a one page of a large notebook. Thumb slowly or search like lightning through your previous entries; modify, update, or erase as you desire with the built-in text editor. Append new pages with a single keystroke, up to 170 individual pages on a Model III diskette! Keep a separate LOG notebook on any diskette in any drive.

- Yes! LOG supports hardcopy to your lineprinter.
- Yes! All commands are single keystroke (no modes to remember).
- Yes! You can access LOG while BASIC is running.
- Yes! It really works!

People are using LOG to store address lists, programming notes, diaries, personnel files, recipes, record collections, and a hundred other uses. Think up your own applications. You'll probably use it every day.

Model I	48K	\$49.95	(upper case only)
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Minimum system: 48K, 2 disk drives, DOS 2.3 (I) or 1.3 (III) required. Ask about other Operating Systems or hardware configurations.

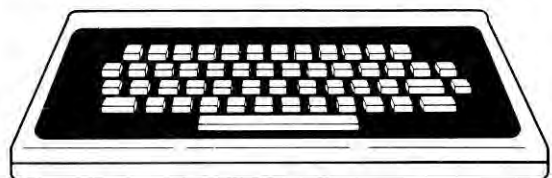
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369

owners, none of these drivers work right with Epson printers. Epson's technical department referred me to Apparat (Apparat is currently preparing a SuperScripts driver for the Epson MX printer). They told me the new driver should be ready soon. The driver will require that your Epson printer have the Graftrax Plus (in order to use the underlining feature). It will also be unable to switch print modes within a document.

The SuperScripts manual lists the source code for the DWII driver and includes an example of how a printer driver works, but writing one for yourself isn't a job for the novice. There's lots of code, and the instructions for writing your own driver don't give you enough specifics to make the job easier.

The letter from F.G. of Warren, MI, (September issue), regarding why the LPRINT instruction didn't give the expected response, was of interest to me and might be of more interest to your readers than you know!

Your answer was to use the command LPRINT " ". But there's at least one printer with such badly written software (by the manufacturer's admission) that the printer won't execute a carriage return/line feed, even if instructed LPRINT, LPRINT " ", OUT###,13, or LPRINTCHR\$(13)! In particular, the Microtek Bytewriter I (also sold as the Tekwriter), when mated with a Model III, has several control codes that don't function properly.

My dealings with Microtek concerning this matter have made it crystal clear that they are a company to avoid. It took nearly three months to get delivery, although I was never told to expect such a delay. It was apparent from the beginning that the printer was worthless and my calls to the manufacturer produced such results as "You don't understand how to use it," and, "Give it some time, it'll grow on you." I'm working on my master's degree in computer science; I know how to use it and I didn't spend several hundred dollars just to let something "grow on me."

After the warranty had expired I was told that they knew all about the glitch and were trying to fix it. Five months after receiving the printer, they finally allowed me to send it back for a refund. Two months passed before I was informed that they were sending the printer back to me and "If I didn't like it,

could sell it locally." It turned out that they had lost the paperwork. After days of screaming phone calls they found the paperwork and assured me that the refund would soon be on its way.

That was something like five weeks ago and I've been told (repeatedly) that it will be at least another two weeks, but probably much longer before I receive any money. In all I've lost about \$100 in replacement-printer rentals, unexpected credit-card expenses, and shipping on this "equipment."

But back to your response to F.G., please inform him (and everyone else) that if a printer does not respond to LPRINTCHR\$(13), they should call the manufacturer immediately!

J.M.
Louisville, KY

"It was apparent from the beginning that the printer was worthless. . ."

Before anyone contacts an equipment manufacturer he should first make sure the problem is actually with the equipment and not the operator. For a printer this means checking out your equipment first. Yesterday I had the unfortunate experience of having a Daisy Wheel printer die. All of a sudden it was printing garbage. I decided to verify the problem by reconnecting my old dot-matrix printer. It also didn't work right, printing everything in lowercase only and ignoring line feeds. Experimentation discovered the true culprit—my printer cable. The cable had gone bad, a wire close to the connector had broken. Depending on the position of the cable and how it was flexed, the printers worked fine, partially worked, or didn't work at all.

If you are experiencing line-feed problems with a printer, perform these tests in this order:

- Reread the printer's documentation (there might be a switch you can set to fix the problem).

- Send LPRINT, LPRINT " ", LPRINT " ";CHR\$(10),LPRINT " ";CHR\$(13), and LPRINTCHR\$(138) commands (Level II Basic intercepts and ignores CHR\$(10) and CHR\$(13) if they're at the beginning of an LPRINT).

- Try a different printer cable.
- Try your computer with a different printer (your printer port could be at fault).
- Try having a friend use your printer on his computer.

If all these procedures leave you with a printer that won't line feed when you command it, call the manufacturer and clearly explain the problem.

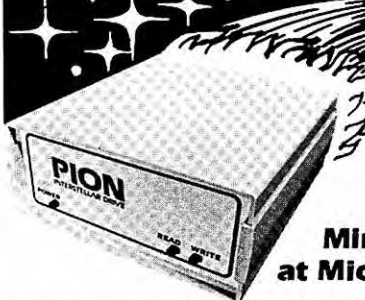
About your difficulties with the Microtek printer, the technician I talked to said that the printer functions exactly as the documentation says it should when connected to a Model I or Model III. Since no one else has complained to him about difficulties with using the printer on a Model III, he suggests that the culprit was probably the PROM in that particular printer.

Your refund is another problem. According to Microtek's customer-service representative, Sally, your printer was shipped to you on November 19, 1981. You returned the printer to them on May 13, 1982 (that's when they received it). The Bytewriter was sold with a 30-day money-back guarantee, so you should've returned it to them before December 31 to qualify for a refund. However, a technician in their service department authorized the return and the refund. Unfortunately, many people who bought the Bytewriter also returned their units. In the confusion, the paperwork for your printer was misplaced, but finally, on July 1, the management authorized your refund.

In August, because of the cash-flow problem created by the Bytewriter printer (to compete on the market, their profit margin had to be slim and the refunds ate it away), Microtek filed for Chapter 11. Since then they have been paying off authorized refunds as cash becomes available. The money to pay these refunds is being generated by the sales of new peripherals from Microtek for the Atari, Apple, and IBM computers, which, according to Sally, are booming. At the moment, September 15, they're mailing refunds to the people who canceled their orders in May. Sally expects to be processing your refund sometime in the next three or four weeks. ■

Terry Kepner is a free-lance writer and programmer, and the vice president of Interpro. He's been writing about microcomputing since 1979.

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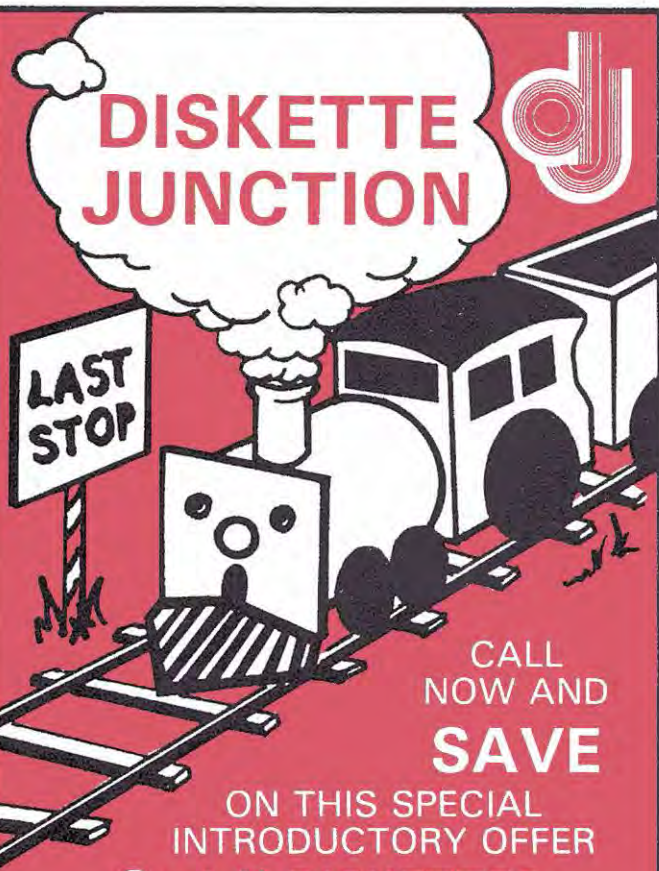
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The first Color Load 80 is now available. Selling for just \$14.97, it encompasses the best of the Color Computer programs from 1982. You can order this little gem by calling (800) 258-5473 or by using the order form in the Color Load 80 advertisement.

The Color Load 80 directory printed last month listed 28 programs; since then we've squeezed in eight more! With this bonus the cost per program is now less than 42 cents.

One of the few programs missing from this cassette is Jake Commander's "Spirals," from "Spiromania, Part II," June/July—80 Micro does not own the software publishing rights.

Color Load 80 bonus

The 1982 Load 80 Index also appears in this issue. If you've been wondering

what we published in past months, scan this list. These are Model I/III programs and as always, 80 Micro is the documentation. Tapes or disks for all months are available and can be ordered by calling (800) 258-5473 or by using the Load 80 advertisements in this magazine.

Tapes are available from April 1981, disks from March 1982. Order by calling (800) 258-5473, or by using the Load 80 advertisements in this magazine.

This column will cover a number of interesting topics in 1983, including how to load and assemble Load 80 programs, load difficult tapes, maintain your recorder, maintain your disk drives and convert cassette I/O to disk. For complete use of Load 80, read this column. ■

An index of all programs on Load 80 ran in the Anniversary Issue. An index of all Load 80 programs in 1982 is on page 465 of this issue.

Month	Page	Article Name	Program	Type
Side A				
Feb	202	Colorful Titrations	TITLEPGE	—
Mar	78	The Editor's Choice	TITRATE	Education
	78	The Editor's Choice	GESAMTE	Graphics
	106	Subchaser	COMMANDR	Graphics
	142	Is a Rose in Color Still a Rose?	SUBCHASE	Game
	142	Is a Rose in Color Still a Rose?	ARTIST	Graphics
	142	Is a Rose in Color Still a Rose?	MAZE	Game
	212	COLORMON	3-D	Game
May	386	Dynamic Item Scheduling	COLORMON	Utility
July	352	Do Not Pass	ITEMSCHD	Application
Aug	94	The Colorful Computer (Part 1)	SIGNS	Education
	188	Color Maze	COCOL*	Graphics
	202	Four In One Plus Another	CCMAZE	Game
	202	Four In One Plus Another	BRICKOUT	Game
	202	Four In One Plus Another	POINDEXT	Game
	202	Four In One Plus Another	MATHTALK	Education
	202	Four In One Plus Another	PIXPRINT	Utility
	260	Space Duel	TANK-GUN	Game
	264	Square Game	SPACEDUL	Game
	268	Color Breakaway	SQRGAME	Game
			BRKAWAY	Game
Side B				
Sep	140	Basic Word Processing	WORDPROC	Application
	230	Joystick Paintbrush	PAINTBRU	Graphics
	238	Conversion	CONVR	Graphics
Oct	168	Income Tax Estimator	TAXCALC	Applications
Nov	164	More Color Conversions	SUBDSTRY	Game
	164	More Color Conversions	LLANDER	Game
	164	More Color Conversions	MISSILES	Game
	213	Color Assembler	ASSEMBLR	Utility
	272	Show the Score	SHOWSCOR	Utility
	304	Test Patterns	TVTEST	Application
	308	Music Marvel	MUSIC	Application
	308	Music Marvel	MARVELI	Application
Dec	388	Picture Editor	PIC-ED	Graphics
	200	Color Morse Code	HAMLOAD	Application
	200	Color Morse Code	HAMSHACK	Application
	354	Color Disk Dump	DISKDUMP	Utility

*all the programs in the article written as one program, each accessible from the menu.

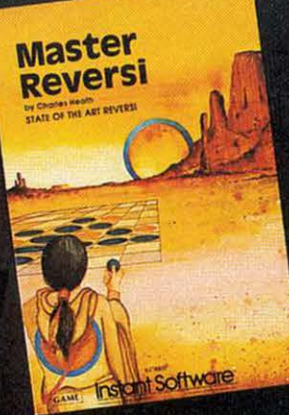
Color Load 80 Directory

Program	Title	Page	Comments
1	COPYRGHT/BAS	—	None
2	ORBITS/BAS	156	None
3	WORDPROC BAS	200	None
4	BREAKOUT/BAS	216	None
5	PINEDRBY/BAS	221	None
6	DSAVE/SRC	232	Needs EDTASM
7	DSAVE/CMD	232	Machine Language*
8	WINDCHLL/BAS	238	None
9	PARSER/BAS	268	None
10	PENRAM/SRC	276	Needs EDTASM
11	PENRAM/CMD	276	Machine Language*
12	FORMATER/BAS	316	None
13	TIMER/BAS	316	None
14	DROSSDOS/BAS	342	None
15	BASTEP/BAS	352	None
16	BASTEP/SRC	352	Needs EDTASM
17	BASTEP/CMD	352	Machine Language*
18	LEAPYEAR/BAS	412	None
19	PCALENDR/BAS	412	None
20	SANDSTME/BAS	412	None
21	WEATHER/BAS	400	None

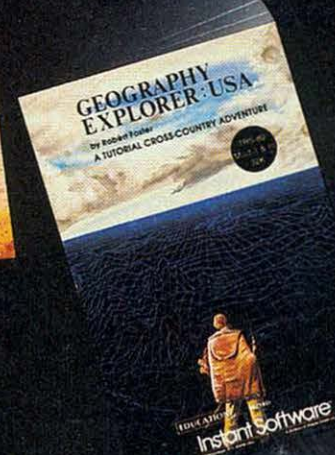
*We have included both the source and object code for these programs. Use an Editor/Assembler with the programs marked /SRC. Files marked /CMD are ready to use as described in the articles.

January Load 80 Directory

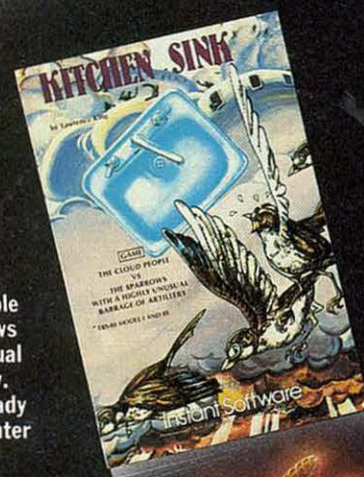
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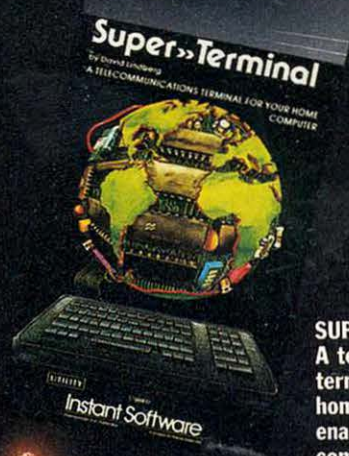
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FUN HOUSE

By Richard Ramella

TIME

Happy New Year!

What better time of the year to think about time than January? Everyone who goes through the Fun House this chilly month will receive a perpetual calendar, an egg timer, and a leap-year lesson; plus a Nickel Bargain Bin offer for an electronic birthday card.

The programs are given for Level II and the Color Computer.

Time...I don't really know what it is. I do know we humans have developed tools and systems for dealing with it in interesting ways. To enter the Secret Time Passage of the Fun House, step inside the giant grandfather clock.

Leap Year

A leap year is a year that has 366 days instead of the regular 365. There is a leap year every four years—nearly. Why are there leap years? Without leap years the calendar would get out of step with the sun and it would take about 760 years to put the whole system out of whack by six months. Imagine celebrating the Fourth of July hip deep in snow.

Hooray for leap years.

The leap year system started in

Leap Year

```

100 REM * LEAP YEAR / LEVEL II AND COLOR COMPUTER *
110 CLS
120 PRINT "A REGULAR YEAR HAS 365 DAYS,"
130 PRINT "BUT LEAP YEARS HAVE 366 WITH THE EXTRA DAY AS FEBRUAR
Y 29."
140 PRINT "LEAP YEARS ARE EVENLY DIVISIBLE BY FOUR;"
150 PRINT "HOWEVER, YEARS ENDING IN -00 ARE ONLY LEAP YEARS"
160 PRINT "IF EVENLY DIVISIBLE BY 400."
170 PRINT
180 INPUT "ENTER A YEAR TO CHECK LEAP YEAR STATUS";A
190 IF A<1582 THEN PRINT "THE LEAP YEAR SYSTEM BEGAN IN 1582.":
GOTO 180
200 AS=STR$(A)
210 IF RIGHT$(AS,2)="00" GOTO 230
220 IF A/4=INT(A/4) GOTO 250
230 IF A/400=INT(A/400) GOTO 250
240 PRINT "NO,";A;" IS NOT A LEAP YEAR": END
250 PRINT "YES,";A;" IS A LEAP YEAR"
260 END

```

Sands of Time

```

100 REM * SANDS OF TIME / LEVEL ii *
110 CLS
120 X=0
130 L=0
140 Z=40
150 FOR Y=0 TO 20
160 FOR X=L TO Z
170 SET(X,Y)
180 NEXT X
190 L=L+1
200 Z=Z-1
210 NEXT Y
220 X=X-1
230 Z=X
240 FOR Y=Y TO 40
250 SET(X,Y)
260 SET(Z,Y)
270 X=X-1
280 Z=Z+1
290 NEXT Y
300 FOR X=0 TO 40
310 SET(X,Y)
320 NEXT X
330 X=2
340 L=2
350 Z=38
360 FOR Y=1 TO 19
370 X=L
380 FOR X=L TO Z
390 RESET(X,Y)

```



Listing continues

Listing continued

```
400 B=B+1
410 FOR A=22 TO 40
420 SET(B,A)
430 IF POINT(B,A+1)=-1 N=N+1: GOTO 450
440 GOTO 580
450 IF N=2 N=0: GOTO 520
460 IF POINT(B+1,A+1)=-1 A=40: GOTO 590
470 RESET(B,A)
480 B=B+1
490 A=A+1
500 SET(B,A)
510 GOTO 460
520 IF POINT(B-1,A+1)=-1 A=40: GOTO 590
530 RESET(B,A)
540 B=B-1
550 A=A+1
560 SET(B,A)
570 GOTO 520
580 RESET(B,A)
590 NEXT A
600 NEXT X
610 L=L+1
620 Z=Z-1
630 NEXT Y
640 GOTO 640
650 END
```

Sands of Time for Color Computers

```
100 REM * SANDS OF TIME / COLOR VERSION *
110 CLS(0)
120 X=0
130 L=0
140 Z=30
150 FOR Y=0 TO 15
160 FOR X=L TO Z
170 SET(X,Y,8)
180 NEXT X
190 L=L+1
200 Z=Z-1
210 NEXT Y
220 X=X-1
230 Z=X
240 FOR Y=Y TO 30
250 SET(X,Y,8)
260 SET(Z,Y,8)
270 X=X-1
280 Z=Z+1
290 NEXT Y
300 FOR X=0 TO 30
310 SET(X,Y,8)
320 NEXT X
330 X=2
340 L=2
350 Z=28
360 FOR Y=1 TO 14
370 X=L
380 FOR X=L TO Z
390 RESET(X,Y)
400 B=15
410 FOR A=17 TO 30
420 SET(B,A,8)
430 FOR T=1 TO 10
440 NEXT T
450 IF POINT(B,A+1)=8 THEN N=N+1: GOTO 470
460 GOTO 640
470 IF N=2 THEN N=0: GOTO 560
480 IF POINT(B+1,A+1)=8 THEN A=30: GOTO 650
490 RESET(B,A)
500 B=B+1
510 A=A+1
520 SET(B,A,8)
530 FOR T=1 TO 10
540 NEXT T
550 GOTO 480
560 IF POINT(B-1,A+1)=8 THEN A=30: GOTO 650
570 RESET(B,A)
580 B=B-1
590 A=A+1
```

Listing continues



1582. However, this program and the Perpetual Calendar program listing won't work for years before 1753, when England adopted it. We follow the British pattern because historical dates common to both Great Britain and the United States would otherwise be thrown into confusion.

I never understood the system for deciding when to put in that 366th day as February 29. I looked it up. Now I know. It's easy, and I'm going to show it to you. The listing works on Level II and the Color Computer.

Sands of Time

I now present the Fun House's latest contribution to humanity: Sands of Time.

I gave it a fancy name to hide the fact that it's an egg timer, more officially called an hourglass. The versions here are actually minute glasses. The Level II program takes about three minutes and 10 seconds to run, and the color version takes about two minutes.

People once used sand-filled glasses to mark the passage of

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Listing continued

```
600 SET(B,A,8)
610 FOR T=1 TO 10
620 NEXT T
630 GOTO 560
640 RESET(B,A)
650 NEXT A
660 NEXT X
670 L=L+1
680 Z=Z-1
690 NEXT Y
700 GOTO 700
710 END
```

time. They're not used much today except as egg timers and to mark a player's turn in some games.

So let's use one of the most sophisticated timing devices available—the computer—to make an old-fashioned sand timer. Please form a line to the left and don't push. There are enough souvenir egg timers for everyone.

Perpetual Calendar

What day of the week were you born? What day was the Declaration of Independence signed? When is Christmas in 1990?

These questions are pretty tough to answer because the only calendar that ever seems to be around is the one for the current year.

But now we have Perpetual Calendar, a simple program that prints out a calendar page for any month in any year from 1753 to infinity. The word infinity

Perpetual Calendar

```
100 REM * PERPETUAL CALENDAR / LEVEL II *
110 CLS
120 DATA SUN,MON,TUE,WED,THU,FRI,SAT
130 DATA JANUARY,FEBRUARY,MARCH,APRIL,MAY,JUNE,JULY
140 DATA AUGUST,SEPTEMBER,OCTOBER,NOVEMBER,DECEMBER
150 DIM A$(19)
160 FOR B=1 TO 19
170 READ A$(B)
180 NEXT B
190 INPUT "THE YEAR";Y
200 IF Y<1753 THEN PRINT "YEAR HAS TO BE 1753 OR LATER": GOTO 190
210 PRINT
220 FOR A=8 TO 19
230 PRINT "(";A-7;A$(A);" ) ";
240 N=N+1
250 IF N=3 THEN PRINT: N=0
260 NEXT A
270 PRINT
280 PRINT
290 INPUT "THE MONTH (1 TO 12)";M
300 IF M>12 GOTO 290
310 A=INT(.51+(1/M))
320 B=Y-A
330 C=M+12*A
340 D=B/100
350 E=INT(D/4)
360 F=INT(D)
370 G=INT((5*B)/4)
380 H=INT(13*(C+1)/5)
390 I=H+G-F+E
400 I=I-(7*INT(I/7))
410 CLS
420 PRINT A$(M+7);Y
430 PRINT STRING$(30,"-")
440 FOR A=1 TO 7
450 PRINT A$(A);" ";
460 NEXT A
470 C$=STRING$(Y)
480 IF M<8 AND M/2<>INT(M/2) THEN J=31
490 IF M>7 AND M/2=INT(M/2) THEN J=31
500 IF M=4 OR M=6 OR M=9 OR M=11 THEN J=30
510 IF M=2 THEN J=28
520 IF M=2 AND RIGHT$(C$,2)<>"00" AND Y/4=INT(Y/4) THEN J=29
530 IF M=2 AND RIGHT$(C$,2)="00" AND Y/400=INT(Y/400) THEN J=29
540 L=192
550 FOR N=1 TO 6
560 IF N=1 AND I=7 THEN PRINT @ 218,"1": P=P+1: GOTO 650
570 IF N=1 THEN FOR L=L+(4*I) TO 216 STEP 4
580 IF N>1 THEN FOR L=L TO L+24 STEP 4
590 P=P+1
600 IF P<10 THEN PRINT @ L," "; ELSE PRINT @ L,"";
610 IF P=<J THEN PRINT P;
620 NEXT L
630 PRINT
640 PRINT
650 L=L+36
660 NEXT N
670 GOTO 670
```

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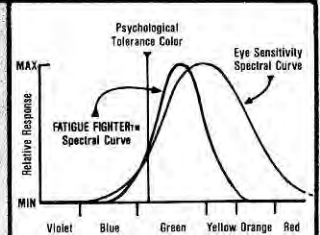


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A SYSTEMS ONLY AS GOOD AS THE BUSINESS PROGRAMS IT RUNS.

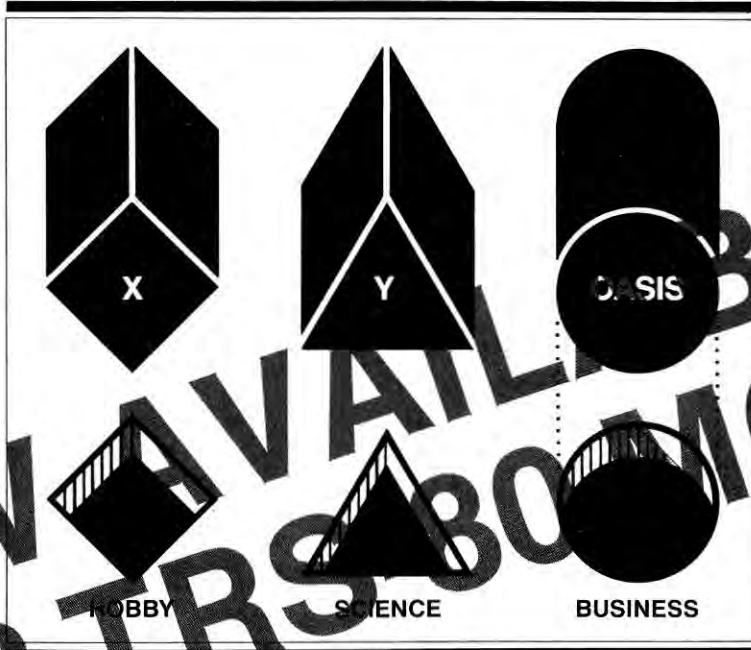
The acid test for any business operating system is the application software available to run on it. There's plenty for OASIS—for nearly any job.

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available, type 'HELP' and the command function title—OASIS displays the syntax and options available.

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* For Z80
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software: OASIS system software compensates for differences. (OASIS exact business fit #3: portability.)

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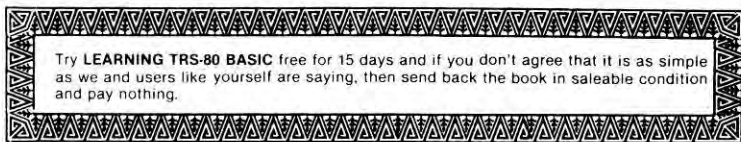
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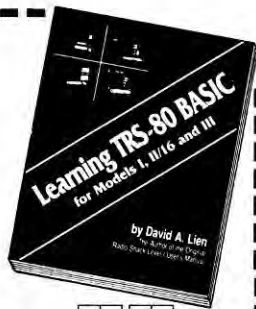
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here only means the jillion or so numbers the TRS-80 can hold.

The program works this way: At the start you see a prompt, The Year? Enter the year you want.

Then the months are printed with their numbers, January being 1 and December 12. You enter the number of the month you want to see, and the computer prints the calendar page.

The program listing given here is for Level II. To make this program run on a Color Computer, change the following lines to read:

```
540 L=128
570 If N=1 THEN FOR
      L=L+(4*I) TO 152 STEP 4
```

Also, delete line 640. Take it out now, before you forget!

Earlier, I mentioned an electronic birthday card. That's a program offered as this month's Nickel Bargain Bin. It makes a nice birthday surprise and can be personalized. It includes a cake with candles and a verse of "Happy Birthday" sung by the computer. If you want the listing, send a stamped, self-addressed envelope and a nickel to:

Richard Ramella
1493 Mountain View Ave.,
Chico, CA 95926

Please don't send your nickels to *80 Micro*. Be sure to specify a Color Computer listing or Level II listing.

By next month I should have the game room ready here in the Fun House. I anticipate the arrival of a truck filled with dice, and we shall play some interesting dice games (no betting, please) where your opponent is a strategy-wise computer. ■

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Assembly Language Section N/A for Color Computer

B.

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- Keyboard: Every key contact tested
- Line Printer: Character test
- Cassette Recorder: Read/write/verify data
- RS-232-C Interface: Read sense switches (Model I), connector fault, data transmission, framing, data loop, baud rate generator
- Disk Drives: Disk controller, drive select and restore, track seek and verify read, read/write/verify all tracks and sectors, formatting, disk drive timer, disk head cleaner
- Model I: single or double density, 35, 40 or 80 track drives
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- One program adapts to any system configuration and hardware.
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- Complete instructions and documentation.

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- CASSETTE or DISK may be used to load or save data from memory.
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- AUTOMATIC STORAGE of incoming data at user's option.
- TRANSMIT or RECEIVE WITH VERIFICATION options included for communication between two TRS-80s using Smart Terminal.
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- Buffered LINE PRINTER ECHO for incoming data.
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- BAUD RATE and RS-232-C CHARACTERISTICS can be reset from within the program.
- SAVE PROGRAM option creates "personalized" back-up copy of program with all options set as specified by user.
- ONE PROGRAM supports both cassette and disk systems. Program is compatible with PMC-80 and other TRS-80 "work alike" computers.

Model I or III Version supplied on cassette **\$69.75**
Model II (CP/M) Version supplied on diskette **\$74.95**
Model II (CP/M) Version **\$79.95**

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MON-3 (For Cassette Systems) \$39.95
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TRS-80 Model 1/3 Cassette Version \$29.95
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Features Include: Password Security System • Four levels of Access-Guest, Member, Owner, Operator • User Log • Four message types • Smart reverse scan to view messages from most recent to oldest.

Minimum Requirements: TRS-80™ (Mod I or III), 16K, Level II, Auto-answer modem, ST80-X10 Host Program (\$50), RS232-C.

Model I or III \$50.00

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More than a personal bulletin board, this is a complete communications system for low to moderate traffic. Like ST80-PBB™ it supports four levels of users and four levels of messages with text editing and reverse scan of messages.

Additional Features Include: Transmit same message to many individuals • Auto logon and multiple command scanning • Print messages on line printer, save messages in memory buffer, maintain database without user intervention.

Minimum Requirements: TRS-80™ (Mod I or III), Level II, 48K, one disk, Auto-answer modem, ST80-X10 Host Program (\$50), RS232-C.

Model I or III \$100.00

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NAME	DESCRIPTION
1 RULE78	Interest Apportionment by Rule of the 78's
2 ANNU1	Annuity computation program
3 DATE	Time between dates
4 DAYYEAR	Day of year a particular date falls on
5 LEASEINT	Interest rate on lease
6 BREAKEVN	Breakeven analysis
7 DEPRSL	Straightline depreciation
8 DEPRSY	Sum of the digits depreciation
9 DEPRDB	Declining balance depreciation
10 DEPRDDB	Double declining balance depreciation
11 TAXDEP	Cash flow vs. depreciation tables
12 CHECK2	Prints NEBS checks along with daily register
13 CHECKBK1	Checkbook maintenance program
14 MORTGAGE/A	Mortgage amortization table
15 MULTMON	Computes time needed for money to double, triple, etc.
16 SALVAGE	Determines salvage value of an investment
17 RRVARIN	Rate of return on investment with variable inflows
18 RRCONST	Rate of return on investment with constant inflows
19 EFFECT	Effective interest rate of a loan
20 FVAL	Future value of an investment (compound interest)
21 PVAL	Present value of a future amount
22 LOANPAY	Amount of payment on a loan
23 REGWITH	Equal withdrawals from investment to leave 0 over
24 SIMPDISK	Simple discount analysis
25 DATEVAL	Equivalent & nonequivalent dated values for oblig.
26 ANNUDEF	Present value of deferred annuities
27 MARKUP	% Markup analysis for items
28 SINKFUND	Sinking fund amortization program
29 BONDFVAL	Value of a bond
30 DEplete	Depletion analysis
31 BLACKSH	Black Scholes options analysis
32 STOCVAL1	Expected return on stock via discounts dividends
33 WARVAL	Value of a warrant
34 BONDFVAL2	Value of a bond
35 EPSEST	Estimate of future earnings per share for company
36 BETAALPH	Computes alpha and beta variables for stock
37 SHARPE1	Portfolio selection model-i.e. what stocks to hold
38 OPTWRITE	Option writing computations
39 RTVAL	Value of a right
40 EXPVAL	Expected value analysis
41 BAYES	Bayesian decisions
42 VALPRINF	Value of perfect information
43 VALADINF	Value of additional information
44 UTILITY	Derives utility function
45 SIMPLEX	Linear programming solution by simplex method
46 TRANS	Transportation method for linear programming
47 EOQ	Economic order quantity inventory model
48 QUEUE1	Single server queuing (waiting line) model
49 CVP	Cost-volume-profit analysis
50 CONDPFROF	Conditional profit tables
51 OPTLOSS	Opportunity loss tables
52 FQOIQ	Fixed quantity economic order quantity model
53 FQEOWSH	As above but with shortages permitted
54 FQEQPB	As above but with quantity price breaks
55 QUEUECB	Cost-benefit waiting line analysis
56 NCFANAL	Net cash-flow analysis for simple investment
57 PROFIND	Profitability index of a project
58 CAPI	Cap. Asset Pr. Model analysis of project

59 WACC	Weighted average cost of capital
60 COMPBAL	True rate on loan with compensating bal. required
61 DISCBAL	True rate on discounted loan
62 MERGANAL	Merger analysis computations
63 FINRAT	Financial ratios for a firm
64 NPV	Net present value of project
65 PRINDLAS	Laspeyres price index
66 PRINDPA	Paasche price index
67 SEASIND	Constructs seasonal quantity indices for company
68 TIMETR	Time series analysis linear trend
69 TIMEMOV	Time series moving average trend
70 FUPRINF	Future price estimation with inflation
71 MAILPAC	Mailing list system
72 LETWRT	Letter writing system-links with MAILPAC
73 SORT3	Sorts list of names
74 LABEL1	Shipping label maker
75 LABEL2	Name label maker
76 BUSBUD	DOME business bookkeeping system
77 TIMECLK	Computes weeks total hours from timeclock info.
78 ACCTPAY	In memory accounts payable system-storage permitted
79 INVOICE	Generate invoice on screen and print on printer
80 INVENT2	In memory inventory control system
81 TELDIR	Computerized telephone directory
82 TIMUSAN	Time use analysis
83 ASSIGN	Use of assignment algorithm for optimal job assign.
84 ACCTREC	In memory accounts receivable system-storage ok
85 TERMSPAY	Compares 3 methods of repayment of loans
86 PAYNET	Computes gross pay required for given net
87 SELLPR	Computes selling price for given after tax amount
88 ARBCOMP	Arbitrage computations
89 DEPRSF	Sinking fund depreciation
90 UPSZONE	Finds UPS zones from zip code
91 ENVELOPE	Types envelope including return address
92 AUTOEXP	Automobile expense analysis
93 INSFILE	Insurance policy file
94 PAYROLL2	In memory payroll system
95 DILANAL	Dilution analysis
96 LOANAFD	Loan amount a borrower can afford
97 RENTPRCH	Purchase price for rental property
98 SALELEAS	Sale-leaseback analysis
99 RRCONVBD	Investor's rate of return on convertible bond
100 PORTVAL9	Stock market portfolio storage-valuation program

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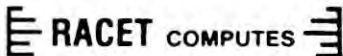
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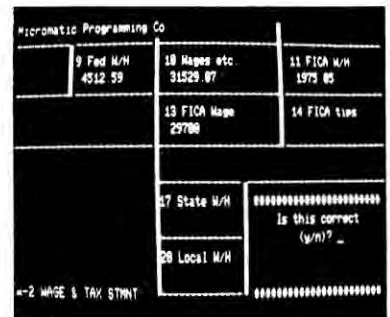
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This month I'll continue the LNW-80 construction project.

(Before jumping in, I would like to ask readers to make sure they glance at the end of this column each month. Very often I get letters asking questions whose answers have already been presented as updates or corrections. Thanks, folks.)



Photo 1. The power supply of the LNW-80 is quite hefty. I have used heavy-duty bridge rectifiers bolted to the case (partly shadowed, bottom right) and fed through barrier strips. An automotive cable clamp holds a large filter capacitor, and all the wires are hanked together with plastic clamps and bolted to the case. A power supply is created for an integral disk drive using the added heft of the LNW-80 transformer; 5- and 12-volt regulators are visible just above and below the left side of the filter capacitor.

Finish your LNW-80

Readers please note: although I still haven't seen it, there are apparently copies of a new instruction manual floating around. I don't know if it's been released yet, but try to get one if you order an LNW-80 kit.

The machine started to look like a computer when I had put all the bigger physical parts in place—the power supply (see Photo 4), the keyboard, mounting hardware, and so forth. But I knew the painstaking stuff was still ahead. I fashioned power-supply connectors from stakes and pins, since I really wanted to be able to lift the boards for the inevitable testing... without desoldering wires. That was a good move. I raided an old television chassis for heavy-duty stakes and slip-on connectors, which conveniently fit the larger holes in the LNW circuit board.

Assembling the power supply was next. Before proceeding, I confirmed a rumor that mounting the rectifiers directly on the PC board created Trace Krispies. I purchased the heaviest rectifiers available from Radio Shack, drilled a pair of holes in the case, and mounted them with heat-sink paste. Barrier strips went in next—those are screw terminal connector blocks—and the transformer and rectifiers met on either side.

The transformer didn't exactly match its description in the book, but I guessed right on 110-volt input wires (black), stuck them into my extension cord (not recommended procedure!), and measured the other pairs with my ac voltmeter. By this time I felt a little fanciness was in order, so I used terminal lugs instead of bare wire to make connections to the terminal block.

The power cord was routed through, the fuse block inserted, and the power switch installed. I labeled each wire, and snaked the lot along the bottom of the case, fastening the wire harness to the case with plastic straps. The far ends were soldered to the slip-on connectors

scavenged from the old TV.

It was ready for the first test. All dc voltages were fine, so I could proceed with assembling the PC boards. I tackled all the confusing instructions. There were separate directions for each of the video outputs, and large letters telling me not to install certain parts if I wanted that type of video output (say, RGB instead of composite video). I couldn't immediately discern what I should do if I wanted them all—which I did—and a call to California evoked something incomprehensible about them not stocking RGB ROMs at the moment. I put all the parts in for all the video versions, but have only tested the composite black-and-white.

Next, the trace-scraping and jumpering was done. A few board revisions noted in the instructions made this necessary. A good photograph would have helped enormously. In went the keyboard socket, and I guessed as to which output connectors were meant to go where. I guessed wrong, it turns out, because I later found reference to the connectors.

Finally, everything was ready for power-supply testing. I double-checked that the power jumpers were out, and turned it on. On-board micro-fuse blew. Damn. They only give you one. The testing section was useless, but I found the problem after some probing and measuring. I had grabbed a regulator marked "7812" to use for the 7812 12-volt regulator. Alas, I had read the date code. It was a 7805 5-volt regulator with the 12th week of the 1978 date code...7812! I fixed that, but what about the fuse?

There's something about odd little fuses like that one. I remembered how as a child I used to pull the wires out of a wire brush and drop them on my Lionel train's tracks. They would heat up, melt, and break. The transformer would heat up, too, but I always figured the wires would break first. (I now use that train transformer as the power supply for a homebrew computer interface). I dug through my wire bag for pieces of microphone cable, and unbraided the shield. I connected them across my Heath bench supply until I got a wire that melted and broke at the same current for which the fuse was rated. This isn't quite fast enough, but for me it was better than trying to locate a 2-amp sub-

miniature pigtail fuse here in rural America.

The power supply now passes all tests, and it's time to put in the integrated circuits. All the TTL stuff goes in first, then the miscellaneous ICs, then the ROMs, the Z80 processor, and the RAM. This is a good order, because it keeps the delicate stuff (processor and RAM, especially) from hanging loose while you fiddle with the other parts. An IC inserter also helps, though I've taken to picking up RAMs with a thin piece of black (conductive) foam held between thumb and forefinger. I can squeeze the leads just right to fit the sockets; I'm too clumsy to use an inserter. The delicate parts end up popping out of place, heading straight for my smiling cats. (Yes, cats will smile if they see some static-sensitive memory about to turn into an expensive batta-bird.)

Everything seems to be in place. I call Claire, who reads the entire parts list to me (in a tone of voice that says: hey, man, I am b-o-r-e-d) as I check. An hour later it's ready for testing. On. MEMORY SIZE? Zowdy! It's past three; time for bed.

The Expansion Board

Things seemed fine the next day, too; so I started the expansion board. This is an easier project, because it is powered by the main circuit board's power supply. Feeling confident, I worked quickly, hooked up the wires, and powered up (Photo 5). Splat. Garbage. Nothing worked, not even reset-break. Now

what? I carefully followed the power-supply wiring—I thought. The jumpers were numbered 1-2-3-4-5-6 (LNW-80) to 4-2-12-8-10-GND (expansion). The accompanying sketch visually suggests the wire placement, which is what I followed. Uh-uh. That placement is 12-10-7-GND-13-4. Once I scrambled the wires properly, everything began to work. The drive came on but...no boot. I pushed the hi/lo speed switch. Still no boot.

From Level II the machine worked fine. I got full, reliable memory. POKEs to 14304 turned the drive on and selected it properly. That was it. I checked voltages to the controller, and these were fine. I checked for bad solder joints and bridges; no luck. In desperation I pulled another 1771 disk controller from the other kit. Fine! It worked. I had been shipped a bum disk controller, or I had blown it in the assembly. Who knows, but the LNW was now performing all those Model I activities with no trouble. Including, alas, keyboard bounce—at 4 MHz, it was more like skitter. LNW had shipped a keyboard mechanically almost identical to the Model I! And with no debounce routine in ROM! What was this?

Actually, I can't get a straight story on that one. There have been at least three keyboards shipped with various generations of the LNW-80, one with no discernable bounce, straight through this one that was dismally disappointing. I followed the suggestions of several people, including Larry Rossiter

of Victoria, BC. He wrote, "Shortly after installation of Level II in my micro in late 1978, I cured the keybounce by thoroughly cleaning the contacts, then packing the keytops with Dow Corning Compound No. 4." He tells me compound No. 2 works as well. Others have used various silicone gels, and they all seem to work for debouncing (as well as stopping the clacking of the keys).

Unfortunately, the keys in both my units are sealed. There is no way to get the compound in, or to clean them. The only other option is at least a possible one: LNW ships its Level II Basic ROMs as a set of six 2716 EPROMs. If you have access to an EPROM programmer (Apparat has one of the best deals—with excellent software—for about \$150), you can include a debounce routine of your own, just like that in the later Radio Shack Basics. Any of the popular debounce routines can be located in the power-up message area around 111H. But neither of these is the kind of cure I like to invoke when purchasing what I expect to be a step forward in microcomputer design. I hope that LNW is shipping either a higher-quality keyboard or a debounce in ROM by the time you read this.

Running Interference

I mounted all the boards in place (Photo 6), and prepared for performance testing. But one more complaint before talking about the performance prowess of the LNW-80. With its heavy metal case, I expected the machine to be much quieter in terms of RFI (radio frequency interference). Hardly. Yes, it is quieter; but this home only has a radio, so I trundled in a borrowed television. It was almost as strong as the interference put out by the Model I.

Again, there is a solution to a problem that shouldn't exist from the start. First, make sure the parts of the case are electrically connected; drill a hole, scrape off some paint, and add a lug to each section to ensure it. Ground the case to the computer ground. Next, obtain some very fine mesh metal screen (a laboratory or photo supplier is a good source) and cover the rear port area, grounding the metal screen to the case. The final suggestion comes from a commercial keyboard I saw somewhere; can't recall where. Out of the finest, most flexible metal mesh you can get, cut 3/4-inch squares. Lift each keytop, insert the mesh square, and very



Photo 2. The LNW expansion board (at right), a monitor (at left), and a disk drive (back right) are all connected for testing. The keyboard is bolted in place and connected. This unit (the second of two built for this article) worked on the first try.

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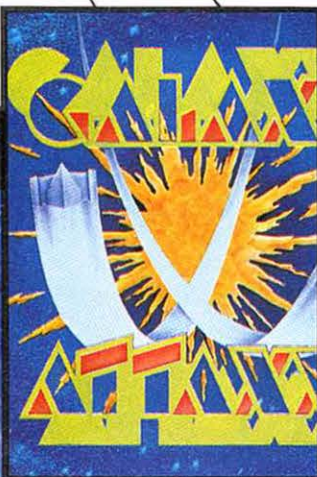
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gently press it back in place. Work it down; if it resists, punch a tiny hole for the plastic cross to protrude through. The squares should overlap; to be sure, weave a piece of fine, bare wire through all the squares. Ground the wire.

Use a short, high-quality cable to the video, and as short a cable as possible to the other peripherals. If you are building peripherals, obtain Gore-shield or Scotch shielded multiconductor cable. It's expensive, but worthwhile. And finally, watch the cassette output. Make up your own shielded cable for this task; don't use the standard Radio

Shack fare. With these changes, the RFI should now be reduced significantly.

Tips and Pointers

Once this first unit was working, I set about building the next one; perhaps the experience would speed the assembly, and a second kit would point out difficulties that luck had obscured during the assembly of the first computer. My hunch was right.

Virtually nothing appeared on the video screen when I turned on the second unit, but my hearing is still acute enough that I could discern a distinct

change in the horizontal oscillation from the monitor. A normal video screen is theoretically scanned 15,750 times per second; monitors and televisions actually produce a high-pitched whine at this frequency when locked in to an image. However, their "free run" frequency is nearby, but rarely on-frequency, and electronic noise from here and there causes it to wobble and fluctuate. Turn on a television, turn the sound down, tune to a known station, and listen to the high whine; then switch to an unused channel, and hear how the whine wobbles or disappears entirely.

If your ears are up to it—mine are yet young enough—listen for a change in your monitor's high-frequency whine to a pure, stable pitch when you turn on the computer. That generally means the horizontal synchronization has locked in, and your computer is providing video output. In fact, a few smeared dots were visible just at the top of the screen; variable capacitor C140 (left side of the board) was far out of adjustment (it provides sync), and the vertical and horizontal positioning controls (variable resistors R144 and R145, back middle) were also far off. The first computer had properly locked in the video by chance; I turned these three controls until the image stabilized.

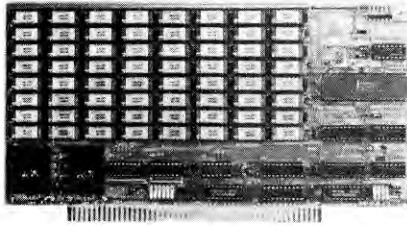
After the computers were moved, or during temperature changes (it's approaching winter as I write this), the video began to glitch. Carefully adjusting C140—with a plastic screwdriver—will eliminate this. You might want to drill a tiny hole in your cabinet so you can reach this control. The video on the LNW-80 is created quite differently from that in the TRS-80 because the LNW is set up to provide several types of output. Thus, the Model I/III hardly ever needs adjusting, whereas the LNW does.

LNW has done a very good job of de-glitching the video display—eliminating the screen hash that was prevalent, especially during games. However, it didn't work on one of my machines, making the display not only hash-filled, but worse than the usual state of affairs. I traced the difficulty to slow U121 and U151, which I replaced with higher-speed ICs. If your screen glitches, try that solution first.

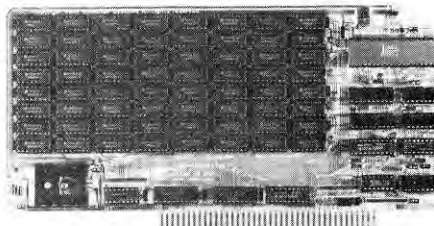
High-Resolution Graphics

This video glitch problem prompted me to test all the high-resolution graph-

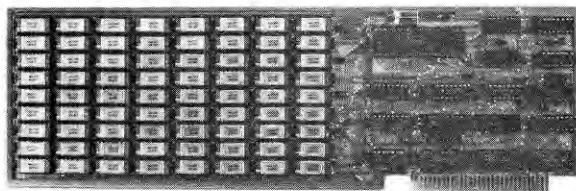
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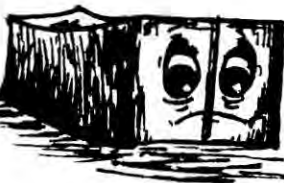
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ics, video reverse, and so forth. Using OUT 254,N commands, I discovered that normal and reverse video modes worked properly, and the high-resolution graphics appeared. But the hi-res dots were blinking on and off randomly. I tried POKEing to the screen memory locations, but to no avail. That was the first mistake; I had let my expectations deceive me. No, you cannot write to high-resolution memory from Basic on a stock LNW computer.

Here's how the high-resolution mode is organized: The hi-res memories are addressed at the same location as the Basic ROMs. This means that the screen circuitry can read them at any time, but the CPU cannot—trying to do so would put the Basic ROMs in conflict with the hi-res memory. In other words, reading the information in graphics memory must be done from machine language or machine-language subroutines, because the Basic ROMs are turned off during the time hi-res memory is being read. However, my good sense told me that since you can't write to the Basic ROMs, the write circuitry would always be left enabled. That way Basic could clear the hi-res screen, draw lines, circles, and so on at all times. Since reading the hi-res memory is a less frequent task, machine-language routines could be used effectively in that case.

Wrong. LNW has designed its machine to require disabling the Basic ROMs *whenever* high-resolution graph-



Photo 3. The expansion board is oriented upside down and bolted above the main CPU board. Off-size washers and close traces shorted out the system several times before I discovered the physical problem.

ics are required. The incomprehensible and disorganized section of the manual describing hi-res obscures this fact in gibberish, but I finally confirmed it. So my next step was to write a short hi-res routine to switch in hi-res mode and clear the hi-res screen. Nothing happened. The randomly blinking memory continued. I checked and rechecked the software. It should have worked; I transferred to the other machine (some dots were blinking there, too) and it did work.

If you recall, in my last column I described the bleariness that forced me to give up examination of the printed circuit board. It was a bad move, as I was to learn after several hours of frustration with this problem. The hi-res video write line (WRT4116) simply evaporated in mid-trace. It just faded out for a while (sort of like a Vermont road), and then returned a quarter-inch later. Moral #1: Check every trace on the board before assembling a single part!

My routines now successfully cleared the hi-res screen. But many dots still blinked back on and off, worse as I put my hands nearby. I assumed the bypass capacitors (all those 0.1 mF parts, and the tantalum electrolytics) were misbehaving. I was short on tantalums, so I had substituted aluminum electrolytics in a few spots; my new supply of tantalums (they look like small blue, green, or red beads) had just arrived. Some of the blinking cleared up when the better capacitors were installed. Moral #2: Use high-quality bypass capacitors, and don't leave any out.

The memory is specified as 250 ns for the high-resolution video. Mine were sold as 200–250 ns, so I switched them with some guaranteed 150 ns memory. The flickering dots disappeared. Not having worked out the actual access time for these memories, I can't say that the 250 ns specification is inaccurate, or if I just had a bunch of memories that leaned past the 250 ns access time. Moral #3: Respect or exceed designer specifications in this project; there is little leeway. Good memory is cheap now, so get guaranteed 200-ns types.

Now hi-res was working, and I have to commend LNW on the detail in this resolution. With the 9-inch Motorola monitor I am using, the detail on diagonal lines and curves is exceptional, possibly the best of any small computer in its price range. And this detail also

makes possible an 80-character-by-24-line screen display, for which LNW has devised software. It isn't provided with the LNW, but make sure you request it when ordering if you're a long-line freak. It will be off-center with respect to the normal text screen (the hi-res extends an additional 128 dots through an area to the right of the usual screen), but that can be adjusted via the internal horizontal positioning control R144. A full-size potentiometer can also be mounted on the back panel of the computer. Use the shortest wires possible from the PC board.

But one thing still bothered me: How could I write to that hi-res memory with Basic intact? I just liked the idea, because creating machine-language programs for everything wasn't interesting to me. After two hours of searching through the schematic, I located all the signals that control the relationship between high-resolution graphics and Basic.

Here's how it works now: U67 is a latch that holds the status of port 254; data line 3, when latched into U67, determines the state of the graphics-read-enable (GRRDEN*) signal. Find this circuit on sheet 2, lower left quadrant, center. When GRRDEN* goes high, the output of OR gate U66 (graphics lower 16K, GLWR16K*) is held high, which in turn holds the output of NAND gate U51 low (read-write disable, RDWRDIS). Find this circuit on sheet 1, lower right quadrant, center right.

When RDWRDIS is low, then the bus enable lines read-out (RDOUT*) and write-out (WROUT*) are gated low through OR gate U36. Find this on sheet 1, upper center. RDOUT* and WROUT* are in turn gated through buffer U18 by ENABLE*, the external bus-request line, to create the computer's completed read (RD*) and write (WR*) signals... sheet 1, upper right quadrant, center. Up to this point, the normal operation of the computer's ROM and RAM are guaranteed by the presence of the completed RD* and WR* signals.

When OUT 254,8 is commanded, however, GRRDEN* goes low. It triggers RDWRDIS high, disabling the ROM. It also sends GLWR16K* low. GLWR16K* is gated through OR gate U152 together with internal-read (IRD*) and internal-write (IWR*) to create graphics memory enable (GRAMEN*) and graphics RAM write

(GRAMWRT*). Find this process on sheet 2, upper right quadrant, lower right. GRAMEN* is used to allow the CPU's data bus to read the high-resolution graphics RAM, and GRAMWRT* goes through a few more permutations before it is permitted to write CPU data to the hi-res RAMs.

My concern is twofold: First, continue to disable the ROM during graphics read. Second, enable the ROM during graphics write. No change is necessary to achieve the first goal.

The second task, however, is tricky unless the goal is turned around... not "enable the ROM" but rather "stop disabling the hi-res write." OUT 254,8 should still work as specified in order to keep full compatibility with all LNW software. Instead, the solution lies in enabling the hi-res write. By working back from GRAMWRT*, it is possible to gate IWR* together with some new signal to create an always-active GRAMWRT*. This is done by disconnecting the offending GLWR16K* (created from A15, A14, and GRDEN*, and dependent on OUT 254,8), and replacing it with a new signal—I called it new graphics write (NEWGRWR*)—obtained from the gating of A15 and A14 at U66.

So here's the process, in order:

- Identify U152 pin 9 from the bottom of the board, and note that a trace leads in two directions from this pin.
- Cut the trace leading from U152 pin 9 to U152 pin 12.
- Cut the other trace leading to U152 pin 9 (from U66 pin 11).
- Connect a wire from U152 pin 12 to U66 pin 11. This restores GLWR16K*.
- Connect a wire from U152 pin 9 to U66 pin 8. This creates NEWGRWR*.
- Cut the trace leading to U139 pin 2 (from U141 pin 16). This frees LGRAMWRT*.
- Connect a wire from U141 pin 16 to spare gate U151 pin 9. This gates LGRAMWRT*.
- Connect a wire from U67 pin 14 (HRES*) to spare gate U168 pin 9.
- Connect a wire from U67 pin 6 (GRDEN*) to U168 pin 10.
- Connect a wire from U151 pin 8 to U139 pin 2. LGRAMWRT* gates on either HRES* or GRDEN*.

If you get into trouble with some software and need a defeat switch, here's how:

- Obtain a double-pole, double-throw switch.

- Take the wire off U66 pin 8 (still connected to U152 pin 9). Connect it to the center left terminal of the switch.

- Hook a new wire from U66 pin 8 to the lower left terminal.

- Hook a new wire from U152 pin 12 to the upper left terminal.

- Take the wire off U151 pin 8 (still connected to U139 pin 2). Connect it to the center right terminal of the switch.

- Hook a new wire from U151 pin 8 to the lower right terminal.

- Hook a new wire from U141 pin 16 to the upper right terminal.

- Switch up is modified; down is normal.

*“Notice that lines
HID0-HID5 don't seem
to come from anywhere.”*

The modification is complete. You can write to the high-resolution graphics screen during display hi-res and activate hi-res modes (OUT 254,N where N=2, 3, and 6 through 15). There are subtle timing changes that should not affect the operation of your machine, but the mod is easy enough to try and remove if there are any difficulties.

Postscript to this mod: It was made infinitely more difficult by the layout of the LNW schematic. In the next column I hope to make available "schematic maps" for the LNW computer and expansion board, identifying parts and signal lines by mnemonic, description, purpose, source, and direction. In the meantime, notice that lines HID0-HID5 don't seem to come from anywhere; they are sourced at the outputs of hi-res memories U105, U107-U111, the DOUT lines.

Also next time: Model I/III comparisons, the success of the 4 MHz mode, questions of weight and heat, thoughts on reliability, and how to operate your LNW-80 from the auto. (That's what I got mine for.) And—for the desperate—sources for all parts that LNW doesn't supply. Also coming up in the future: More music for the Model I, the long-delayed EPROM programmer, and some software trinkets that I've been collecting.

Updates, Corrections, and Thoughts

- I've gotten the word from Fort

Worth: Leave us alone, since there are no more leftover Model I keyboards! If you want to do the Color Computer modification I presented in January, 1982 you'll have to buy a new keyboard from Radio Shack National Parts at about \$80 or, cheaper, from Jameco (1355 Shoreway Road, Belmont, CA 94002, (415) 592-8097; part number K62, \$34.95).

- The way I described the 32K memory upgrade for the Color Computer two columns ago was a little sloppy. Let's try again:

1. Open the case and remove the metal lid.

2. Move all the jumpers from their current position to the 32K position.

3. Jumper the pins marked R83 (left of the 6883 SAM chip U10) with a 33-ohm resistor.

4. The HI/LO jumper can be in either position.

5. Here's the important one I forgot to mention:

Remove (cut or break off) capacitors C31, C35, C45, C48, C61, C64, C67, and C70. These sit across what used to be a power-supply line and is now an address line.

6. Insert the 64K chips.

7. Reinstall the cover and case, and power up.

Many thanks to all those who wrote (at least those who were civil).

- I submitted an incorrect early version of the CoCo ROM Pack printed circuit layout in August Applications. (See "80 Input" next month for more.) Readers wishing a corrected layout can write to me at Roxbury, Vermont 05669. Since this is my fault, forget the SASE. Just send your address; I'll pay the postage.

- Important note: The source for the Micro Front Panel, Word Processing Lowerkit, CoCo ROM Pack, CoCo-Port, and other projects featured in this column is no longer MSB Electronics, which fell victim to the current economic recession. You can obtain my projects from Hometronics International, 7701 Fifth Ave., Brooklyn, NY 11209, (212) 680-9757. Owners of any projects purchased from MSB Electronics should write to Michael Barton, 25 Park Street, Barre, VT 05641 for information.

- Langley-St. Clair Instrumentation Systems has a treat for Model I, II, and III owners—colorful picture tubes for your video display. I've had green tubes

in various computers for a while, so I decided to try out the Langley orange unit, a color that is popular in Europe. The results are impressive, not only because the image is crisp and well defined, but also because of a subtlety in the phosphor itself—it decays (fades from the screen) slower than the screen is refreshed. This means that the usual screen flicker is gone, and your eyes and brain can relax through more hours of computing. Also, the annoying screen glitches (due to CPU accessing) are significantly reduced.

The tubes are not very expensive (\$80 for green, \$90 for orange, and more for the soon-to-be-released blue and red) and are shipped with excellent instructions. I installed my unit in less than a half hour. There is no soldering, only the removal and replacement of a few bolts and the tube socket.

One caution (mentioned in the newer Langley documentation): Don't leave a menu on the screen continuously for a few days with the brightness way up. You can burn the image into the screen, causing permanent dim spots in some areas. Also, expect a bit of a disappointment if you switch often from normal to reversed screen images—ghost images do appear on the screen if you've spent a long time in normal mode and

switch to a reverse mode. They fade in a few minutes, longer if you've been using lines of text. Ghosted horizontal blurs can last an hour or more after I use a word processor for an afternoon. But now that I have the orange tube, I don't plan to give it up—unless I decide, just for fun, to get the red one.

● I received a letter from Larry Holmes of Holmes Engineering. I've recommended the Holmes Engineering internal memory boards, and am anxiously waiting for some of his other products. All seem extremely reliable and very well thought through. I would like to quote some interesting information from Larry's letter regarding the use of 64K RAM chips in a Model I keyboard:

"Although the 64K RAM chips do not draw any more power than the 16K chips they replace, the 64K chips draw all their power from the +5-volt supply. The 16K chips draw very little power from the +5-volt supply; most of their operation is drawn from the +12-volt supply. The 16K chips use the +5-volt supply only for their output buffers to obtain TTL levels at the outputs.

"I am concerned that 64K chips can cause enough of an increased load on the +5-volt regulator inside the keyboard unit to cause problems in some systems, especially if other hardware

mods are present (such as The Patch lowercase mode, which draws a lot of +5-volt power). Eight RAM chips plus nine TTL chips is not a trivial load! This is why Holmes Engineering did not pursue a 64K board. Especially when running at double speed (which increases the power drawn by the RAM and to some extent the entire computer), you could draw 300 mA or more from the +5-volt supply. Add another 200 mA from other mods, and you will have a problem.

"One solution to this problem: The +12-volt regulator in the keyboard unit can easily handle 500 mA of current. By placing a 7805 regulator in series with the +12-volt regulator, you can produce a second +5-volt supply in the keyboard unit. If you aren't using 4116 (16K) RAMs, you don't need the +12-volt supply. It would probably be best to place a capacitor on both the input and output of the 7805, as shown in the data manuals, and heat-sink the 7805.

"It is the extra capacity of the +12-volt regulator, as opposed to the +5-volt regulator, which allows the Holmes Internal Memory to operate reliably even though it triples the number of RAM chips inside the keyboard."

As readers know, I reviewed the Exatron MM-800 memory board favorably in my last column. I installed it inside a machine without any modifications other than lowercase, so there was fully reliable operation. However, Larry's letter prompted me to reread the 64K RAM data sheet. I found that a set of eight chips draws approximately 560 mA when active. Since the chips are active about half the time, Larry's 300 mA estimate is reasonable. By contrast, the 16K chip specification is a comparable 240 mA from the +12-volt supply for eight chips (less than 150 mA on average); however, just 34 mA per set is drawn from the +5-volt supply (all outputs low), and only during the read cycle—an effective drain of about 15 mA. Therefore, using 64K RAMs demands about 300 mA from +5 volts, whereas four sets of 16K RAMs (the same total memory) requires only about 60 mA. At worst, the 64K worth of 16K chips uses less than half the power than one set of 64K chips. As usual, I leave the final evaluation to the readers; please write if you experience any power-supply or heat-related problems with the Exatron MM-800 in a machine with other modifications. ■



Photo 4. The finished LNW-80. The monitor and single drive are fastened to the case below with strips of foam tape, making a secure and transportable—though quite heavy—system.

COLOR *plus much, much more . . .*

FOR YOUR MODEL I & III

NOW—create color graphics and play color games on your TRS-80* MOD 1 & MOD 3. CHROMAtrs Kit

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- Operating manuals
- One complimentary game
- 16K RAM on board

The TRS-80* memory is not used and there is no modification necessary (warranty not voided). This uncomplicated system is so simple to connect you'll be amazing your friends with your color powers immediately.

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TRS-80 is a product of Tandy Corp.

- TRS-80* MOD 3 cable \$14
 Modulator with cables & switch box. \$25

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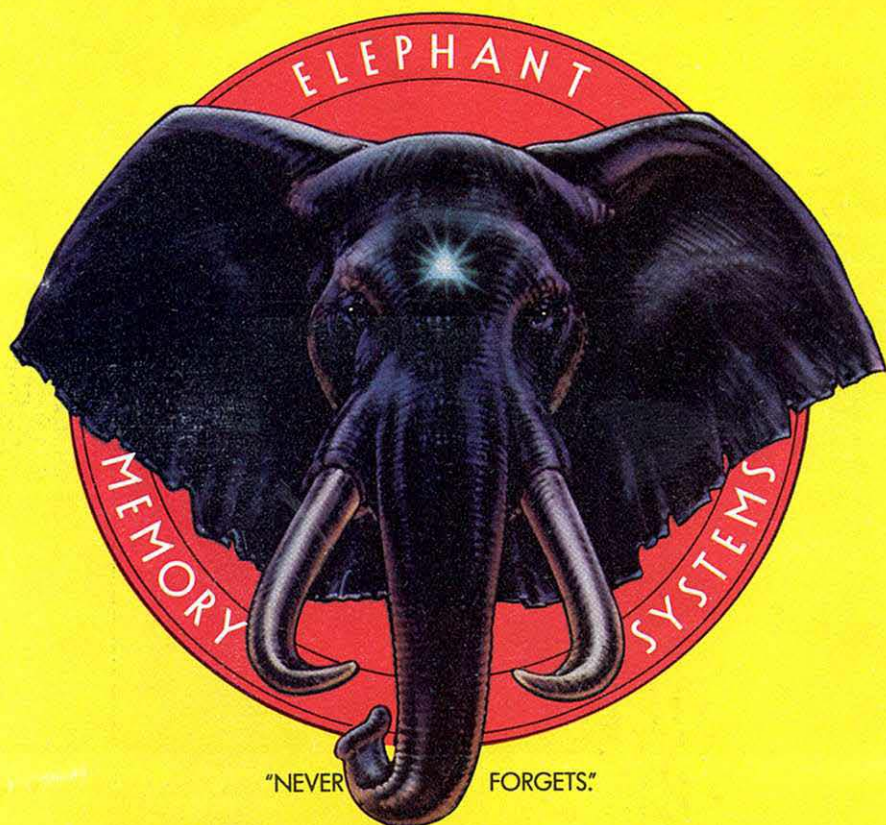
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REMEMBER:



MORE THAN JUST ANOTHER PRETTY FACE.

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Specifically, subcommittee X3B8 of the American National Standards Institute (ANSI) says so. The fact is all Elephant™ floppies meet or exceed the specs required to meet or exceed all their standards.

But just who is "subcommittee X3B8" to issue such pronouncements?

They're a group of people representing a large, well-balanced cross section of disciplines—from academia, government agencies, and the computer industry. People from places like IBM, Hewlett-Packard, 3M, Lawrence Livermore Labs, The U.S. Department of Defense, Honeywell and The Association of Computer Programmers and Analysts. In short, it's a bunch of high-caliber nitpickers whose mission, it seems, in order to make better disks for consumers, is also to

make life miserable for everyone in the disk-making business.

How? By gathering together periodically (often, one suspects, under the full moon) to concoct more and more rules to increase the quality of flexible disks. Their most recent rule book runs over 20 single-spaced pages—listing, and insisting upon—hundreds upon hundreds of standards a disk must meet in order to be blessed by ANSI. (And thereby be taken seriously by people who take disks seriously.)

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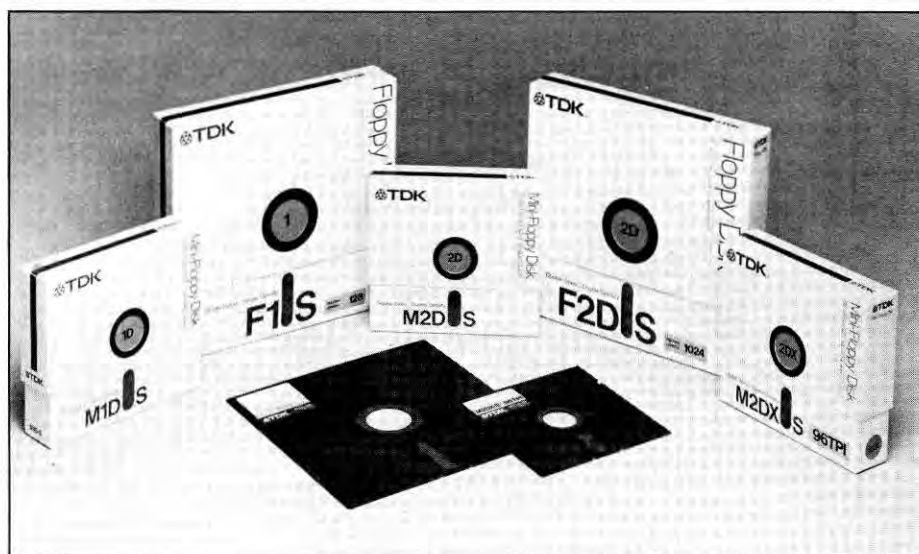
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TDK Floppy Disks

TDK Debuts Disks

TDK, a familiar name in audio and video recording, has entered the computer arena with two 8-inch and three 5¼-inch floppy disks and two data cassettes.

The disks, certified error free for double-density encoding, are sold with individual envelopes in boxes of 10. They are designed for rigorous business use and backed by an extended warranty.

The 8-inch disks are single-sided and single density (\$7.20), formatted for 128 bytes in 26 sectors; and double-sided, double density (\$8.90), formatted for 1,024 bytes in 8 sectors. The 5¼-inch disks, all double density, are single-sided (\$5.50), double-sided (\$7.85), and double-sided 96 tpi (\$8.90). The HR-300 cassette (\$6.80) is for non-ANSI applications, while the HR-850 (\$7.85) meets ANSI, ECMA, and ISO standards.

The disks and cassettes are sold through dealers. For more information, write TDK Electronics Corp., 12 Harbor Park Drive, Port Washington, NY 11050.

Reader Service ✓ 586

Programming Utility

ULTPLS is a monitor and utility for Assembly-language programmers. It lets you load, test, and modify programs, and make and verify tapes without using a reset switch or starting through system mode.

Memory can be loaded by file name or first file, and up to six files verified

on tape. A find data feature locates up to 25 bytes and displays starting address, while a clean tape command writes zeroes to tapes with leaders.

In addition, the utility can dump memory to tape, assign a file name, display and allow change of memory at any address, and interface to and from EDTASM. A user monitor converts ASCII keyboard data to hexadecimal and saves it in buffers.

ULTPLS for the Model I or III is priced at \$19.95 for tape and user's manual. For more information, contact Bulldog Software, 2706 Bentwood,

Palestine, TX 75801, (214) 723-0942.

Reader Service ✓ 551

Model II Accounting

A new general-ledger package for the Model II records transactions and balances and provides accurate statements of your financial position. With accounts-receivable, accounts-payable, and payroll programs, it forms an integrated double-entry accounting system.

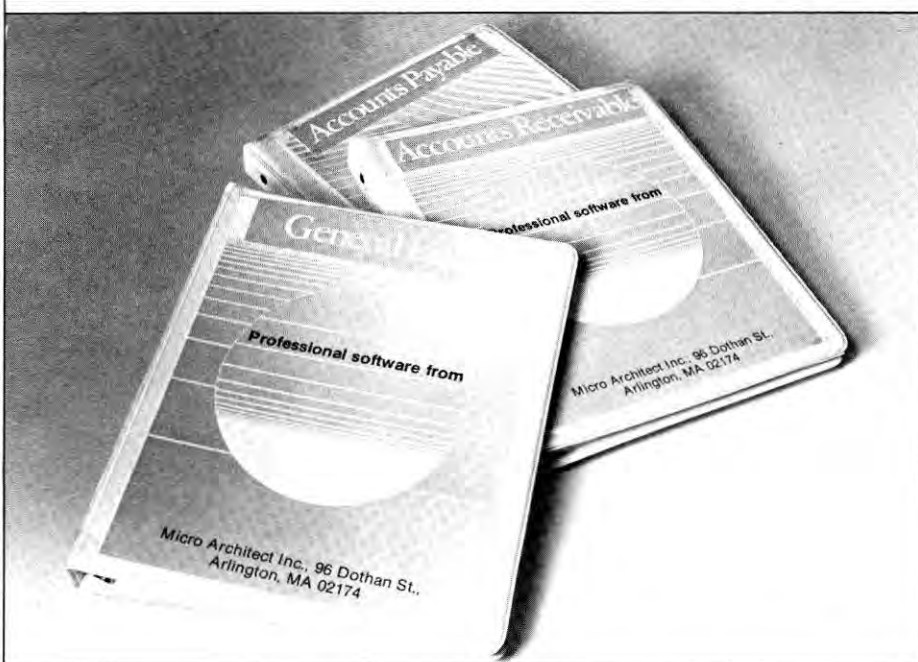
The ledger's departmental and summary income statements show current and year-to-date amounts, percentages by category, and comparative data with the previous year. The chart of accounts contains a five-digit account number; description; and current, year-to-date, and budget balances. For format flexibility, you can specify account type, a master/subaccount code, and a balance-sheet column code.

The accounting programs run on the 64K Model II with dual disk drives, and cost \$149 each. Hard-disk versions are available for \$199, and a set of all four on hard disk for \$717. For more information, contact Micro Architect Inc., 96 Dothan St., Arlington, MA 02174, (617) 643-4713.

Reader Service ✓ 571

Power Loss Insurance

Integrated Devices' DSV1 disk-saver



Model II Accounting Programs

DOES STRING COMPRESSION HAVE YOU TIED UP IN KNOTS?

LET TRASHMAN CLEAN UP THE MESS!

TRASHMAN is a machine language utility for the TRS-80 Models I and III. It was written by Glenn Tesler, the author of FASTER, and can reduce BASIC's string compression time by 95% (see table below).



WHAT'S STRING COMPRESSION?

When a BASIC program changes a string (words, names, descriptions), it moves it to a new place in memory, and leaves a hole in the old place. Eventually, all available memory gets used up and BASIC has to push the strings together to free up some space. This takes time. Lots of time. The computer stops running for seconds or minutes, and you may even think it's "crashed". The keyboard won't work, and until all the strings have been collected, you just have to sit and wait. Then things run for a while, until string compression is needed again. And again.

If you're using your computer for business, that wastes your money. If you're using it personally, it wastes your time.

WHAT'S THE SOLUTION?

As soon as you start using TRASHMAN, those delays almost disappear. It uses less than 600 bytes of memory, plus 2 bytes for each active string. It works with other machine language programs and with all major operating systems. It's easy to use, comes with complete instructions, and can be copied to your own disks.

WHAT'S THE CATCH?

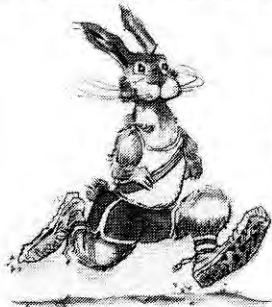
If a BASIC program uses only a few strings, very little time is wasted in string compression, and TRASHMAN won't be helpful. But, if hundreds of strings, including large string arrays, are used, TRASHMAN is just what you need.

TRASHMAN is available on disk for just \$39.95.

# STRINGS	SECONDS DELAY NORMAL	SECONDS DELAY TRASHMAN	PERCENT IMPROVEMENT
250	11.8	0.7	94
500	45.8	1.6	96.5
1000	179.6	3.5	98
2000	713.2	7.8	98.9

(All timings done on TRS-80 Model I. Model III 15% faster, but pct. improvements identical. Listing of timing program available on request.)

SAVE TIME WITH FASTER



"FASTER" speeds up most TRS-80 BASIC programs by 20-50%. It's helped hundreds of satisfied people and it can help you. Detailed instructions make it easy to use. FASTER analyses your BASIC programs while they run, then displays a simple change, usually one line, that sequences program variables so the ROM will find them faster.

You can use FASTER to speed up programs you've bought, as well as programs of your own. Since it isn't a compiler, your BASIC programs can be read and changed afterwards. FASTER works on business programs, models, and games. The more complex your program, the better the results.

Does FASTER really work? Yes! Just check the reviews in *Personal Computing*, May, 1981, p. 116: "FASTER is effective and easy to use"; *80 U.S. Journal*, April, 1982, p. 106: "I recommend FASTER to everyone"; and *80 MICRO* (April, 1982, p. 40): "If you...would like a significant increase in the run-time speed, then buy FASTER."

FASTER runs on the TRS-80 Models I and III, 16-48K tape or disk, and all major operating systems. **\$29.95**

"QUICK COMPRESS" takes only 276 bytes of memory, and removes the blanks and remarks from even the largest BASIC program in less than 3 seconds. It produces smaller, faster programs without altering their logic. **\$19.95**

SPECIAL: FASTER and QUICK COMPRESS: \$39.95

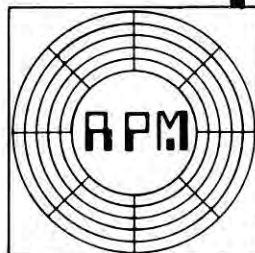
ERRATIC DISK DRIVES?

You can avoid unnecessary disk errors and repair bills by using **RPM**. This easy-to-use program measures the rotational speed and fluctuations of your disk drives, and warns you if they are running too fast, too slow, or unevenly.

Incorrect or erratic speed is a common cause of unexplained disk errors and loss of data. RPM's documentation explains how to detect and correct these problems quickly and easily. As *80 MICRO* (April, 1982, page 41) said: "If your drives have problems I recommend RPM before paying to get it repaired."

RPM is supplied on diskette for the TRS-80 Models I and III. We suggest you order a copy before you need it.

\$24.95



ORDER FROM YOUR LOCAL SOFTWARE DEALER, OR CALL NOW, TOLL-FREE:

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NEW PRODUCTS

module protects disks from power-loss crashes. Now you can leave your disks in the drives all the time.

The module mounts inside the Model I or III, needing no software drives or changes of any kind. The Model I (\$29.95) requires some soldering; the Model III version (\$34.95), which protects internal drives only, simply plugs in.

The DSVI is available from Integrated Devices Inc., P.O. Box 8385, Haledon, NJ 07538, (201) 956-8496.

Reader Service ✓583

Telex Access for CP/M Conversions

If you have the conversion hardware to run CP/M programs on your TRS-80, MicroTLX lets you turn your system into a fully-featured Telex machine.

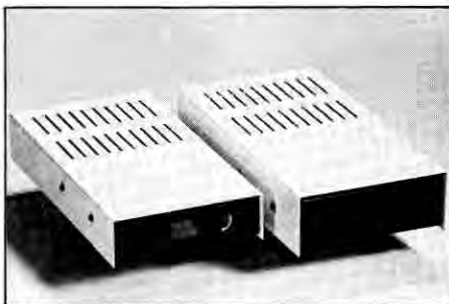
With this software package, you can directly send and receive Telex, TWX, and International Telex messages; send Mailgrams, telegrams, or overseas cables; and have immediate access to news, sports, and weather, as well as stock and bond (updated hourly) and commodities (updated twice daily) prices.

The MicroTLX CP/M package requires 24K of memory. Priced at \$150 including documentation, it is available from Advanced Micro Techniques, 1291 E. Hillsdale Blvd., Suite 209, Foster City, CA 94404, (415) 349-9336.

Reader Service ✓570

Low-Profile Disk Drive Accessories

Ann Arbor Precision has introduced enclosures and power supplies for the new half-height Teac FD-55A and 2/3-height Canon MDD-6108 disk



Low-Profile Drive Enclosures

drives. The enclosures can be purchased with or without drives installed.

In addition to the stackable single-drive horizontal mount enclosure, a dual-drive vertical model is also available for the Teac. Both styles offer mar-resistant white or silver finishes.

The half-height model with installed FD-55A is priced at \$269. For more information, contact Ann Arbor Precision, 7536 Jackson Road, Ann Arbor, MI 48103, (313) 426-5477.

Reader Service ✓577

Read All About It

The Computer Newsletter Publisher's Directory is a list of over 1,000 newsletters from user groups, clubs, manufacturers, individuals, and educational institutions. Newsletters are in zip-code order, with Canadian entries listed by province and city, and foreign countries listed alphabetically.

The Directory is in a loose-leaf format. The annual subscription rate of \$70 (\$60 if payment accompanies order) includes corrections and updates sent at least every 90 days.

A cross index by computer type is included, and cross listings by profession will appear in updates. Sections are being added to show over 300 computer-related periodicals and a guide to public-access bulletin boards. A special listing mentions free newsletters.

The Directory is published by Andrew R. Alaways, 306 West 46th St., New York, NY 10036, (212) 799-9190.

Reader Service ✓550

Color Computer Mailing List

C. C. Mailer is a mailing-list program available on disk or cassette for the Color Computer. The program holds from 90 to 800 records depending on version and available memory, listing name, two-line mailing address, city, state, zip code, phone number, and user-defined code fields for extracts and label printing. The larger disk version sorts files in zip-code order to allow presorted mail rates.

The C. C. Merger option permits the merging of selected addresses with letters from the C. C. Writer word processor. C. C. Mailer is priced at \$20, with the merger option an additional \$15.

For more information, contact Transformation Technologies, 194

Lockwood Lane, Bloomingdale, IL 60108.

Reader Service ✓575

Model 16 Spreadsheet

Datamate's widely used spreadsheet system, Finanswer+, is now available for the Model 16.

The only spreadsheet package that will run in 16-bit mode on the 68000 CPU, the Model 16 version supports 12 spreadsheets per data file, with 1,200 figures each. Spreadsheets can be linked or consolidated for a total of up to 14,400 figures. Operating features include menu-based processing, automatic saving and restoring of spreadsheets, password protection, sorting, and graphing.

Loading a full 30-by-40 spreadsheet and calculation rules takes approximately five seconds using floppy disks. Processing the spreadsheet with row and column totals takes less than 25 seconds.

Finanswer+ can print the entire spreadsheet or display and print the entire set of calculation rules. A help command lists possible options at each step.

The system sells for \$395, with maintenance after the first 90 days \$60 per year. For more information, contact Datamate Company Inc., 4135 S. 100th East Ave., Suite 101, Tulsa, OK 74145, (918) 664-7276.

Reader Service ✓561

Talkprocessor

The Talkprocessor is a simple, inexpensive voice-output program for the Color Computer with 16K Extended Basic.

Twenty-six words are digitally recorded and displayed on the screen, with a two-letter code for each word. The user enters the codes in any combination to form a statement. When the command is given to speak, the statement comes out of the video display's speaker in one of three voice pitches.

The cassette program is priced at \$14.95 plus \$1 for shipping. It can be ordered from H I B, 3505 Hutch Place, Chevy Chase, MD 20815.

Reader Service ✓560

Lab Management Software

Downeast Digital, a subsidiary of Fairview Hospital Inc., announces the

As Easy As...



1 TRS-80 Disk & Other Mysteries

by H.C. Pennington

This book is the definitive authority on data recovery for the TRS-80 Model I disk system. In almost every case, lost data can be recovered and this book tells you how to do it. From clobbered directories to parity errors, this profusely illustrated data recovery cookbook includes examples and step-by-step instructions for both beginners and professionals.

132 pages. \$22.50

2 Microsoft BASIC Decoded & Other Mysteries

by James Farvour

This book is the only one of its kind. You will learn how the TRS-80 Model I BASIC interpreter works from power-up to power-down. It has the complete disassembled Microsoft BASIC Level II interpreter with over 13,000 lines of detailed comments in one volume. The math, arithmetic and utility routines are fully explained with examples on how to use them. An incredible learning aid for the beginner and a valuable reference for the professional.

312 pages. \$29.95

3 The Custom TRS-80 & Other Mysteries

by Dennis Bathory Kitsz.

A complete hardware/software how-to-do-it like reverse video, high res graphics, audible keystrokes, 8-track mass storage music synthesizer, and real time clock. Dozens of project hints, tips, and fixes complete with the interface software. If you are a beginner, there are chapters on wire-wrap, soldering and construction methods. If you are a professional, there is a wealth of technical detail.

332 pages. \$29.95

4 BASIC Faster and Better & Other Mysteries

by Lewis Rosenfelder

BASIC is not nearly as slow as you think! This book shows you how to make it faster and better with techniques and tricks that you never dreamed of for Model I, II and III disk systems. You won't find trivial, poorly designed "checkbook" programs here - only useful BASIC techniques and code ready for use in YOUR programs. Tutorial for the beginner, instructive for the advanced, and invaluable for the professional. All routines are available on disk.

290 pages. \$29.95

Learn about your TRS-80 computer - it's as easy as 1-2-3-4. These books are easy to read and understand because they are written for you by people just like you. Here are answers and solutions without jargon. There are no end of chapter "tests" - no incomprehensible math formulas - no textbook explanations - just straightforward, plain English.

You will learn how to recover "lost data" on disk, how the BASIC interpreter works, how to make BASIC run faster and better, and how to modify and interface your TRS-80. In other words, you will learn how to make your computer do all the things you want it to do. It's as easy as 1-2-3-4.

Available at computer stores, B. Dalton Booksellers and independent book dealers. **BASIC Faster and Better** is also available at all RADIO SHACK Computer Centers and selected RADIO SHACK stores. (Cat. No. 62-1002) If your dealer is out of stock, order direct. Include \$4.00 for shipping and handling. Foreign residents add \$11.00 plus purchase price, in U.S. funds.

TRS-80 trademark TANDY Corp.



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91786

new LabManager series of programs for medical laboratories.

LabManager Quality Control (\$600) performs immediate precision, trend, and shift analysis and stores data for current operations, year to date, and previous month. Mean, coefficient of variation, number of assays, and upper and lower limit are continuously updated, and graphs are displayed on command.

The Workload and Finance program (\$500) provides year-to-date and current workload by department, per test, for inpatients, outpatients, nonchargeables, and quality control, with revenue charged per test for inpatients and outpatients. LabManager Test Pricing (\$150) rapidly determines the cost of tests, recalculating all costs as supply prices change. A calculator mode allows hypothetical changes.

All programs require a Model I or III with DOSPLUS, two disk drives, and 48K, and are available from Downeast Digital, P.O. Box 286, Solon, ME 04979, (207) 643-2437.

Reader Service ✓566

Graphics from Your Printer

The Printer Graphist converts your dot-addressable printer to a plotter, transforming all kinds of data into

high-resolution graphics using the IDS 460G/560G, Epson MX-80 with Graftrax, MX-100, or Centronics 123. The IDS Prism color printer permits eight-color graphics.

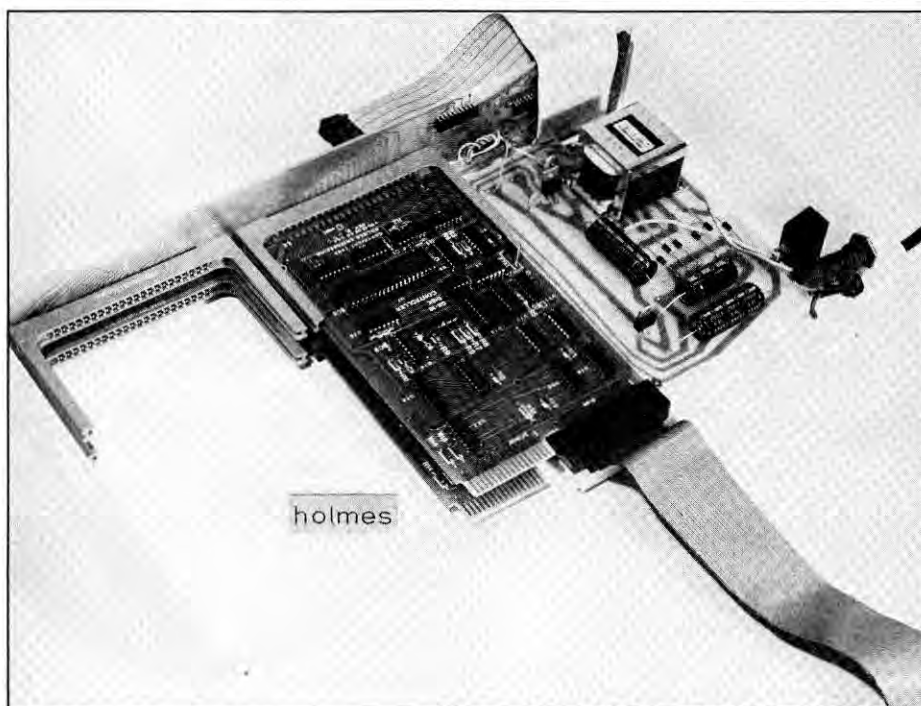
With a few instructions—a new Basic verb, Dot, is provided—and your data, graphics work can be generated in seconds. The Printer Graphist can produce plots as wide as four pages and as long as 10 feet. With IDS printers, there is no limit to the possible number of lines per plot; with the other printers, the limit is approximately 3,000 lines depending on the size of the user's program. No hardware modification or additional software is needed.

The Printer Graphist works on most DOSes (send exact configuration when ordering), and requires a Model I or III with 32K or 48K and two disk drives. It is available for \$194.50 from Printer Graphist Ltd., P.O. Box 603, Newport, VT 05855, (802) 564-7704.

Reader Service ✓574

Mainframe Replaces Expansion Interface

The Holmes Expansion Mainframe upgrades the Model I with gold connectors, buffers for high-speed operation, and room for four peripherals, as well as a power supply and sturdy metal enclosure.



Holmes Expansion Mainframe

It is the heart of a \$319 system adding double-density and 8-inch drive capacity to the Model I, including the mainframe, Holmes' DX-1S disk controller and DX-1D double-density adapter, an LSI data separator, parallel printer port, and keyboard-to-mainframe connector cable. The use of 8-inch double-density drives requires a speed-up peripheral such as Holmes' Sprinter II.

The DX-1D adapter can be purchased alone for \$129.50. Other peripherals, including 80-character video and extended memory, are available or will be soon.

For more information, contact Holmes Engineering Inc., Dept. 15, 3555 South 3200 West, Salt Lake City, UT 84119, (801) 967-2324.

Reader Service ✓564

Rail Runner

Rail Runner is a new graphics game for the Color Computer featuring sound, fast action, and many levels of difficulty.

Your railroad engineer must scurry over the tracks of the busy switchyard, dodging speeding trains and handcars, to rescue the hoboes on the other side of the tracks. And you've got only so much time to save them—the real-time clock keeps ticking.

The game costs \$21.95 on cassette and \$26.95 on disk, plus \$2 shipping and handling. It is available from Computerware, Box 668, Encinitas, CA 92024, (714) 436-3512.

Reader Service ✓573

Paysoft

An enhanced version of the Paysoft payroll system is now available for the Model III.

The system calculates gross and net pay and deducts withholdings for any number of employees, providing company and employee payroll summaries and reports with current, month-, quarter-, and year-to-date totals. With a pin- or tractor-feed printer, it will print and number payroll checks.

Eight deduction categories, including federal, state, and FICA taxes, can be custom-labeled. In addition, Paysoft handles bonus pay and overtime. An auto-run feature makes operation easy, enabling the user to select only those employees whose hours change every payday.

The program requires 32K TRSDOS and dual disks. It sells for \$199 from Business Micro Products, 311½ 8th St., Suite 400, Glenwood Springs, CO 81601, (303) 945-8166.

Reader Service ✓576

Programming the Color Computer

A Byte of Color Basic from Computer Island (227 Hampton Green, Staten Island, NY 10312) teaches programming on the Color Computer to children and beginners of all ages.

The book has three units—Basic, graphics, and sound. There are 24 chapters, each with examples, illustrations, programs, and practice exercises. An instructor's manual and answer key is included.

Its price is \$5.95 plus 50 cents for postage. Discounts are given to schools.

Reader Service ✓559

DISnDATA

DISnDATA 1.1 is a two-pass disassembler that converts a machine-language program to fully labeled source code using standard Z80 mnemonics. Output can be directed to video display, line printer, cassette, or disk.

Unlike other disassemblers, this program discriminates between instructions and data areas within the original machine language. Other disassemblers treat all areas of the program as instructions, causing them to output meaningless information upon encountering data items. In contrast, DISnDATA translates as instructions only those areas that are directly executed from one or more specified entry points. All other areas are output as data at the correct place within the program and with appropriate pseudo-operations attached.

DISnDATA 1.1 is also capable of relocating itself to any available area of RAM, moving up or down by a single byte or as many bytes as desired to disassemble programs located elsewhere in memory.

This product sells for \$24.95 on Model I or III cassette, or \$29.95 on Model III disk. Each requires an additional \$1.50 shipping and handling, and is available from Pro/Am Software, 220 Cardigan Road, Centerville, OH 45459, (513) 435-4480.

Reader Service ✓580

Morse Code for Color Computer

Prof. J. C. Sprott, author of a popular Morse code program for the Model I/III, has introduced a version for the Color Computer.

Translated into 16K Extended Color Basic, the W9AV Morse code translator allows you to send and receive Morse in most cases simply by connecting the computer cassette plugs to the transmitter key and receiver phone jacks. Send to 60 wpm and receive to 30 wpm, automatically adjusted. The translator has nine programmable message memories of 240 characters each, and a random-character practice mode.

Priced at \$14.95 for a cassette and \$7.95 for a source list, the program is available from J. C. Sprott, 5002 Sheboygan, Madison, WI 53705, (608) 273-0627.

Reader Service ✓582

Data-File Management System

Filemate is a software package containing six modules for the creation and management of a data base for almost any personal or business requirement. Using hashing techniques for instant access to any record, regardless of file size, it also provides computation capability on any numeric field and storage of algorithms for repeated use, as well as editing, sorting, and printout of up to 2,000 records.

An auto-adaptive system, Filemate permits easy conversion of existing sequential files to its random format. Once a file has been established and loaded, one can still add, delete, or change the size of any field, or expand the total file capacity without losing or having to reenter any data.

It is available on disk for Models I and III with 48K and either TRSDOS or NEWDOS80 2.0 operating systems. With instruction manual included, price is \$95 from Datafile Systems, 801 Welch Road, Palo Alto, CA 94304, (415) 326-1447.

Reader Service ✓557

Home Is Where the Hearth Is

Computer-Assisted Home Energy Management by Paul E. Field enables readers with limited knowledge of digital electronics and microprocessors to build and operate a residential energy monitoring system.

Details given for the hardware re-

quired include a buffered microcomputer interface, an interrupt-driven time-of-day clock, and a thermometer port for measuring eight separate temperatures. For software, five Basic programs are discussed: a machine-language monitor loader, residential heat-loss calculator, thermometer calibrator, nine-option time and temperature data manager, and statistical-analysis programs. A final chapter suggests variations and refinements for the completed system.

The 182-page paperback refers primarily to the 16K Model I. It is available for \$15.95 plus \$1 shipping and handling (Virginia residents add 4 percent sales tax) from Group Technology Ltd., P.O. Box 87, Check, VA 24072, (703) 651-3153.

Reader Service ✓562

Dinosaurs and Dungeons

Two new fantasy/adventure games for the Model I and III are available from Software Magic.

In *Marooned in Time* (16K Level II), the Institute of Temporal Studies has selected you as the first person to become a chrononaut and test drive the time machine. However, not only has the chronosphere pitched you back to the age of dinosaurs, it's landed without you somewhere in the area. Between searching for it and dodging Tyrannosaurus Rex, you'll have quite a time trying to get home.

Lair of Evil (32K Level II) casts you as Kiron the mercenary, hired by the village of Selira to rid them of the wicked Lord Lainem. You have 1,200 silver pieces and a choice of four characters, four weapons of different qualities, and five magic spells, but you will face 13 types of monsters or allies in exploring the Lair of Lainem. Needless to say, there is treasure galore—if you are successful.

Each game sells for \$14.95 from Software Magic, P.O. Box 2184, Bramalea, Ontario, Canada L6T 3S4, (416) 451-9452.

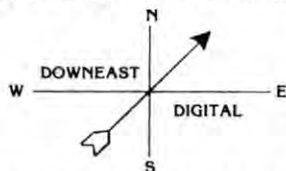
Reader Service ✓581

Computer Dietitian

Nutri-Man, a nutritional management system employing a data base of 750 common foods, monitors and creates dietary menus according to one's specific nutritional needs.

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80-MICRO READERS

If you read Dennis Kitz's December column then you know that we are the new distributors of his projects. These are completely assembled.

COLOR COMPUTER

Lower Case Conversion \$69.95
RAM/ROM Expansion Module . . . empty \$39.95
16K RAM \$79.95
single 2732 EPROMs \$7.50
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MODEL I

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Dynamic display of all 16 address and 8 data lines with single stepping control.

SOFTWARE SOFTWARE SOFTWARE

MAIL LABEL Model III Disk \$19.95
Works from Profile Database - Many options!!!
INVOICE Model III Disk \$19.95
Prints Invoice and packing label Profile

WORLD ELECTRONICS

177 27th Street
Brooklyn, N.Y. 11232

✓234

NEW PRODUCTS

program compares your present diet with the nutritional requirements of your age/sex category and prints suitable menus, taking your food preferences into consideration. The system accommodates special factors or dietary restrictions, even for individual members while printing menus for an entire family.

In addition, it automatically maintains a food inventory, prints shopping lists, performs nutritional analysis of recipes, manages the ingredients ratio for varying batch size, and reduces food costs by consolidating purchases.

Written in Assembly code for speed and efficiency, Nutri-Man requires a Model I or III with 32K and two disk drives. It can be ordered for \$250 from Quant-m Corp., P.O. Box 55, Newfane, NY 14108, (716) 778-9384.

Reader Service ✓553

Cassette for Backup Storage

The Micro-Comp 450 digital cassette is an economical back-up for floppy-disk storage. A four-track cassette with 450 feet of high-density tape, it holds over one megabyte at the standard two-track 800-bpi rate.

It sells for \$5 from Magnetic Information Systems, P.O. Box 806, Shelton, CT 06484, (203) 735-6477.

Reader Service ✓567

Stock Market Data

Twenty years of daily and weekly (1962-1982) Dow Jones and Standard & Poor's 500 averages are now available on Model III disks and Model I/III cassettes.

The Dow Jones includes utilities, transportations, and industrials. Typical running average and cyclic analysis programs, as well as a user's manual, show usage of the data. Utility programs for maintaining and updating the averages are also included.

Other software is available for financial analysis, curve-fitting data, and plotting. For more information, contact Young Ideas Inc., 555 N. New Ballas, Suite 310, St. Louis, MO 63141, (314) 569-8534.

Reader Service ✓585

Fractions

Fractions, a sequence of 24 interactive programs, guides students in grades five and up through the concepts and

operations of fractions.

For each of 11 topics, concept development and skill building is followed by an exploration program. The series also includes concept overview and placement or review test programs.

The Fractions package is available on Model III 32K disks for \$175. For more information, contact Quality Educational Designs, P.O. Box 12486, Portland, OR 97212, (503) 287-8137.

Reader Service ✓568

Color Computer to Model III

Color III is a set of plans for upgrading the Color Computer to Model III capability at a cost of approximately \$300.

Builders can convert their computer to a 65-key keyboard with 12-key numeric pad, front reset button, and television or color CRT display in a Model III enclosure. The unit includes RS-232, cassette, and joystick jacks, a ROMpak hatch door, disk-mounting capacity, internal sound, power-on indicator, and (with TV option) channel selector, telescopic antenna, and up to 256-by-192 resolution display. Once the Color III is built and your Color Computer installed, you can use your old enclosure as a remote terminal for home or office.

The \$15 plan package includes a complete bill of materials, tool and manufacturing lists, step-by-step instructions, illustrations, wiring diagrams, and sheet-metal templates. A kit consisting of plans and materials may be offered in the future.

For more information, contact L & E Electro Sales Co., 7017 Hazeltine Ave., Suite 10, Van Nuys, CA 91405, (213) 994-3110.

Reader Service ✓556

Model II/16 Hard-Disk CP/M

Aton International has introduced CP/M 2.2 on Radio Shack's hard-disk drives for the Models II and 16. It is the first CP/M operating system available for Tandy's hard disks, which were introduced last January.

The system uses only 16K controller RAM and 2K of CPU memory, leaving 62K RAM for user processing. For programs requiring dual floppies or dual hard disks, the total formatted capacity of eight megabytes can be divided into user-specified logical drives that sim-

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ulate multiple drives. This partitioning also lets the user back up data on unused portions of the same or a different hard disk.

Another utility allows files as large as eight megabytes to be backed up onto multiple floppy disks. Flawed sectors, bad tracks, and other problems are automatically detected and fixed.

Users can boot up either TRSDOS or CP/M, accessing programs formatted for either system that are stored on different parts of the same hard disk. The system can also bootstrap directly from the rigid platter, in minicomputer fashion, without the need of floppy-disk intervention.

The CP/M 2.2 package, including the hard-disk adaptation and full documentation, lists for \$279. Present Aton CP/M owners can purchase the hard-disk upgrade for \$125. For more information, contact Aton International Inc., 260 Brooklyn Ave., San Jose, CA 95128, (408) 554-9922.

Reader Service ✓563

Breakout Box

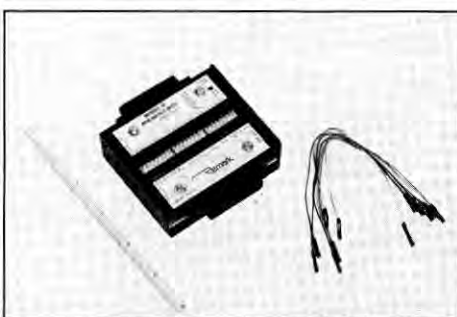
The Model 50 Breakout Box simplifies interfacing of RS-232 peripherals.

Two sets of 24 test points and six jumper plugs let you reconfigure any combination of the 24 interface signals. When more than two points have to be connected, patch to one of the four common bus areas.

The Model 50 has one female and one male D-type RS-232 connector. Its aluminum case measures 3¼ by 3¼ by 1 inches, and the rear cover has a signal list description of the RS-232 interface. Six jumpers are included.

Price is \$79 from Remark Datacom Inc., 4 Sycamore Drive, Woodbury, NY 11797, (516) 367-3806.

Reader Service ✓554



RS-232 Breakout Box



Visionary 100

The Soul of Wit

Brevi-T, a new software package for NEWDOS 80 Version 2.0 owners, lets you create and use abbreviations for common or complicated DOS and Basic command sequences.

It can be used for simple, multi-positional, multi-parameter, or conditional abbreviations, the number limited only by the space on your disk. You can add, delete, list, print, verify, and test abbreviations. Files for Basic and DOS are maintained separately, allowing an abbreviation to be used at two levels.

Brevi-T is available for \$19.95 from SofTrends Inc., 26111 Brush Ave., Euclid, OH 44132, (216) 289-2002.

Reader Service ✓579

Independent EMAIL Modem

The Visionary 100, a 300-baud programmable modem, can send and receive electronic mail while your computer is being used for other purposes or even while it is turned off.

With its internal real-time clock, calendar, and 8085 microprocessor, the modem can automatically distribute a message to a number of different destinations, redialing any numbers that are busy, and send or receive messages at any time or date specified. Messages are stored in 2K of memory (expandable to 24K) and given a time-and-date stamp for output.

The unit uses the standard RS-232 interface and is compatible with any Bell 100 series modem. It sells for \$595 from

Visionary Electronics Inc., 141 Parker Ave., San Francisco, CA 94118, (415) 751-8811.

Reader Service ✓555

Engineers' and Architects' Spec System

Compuspec is an office master system for use by engineers and architects in preparing project specifications. Using the CSI format, the system contains over 150 sections, consisting of more than 1,000 pages of bidding requirements, contract conditions, and forms used in every stage of design.

Written by professional engineers, the specifications have been used for over 10 years in EPA, HUD, and FMHA construction. Most sections are usable as is, while others must be customized to individual projects.

Specifier's notes, section schedules, special codes, and a global replace feature allow owner and project names, titles, bid opening dates, and other information to be automatically inserted throughout the specifications in minutes. Proofreading time is virtually eliminated, and output is camera-ready for production.

Compuspec is available for Model II and 16 micros with a Daisy Wheel II printer; licensees must show proof of purchase of Radio Shack's Scripsit 2.0, or purchase it as an option. The price of \$1,250 includes updates for one year.

For more information, contact Eberhard Engineering, P.C., 27 Pine Ridge

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Reader Service ✓572

School Attendance Monitor

Attendance is a menu-driven software package designed to maintain student records at a small high school or junior high. Students are handled as names, not numbers; data is checked for accuracy when entered; and arrow keys are used for easy correction. A password feature prevents unauthorized system entry.

Reports for individuals or groups can be displayed or printed. Students in groups can be listed alphabetically, by grade, or according to a mixture of the two.

The system allows a user to set grade breaks (e.g., one absence and two tardies is the lowest A); whenever a student crosses one of these grade breaks (slipping from a B to a C, for example), his or her name is printed and the attendance officer notified.

Two versions are available, each able to track students by date, absent or tar-

dy, and excuse. Version 2.0 also tracks by period and teacher, and can accommodate up to 1,000 students. Version 3.0 tracks by specific class name, accommodating 750 students and 350 classes.

The Attendance package requires a 48K, two-disk Model III and an 80-column printer. It is available for \$275 from Schoolhouse Software, 5302 33rd SE, Auburn, WA 98002.

Reader Service ✓569

Color Data Base

The Colour Data Management program allows Color Computer users to custom design data bases. Up to 10 user-named fields can be created, either character or numeric. Records can be sorted by any field, and a search made for any specific string or number. A sum command adds all the values in a numeric field. A list feature is included, with a selective list optional. Records can be added or deleted at any time.

The program will operate with either 16K or 32K Extended Basic. It is modifiable by the user and transferable be-

tween disk and cassette. Files may be stored on either medium.

Colour Data Management sells for \$20.95 from Computer-Mate Business Service, P.O. Box 3082, Station F, Scarborough, Ontario, Canada M1W 3P5, (416) 494-1862.

Reader Service ✓552

Educational Software Library

Educational Software Library, a nonprofit mail-order organization, reviews, evaluates, and distributes a wide range of software available for preschool to high-school students.

A one-year membership fee of \$25 entitles the member to ESL's review catalog of Model I and III programs and a bimonthly newsletter evaluating recent library additions. Members can borrow software for two weeks for \$2 per program, or buy programs at discount prices.

The review catalog of over 150 programs (most on cassette) is available separately for \$4.95. For a free sample newsletter, send a stamped, self-addressed long envelope to Educational

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SUPERTAX II: This 2-disk set includes the efficient SUPERTAX I program as well as the more detailed SUPERTAX II program which makes all of the SUPERTAX I calculations, but which also PRINTS THE INCOME TAX RETURN! This program prints Page 1, Page 2, Schedules A, B, and G (income averaging) of the FORM 1040 as well as the Form 3468 (investment tax credit) using tractor-feed income tax forms (one of each is supplied with the program).

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SUPERTAX II — \$31.50

SUPERTAX III — \$36.50

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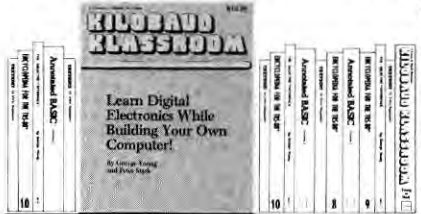
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Makes learning electronics fun and easy. First published as a series in *Kilobaud Microcomputing*, the book combines the learning of essential theory with practical, hands-on experience. The course begins with basic electronic projects and culminates in the construction of your own programmable microcomputer. The direct instructional methods of authors Young & Stark make KILLOBAUD KLASROOM a simple way for you to acquire a solid background in digital electronics.

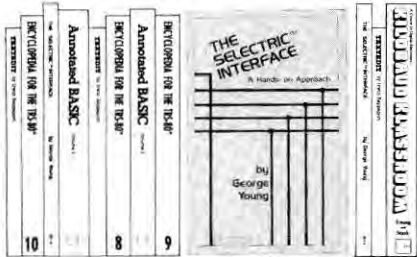
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THE SELECTRIC INTERFACE by George Young

You need the quality print that a daisy wheel printer provides but the thought of buying one makes your wallet wilt. The SELECTRIC™ INTERFACE, a step-by-step guide to interfacing an IBM Selectric I/O Writer to your microcomputer, will give you that quality at a fraction of the price. George Young, co-author of *Kilobaud Microcomputing* magazine's popular "Kilobaud Classroom" series, offers a low-cost alternative to buying a daisy wheel printer. The SELECTRIC INTERFACE includes: step-by-step instructions, tips on purchasing a used Selectric, information on various Selectric models, including the 2740, 2980, and Dura 1041, driver software for Z80, 8080, and 6502 chips, tips on interfacing techniques. With The SELECTRIC INTERFACE and some background in electronics, you can have a high-quality, low-cost, letter-quality printer. Petals not included.

BK7388 (125 pages).....\$12.97



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A Complete Word Processing System in Kit Form

by Irwin Rappaport

TEXTEDIT is an inexpensive word processor that can be adapted to suit your differing needs—from form letters to lengthy texts. Written in TRS-80 Disk BASIC, the system consists of several modules, permitting the loading and use of only those portions needed. A disk is also available which provides the direct loading of the modules, however, the book is required for documentation. For Model I and III with TRSDOS CONVERT., one disk drive (2 disk drives or copy utility needed to transfer to system disk). Runs under TRSDOS 2.2/2.3. May not function under other systems.

BK7387 (book, 90 pages).....\$9.97

DS7387 (disk).....\$19.97

Disk is manufactured by Instant Software, a division of Wayne Green Inc.

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ANNOTATED BASIC

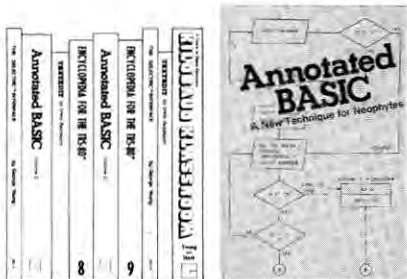
A New Technique for Neophytes

Put your BASIC knowledge to work for you with this 2-volume set of TRS-80 Level II BASIC programs. Gain a better understanding of the elements and techniques involved in programming. ANNOTATED BASIC'S uniquely designed format breaks each program down for you to include: initial documentation and instruction, definitions of New BASIC Concepts, flowchart, annotations of sections, showing how each part fits into the whole, and explaining why certain BASIC commands are chosen over similar ones.

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BK7385 (Vol. 2, 136 pages).....\$10.95



COMPUTER CARNIVAL by Richard Ramella

Your child can become a crackerjack computerist with the sixty TRS-80 Level II programs in COMPUTER CARNIVAL. This large-type, spiral bound book for beginners is a veritable funhouse of games, graphics, quizzes and puzzles. Written by 80 *Micro* columnist Richard Ramella, the programs are challenging enough to ensure continued learning, yet short enough to provide your child with the immediate delight and reward of mastering basic computing skills. And for even greater enjoyment, get the CARNIVAL COMPANION, a 30-minute cassette containing all the programs in the book. Eliminates tiresome typing and lets your child spend more time enjoying the programs.

BK7389 Book (218 pages).....\$16.97

CC7389 Book & Cassette "Carnival Companion".....\$24.97



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NEW PRODUCTS

Software Library Inc., 262 Park Lane,
King of Prussia, PA 19406.

Reader Service ✓578

C Language For Model 16

While Radio Shack has not yet delivered its Basic or Fortran languages for the Model 16, Softworks Limited has introduced a complete C compiler for the new machine.

Based on Whitesmith's compiler of the Bell Laboratories-developed language, Softworks C is the first higher-level language for the Model 16. Operating in full 16-bit mode, it links modules together and generates standard IEEE assembler code. Sample programs are included; cross-compilers are available for developing Model 16 C programs using different computers.

The language is priced at \$950, with a documentation package selling for \$30. For more information, contact Softworks Limited, 607 W. Wellington, Chicago, IL 60657, (312) 327-7666.

Reader Service ✓565

Copy-Not

Copy-Not is a copy protection scheme that permits Basic software authors to save their creations from pirates. It is designed to alter the format of a target TRSDOS 2.3 system disk to make it readable only by itself, only if programs are assigned identical serial numbers, and copyable only by Copy-Not. One or more of the Basic programs on the disk can also be data-encrypted to provide maximum protection.

After creating a master disk, the system can be used to mass-produce copies for marketing. Like the original, each copy will boot and run correctly, but will not be readable by any other operating system except Copy-Not.

This product requires a Model I with 48K, two disk drives, and TRSDOS 2.3. It sells for \$275 from HPB Vector Co., 130 Center St., E. Stroudsburg, PA 18301.

Reader Service ✓587

Bazul's Quest

King Rifraf, ruler of an enchanted land filled with magical objects, strange riddles, and friendly and hostile creatures, is deathly ill. To make a healing potion, the Alchemist needs 26 items—dragon teeth, a witch's broom, a silver acorn, a Griffon egg, and more. Can you, as Bazul, find the ingredients



Once A Tree

or will the kingdom fall under the control of the Evil Jester?

Bazul's Quest is a text adventure designed to challenge the experienced player. Written in machine language on a Model I or III disk, it features nearly 200 items, a vocabulary of over 400 words, split screen, and the capacity to save up to 18 games.

It requires one disk drive and 32K, and sells for \$29.95 from Swallow Software, P.O. Box 502, Florence, AL 35631, (205) 766-0030.

Reader Service ✓558

Computer Furniture

An alternative to plastic or processed wood scrap comes from Once A Tree, which has introduced a line of solid-oak furniture designed to be a comfortable, multi-function computer work space.

All items are finished with a hand-rubbed Danish penetrating oil, and built for easy assembly and disassembly without losing quality or structural strength. They can be shipped via UPS.

The basic computer desk is priced at \$184.95, the printer stand at \$139.95. For more information, contact Once A Tree/Amaro & Son Inc., 3192 Commercial St., San Diego, CA 92113, (714) 421-0441.

Reader Service ✓584

The November 1982 New Products listing for The Last One program-writing utility gave Southwest Micro-computer Systems (16885 West Bernardo Drive, Suite 220, San Diego, CA 92127) as the sole distributor. The northwestern U.S. distributor for The Last One is Krown Computing, 1282 Conference Drive, Scotts Valley, CA 95066, (408) 335-3133.

New Products listings are based on information supplied in manufacturers' press releases. 80 Micro has not tested or reviewed these products and cannot guarantee any claims.

THE ULTIMATE IN COLORCOMPUTING

For the TRS-80 Color Computer and TDP System 100 Personal Computer

Super "Color" Writer II

By Tim Nelson

The Rolls Royce of Word Processors

The Super "Color" Writer is a FAST, machine code, full featured, character (screen) oriented word processing system for the TRS-80™ Color Computer and ANY printer. The video display is styled after a professional phosphor (green characters on black background) display for hours of use without eye fatigue (optional orange on black). The unique print WINDOW frees you from 32, 51 or 64 character lines FOREVER! This window can be moved anywhere in the text file, up, down, left or right to display the text as it will be printed without wasting paper. You can create or edit Super "Color" Terminal files, ASCII files, BASIC programs or Editor/Assembler source listings. It's simple enough for beginners with 4K and . . . for the professional writer with a 32K disk system and a lot to say, there's plenty of room to say it!

COMPARISON CHART	SUPER COLOR WRITER			THE COMPETITION		
System Size	4K	16K	32K	4K	16K	32K
TAPE: Text space	N/A	7K	23K	N/A	2K	18K
ROMPAK: Text space	2.5K	16K	31K	N/A	N/A	N/A
DISK: Text space	N/A	5.5K	21.5K	N/A	0.5K	16.5K
Right Justify		YES			NO	
Video Window		YES			NO	
Edit any ASCII File		YES			NO	
Programmable Function		YES			NO	

The figures speak for themselves and with professional features like PROGRAMMABLE function string commands to perform up to 28 commands automatically. PROGRAMMABLE text file chaining, PROGRAMMABLE column insert & delete, and right hand JUSTIFICATION with punctuation precedence, the choice is clear but there's still more! In their September '82 issue, "80 MICRO" says, "The Color Computer has finally come of age. Nothing illustrates that coming of age better than this offering (SUPER "COLOR" WRITER) by Nelson Software". The Super "Color" Writer takes full advantage of the new breed of "smart printers" with Control codes 1-31, 20 Programmable control codes 0-255 for special needs. Works perfectly with all Epson, Radio Shack, Okidata, NEC, IDS, Centronics, Citoh, Smith Corona, Diablo Etc., Matrix, or Letter Quality Printers.

CHECK THESE FEATURES!!

User friendly • Easy commands • 32K Compatible • Window • Key beep • HELP table • 128 character ASCII & graphics • Mem left and Mem used • Full cursor control • Quick paging • Scrolling • Word wrap around • Tabs • Repeat all functions • Repeat last command • Insert character & line • Delete character, delete to end of line, line to cursor, line & block • Block move, copy & delete • Global Search, Exchange & Delete • Merge or Append files • Imbed Control Codes in text • Underline • Superscripts • Subscripts • Headers, Footers & 2 Auxiliary footnotes on odd, even or all pages definable position • Flush right • Non-breakable space • 4 centering modes: 5, 8.3, 10 & 16.7 (CPI) • Full page & print formatting in text • Single sheet pause • Set Page length • Line length, Line spacing, Margins, Page numbers • Title pages • Printer baud: 110, 300, 600, 1200, 2400 • Linefeeds after CR • Soft & hard formfeed • Works with 8 bit printer fix • and more!

Super "Color" Writer II Disk

The Disk version of the Super "Color" Writer works with the TRS-80C Disk System and has all the features listed above plus many more! Use with up to four Disk Drives. Includes an extended HELP table you can access at any time. Call a directory, print FREE space, Kill disk files and SAVE and LOAD text files you've created all from the Super "Color" Writer. Print, merge or append any Super "Color" Terminal file, ASCII file, BASIC program or Editor/Assembler source listing stored on the Disk or tape. The Super "Color" Writer Disk version has additional formatting and print features for more control over your printer and PROGRAMMABLE chaining of disk files for "hands off" operation. Print an entire BOOK without ever touching a thing! Includes comprehensive 90 plus page Tutorial manual.

TAPE \$49.95 ROMPAK \$74.95 DISK \$99.95
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Super "Color" Terminal

By Dan Nelson

The Ultimate in Smart Terminals

The Super "Color" Terminal turns the Color Computer into a Super-smart terminal with all the features of VIDEOTEX™ plus much more. COMMUNICATE with Dow Jones & Compuserve and with computers like the TRS-80™ MODEL I, II, III, APPLE etc., via modem or RS-232 direct! Save the data to tape or print it! Reduces ON-LINE cost to a minimum!

FEATURES

10 buffer size settings from 2-30K • Buffer full indicator • Prints buffer contents • Full 128 ASCII keyboard • Compatible with Super "Color" Writer files • UPLOAD & DOWNLOAD ASCII files, Machine Language & Basic programs • Set RS-232 parameters • Duplex: Half/Full • Baud Rate: 110, 300, 600, 1200, 2400, 4800 • Word Lengths 5, 6, 7 or 8 • Parity: Odd, Even or None • Stop Bits: 1-9 • Local linefeeds to screen • Tape save & load for ASCII files, Machine code & Basic programs • Unique clone feature for copying any tape.

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Operators manual only \$10.00 (Refundable with purchase)

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Super "Color" Mailer

Correspondence-Mailmerge

The Super "Color" Mailer is a powerful multi-purpose file merging program that uses files created by the Super "Color" Writer II. One of Super "Color" Mailer's most popular uses is producing customized form letters — at a fraction of the time and expense of individually typed letters. With Super "Color" Mailer you can combine a Super "Color" Writer II file containing a form letter with a file containing a list of names and addresses. You can even insert special words and phrases — unique to each addressee — into the body of the letter. Other Super "Color" Mailer uses include creating invoices, printing mailing labels, addressing envelopes, and producing "boiler plate" legal documents out of many different paragraphs. Features include: the ability to selectively print mailing lists by any of up to 10 user definable fields • automatically prints current date • address • salutation • closing • P.S. etc. • prints any ASCII file • justification.

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1982

Article Index

BUSINESS

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
Autotrak	Lloyd	10/82:203		Keep track of maintenance records for a fleet of vehicles. (Model I/III)
CC—Color Computer or Chamber of Commerce	Adcock	3/82:210		Using the Color Computer as a business machine.
Discriminating Pallets	Eaton	1/82:98		Plot prices for increasing material costs. (Model I)
Financial Wizard	Perelman	5/82:326		Figure compound interest, annuity, and amortization. (Model II)
Forms Maker	Perelman	12/82:356		Make business forms. (Model II)
High Finance	Byrne	10/82:324		Program to use with all-saver savings accounts. (Model I/III)
Industry Saver	Leichtman	10/82:156		How a TRS-80 improved production-line efficiency.
Invoice	Hackman	10/82:342		Organize your billing procedures. (Model I/III)
One Twelfth of a Misery	Krapf	4/82:298		Loan-amortization program. (Model I)
Order Form	Wright	9/82:270		Produce custom-designed forms. (Model I/III)
Phonfind	Eldridge	6/82:358		See Home/Hobby.
Pocket Portfolio	Dethlefsen	1/82:94		Investment-analysis program. (PC)
Portal-to-Portal Report	Keneipp	6/82:300		Keep track of air miles traveled. (Model I)
Production Learning Curve	Jeffrey	10/82:316		Program to track production costs per unit. (Model I/III)
Profit Prognosticator	Nottingham	2/82:268		Estimate business profits. (Model III)
Questions, Questions, Questions	Rutledge	1/82:102		Tabulate and average survey results for business. (Model I/III)
Queue Up!	Clapp	12/82:333		Analyze waiting lines. (Model I)
QuickCalc	Leafstand	10/82:114		VisiCalc clone. (Model I/III)
Rule of 300	Zimmerman/Conrad	1/82:116		Figure interest payments on loans. (Model I/III)
Spanning of Mod II Disks	Keen/Dischert	1/82:110		See Programming Techniques.
Survey	Wells	6/82:248		Telemarketing program. (Model I/III)
Tax Relief for the Rich	Perelman	3/82:176		Figure taxes after the Economic Recovery Act. (Model II)
Trade Wins, The	Finkelstein	2/82:238		Stock Market simulator. (Model I/III)

EDUCATION

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
80 in the Apple, An	Radin	2/82:68		About a teacher in NYC using 80s in the classroom.
Anything Jodi Can Do...	Tallman	2/82:60		Code game written by 9-year old and comments from her dad on teaching kids to program. (Model I)
BIPED	Leichtman	4/82:112		Story on a program using micros to train handicapped people.
CIE—Computers in Education	Radin	6/82:254		How a school district uses computers.
Classroom Crystal Ball	Keough	2/82:94		The future of computers and education, and how programmers should view educational software.
Computer Etch-a-sketch	Mustico	2/82:70		See Programming Techniques.
Do Not Pass	Wood	6/82:352		Teach road signs in driver-education class. (CC)
Dynamic Item Scheduling	Wyckoff	5/82:316		Write educational programs that interest and teach students. (CC)

Earth to Class, Listen Up	Fish	2/82:120	Classroom networking. (Model I)
Elementary, My Dear Primate	Vanderburgh	2/82:256	Use randomly generated text to study language synthesis. (Model I)
Extra-terrestrial	Wells	2/82:112	Program to teach the solar system. (Model I)
Fret No More!	Louis	5/82:164	Learn how to play the guitar with your 80. (Model I)
Future in Miniature, The	Mello	2/82:53	The micro in the classroom.
Grade Book	Pugsley	3/82:184	Keep students' grades on the computer. (Model I)
King Komputer	Allison	4/82:302	Program to teach kids how to read a ruler. (Model I/III)
Learning the Elements	Wood	2/82:116	Program to teach chemical elements. (Model I/III)
Making More Possible	Leichtman	2/82:128	How micros help the handicapped.
Moby Dick Touch Typing Tutor	Brown	9/82:139	Learn touch typing. (Model I/III)
Model II Math Skills	Kilroy	11/82:292	Teach your kids to add and subtract. (Model II)
Music Marvel	Blyn	11/82:308	Teach retarded people to play music. (CC)
OJT	Tymon	6/82:326	Program to build your own educational programs from. (Model I)
Put Them to the Test	Davis	2/82:104	Program that generates quizzes. (Model I/III)
Roll Call	Henderson	2/82:100	Using computers to keep track of student records.
RS-80Tay, Aysay Hatway?	Stratton	2/82:142	Program to teach a foreign language. (Model I)
Sound OFF!	Thiel	11/82:422	Add sound to your education programs. (Model I)
Ten-key Tutor, The	Knogle	2/82:192	Program to teach typing on the ten-key pad. (Model I)
Time to Make 'em Sweat	Hawkes	5/82:332	Generate multiple-choice, true-false, short-answer, or completion tests. (Model I)
To Comma, or Not to Comma	Perron	2/82:82	Punctuation-teaching program. (Model I)
Vocabulary Test	Kalkstein	4/82:294	Match a word with a definition. (Model I)
You Light Up My Life	Wood	3/82:330	Teach the physics of light. (CC)

GAMES

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
Acrostic Generator	Falk	8/82:240		Create puzzles. (Model I/III)
Alien Attack	Perry	8/82:282		Arcade game, with joysticks. (CC)
Amazing Cardoni II	O'Connor	8/82:302		Card trick. (Model I/III)
Assignment 46	Albino	8/82:66		Adventure game. (Model I)
Astro-Scrambler	Long	12/82:252		Dodge ball in space. (Model I)
Birthday Party	Zuckerbraun	10/82:262		Games for kids' birthday parties. (Model I)
Casino Draw Poker	Balewski	11/82:246		Play cards against your computer. (Model I/III)
Casino Slot Machine	Balewski	11/82:222		Simulate a Las Vegas slot machine. (Model I)
Color Breakaway	Grossbach	8/82:268		One-on-one hockey simulation. (CC)
Color Maze	White	8/82:188		Maze game. (CC)
Color Reversi	Ledger	3/82:90		Reversi on the Color Computer.
Computer Repeat	Fontenot	4/82:222	9/82:32	Memory game. (Model I)
Conquest of Memory Alpha	Myers	8/82:254		Colonize the universe. (Model I/III)
Cram	Brothers	8/82:234		Draw the line without going back or into it. (Model I/III)
Cube-80	Washington	8/82:106	10/82:30	Rubik's Cube on the computer. (Model I/III)
Enter the Dragon	Hadlock	8/82:248		Kung-fu adventure. (Model I/III)
Flip-a-piece	Cominio	3/82:252		Othello-like game. (Model III)
Fortran Puzzler	Yehle	6/82:227		Figure out the secret code. (Model I)
Four in One Plus Another	Becker	8/82:202	10/82:31	Four games and a utility for the CC.
Game of Kalah, The	Victor	8/82:132		Similar to Reversi. (Model I)
Game of Sim, The	Radin	9/82:276		Similar to tic-tac-toe. (Model I/III)
Intellectual Somnambulism	Keller	8/82:296		Arcade game. (Model I)
Invader	Fisher	11/82:450		Destroy the K'taabas. (Model I)
Kings and Catapults	Adams	2/82:232	9/82:32	Two feudal kings battle it out. (Model I/III)
Kwikmaze	Rollins	11/82:318		Generate mazes. (Model I/III)
Loco Motion	Ridgway	8/82:286		One-player to align objects into a pattern. (Model I)
Martian Missile Attack	Gillen	1/82:265		Save cities, destroy Martians. (Model I)
Master Muses, The	Heath	8/82:186		See Tutorials.

Maze XIX	Teter	12/82:341		Maze game. (Model I)
Micro Puzzle Box	Moews	1/82:302	3/82:28	Put the numbers in the right order in a grid. (Model I)
Model III Microchess	Embar	11/82:300		Modify Microchess for the Model III.
More Color Conversions	Freeman	11/82:164		Some Model I games converted to the CC.
Naval Wars	Byrnes	8/82:114		Battleship with two computers. (Model I/III)
Outdoor Computer Games?	Adams	8/82:80		Play spy vs. spy outdoors with your computer. (Model I/III)
Pitty Pat	Barnes	8/82:270		Variation of draw poker. (Model I/III)
Save All Humans	Boothe	3/82:154		Save people from flying saucers. (Model I/III)
Save Our Ship	Hawkins	8/82:174		Star Trek adventure. (Model I/III)
Ski Slalom	Commander	8/82:112		Hit the slopes on the 80. (Model I/III)
Space Chase	Gillen	5/82:292	10/82:30	Arcade space game. (Model I)
Space Duel	Edick	8/82:260		Arcade game. (Model I/III, CC)
Square Game	Kanach	8/82:264		Merlin-like game. (CC)
Stanley	Black	8/82:300		Out stare your VDT. (Model I)
Sub Destroy	Steele	8/82:212		Arcade game for the Model II.
Tee for Six	Bevington	8/82:156		Tee-jumping board games for the computer. (Model I/III)
Termites	Weindorf	8/82:274		

GENERAL

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
Basic Misinterpreter	Busch	4/82:86		Humor—change Basic keywords to misspelled words. (Model I)
Bob Rosen— A Colorful Story	Leichtman	6/82:174		Personality piece on Bob Rosen.
Broadening the TRS-80 Horizon	Busch	3/82:298		Thoughts on expanding your system.
Calculating Genius, Pt. I	Cook	11/82:130		The story of Charles Babbage, inventor of the digital computer.
Calculating Genius, Pt. II	Cook	12/82:88		See Part I.
Cassbox	Gillen	11/82:282		Print out cassette-box cards. (Model I)
CC CQ	Chuck	12/82:200		Use your Color Computer with your ham rig.
Celluloid CPUs	Nadeau	5/82:98		Micros in the movies.
CompuServe, MicroNet, TRS	Maquire	1/82:74		TRS-80 users and CompuServe
Computer Creationists	Rose	5/82:80		How micros are used in sound studios.
Computer-Assisted Electronic Design	Harper	11/82:372		Use your computer to design circuit boards. (Model I/III)
Confessions of a Microholic	Keller	5/82:320		One user's life after buying a TRS-80.
Dateline: Sri Lanka	Mello	4/82:128		Personality piece on David Busch.
Divine Dementia	Nadeau	5/82:176		Personality piece on Dennis Kitsz.
Dream Team	Wangness	2/82:196		Put together an ideal team with this program. (Model I)
Family Tree, The	Castor	11/82:398		Genealogy program. (Model I)
Gabby the Space Cowbum	Ramella	5/82:322		This space cowboy won't shut up. (Model I)
Graphics King, The	Frann	8/82:120		Personality piece on Leo Christopherson.
Jake's Wampeters	Mello	3/82:162		Profile on Jake Commander.
Kryha Cipher Machine	Deavours	5/82:272		Use Tiny Pascal in cryptology. (Model I)
Little Byte Music, A	Levine	5/82:128		History of digitally synthesized music.
Make Those Headlines Fit	Ramella	11/82:260		Know if a headline will fit in a space before you typeset it. (Model I)
Memory Map—Level II	Goodwin	12/82:298		Level II memory map.
Night on the Town, A	Gunn	4/82:124		Humor—take your computer out on a date.
Northern Lights	Latamore	5/82:104		How a sculptor uses a micro to play his designs.
Ohio Electronic News Experiment	Chidsey	6/82:100		Progress report on the Tiffen, OH, newspaper's electronic news experiment.
Out of Thin Error	Adcock	5/82:258		Humor—what error messages "really" mean.
Philly Phiasco	Gunn	5/82:140		Commentary on the Philadelphia Computer in the Arts Symposium.

Radio Shack vs. IBM ROM Bibliography	Van Ghent Secord	3/82:168 4/82:76		Model II compared to the IBM 5150. Annotated list of literature on the ROM. (Model I/III)
Shopping with Uncle Sam	Stolker	10/82:88		A look at the Federal DP Expo in Washington, DC.
Terminal Case, A Tracking Lobsters	Latamore Kaczor	1/81:66 12/82:150		A look at the Canadian videotext system, Telidon. Plot maps to locate lobster pots, or anything else. (Model I)
TRON: Man in the Computer	Mello	8/82:124		Piece on the movie, Tron.
Vexed by the Void	Resnick	4/82:262		An alien's view of TRS-80 users—humor.
Videotext for the Masses	Nadeau	1/82:60		What videotext means to the home computerists.
When the Postman Doesn't	Averill	3/82:308		Thoughts on mail order.

GRAPHICS

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
3-D Graphics	Fogelin	3/82:138		Get 3-D geometric shapes on the screen. (Model I/III)
Alpha-graphics	Basch	1/82:190		See Programming Techniques.
Back to the Drawing Board	Rappaport	3/82:120		See Utilities.
CC on Parade, Pt. I	Barden	10/82:82		Using graphics on the CC.
Color from a Model II?	Ward/Deininger	3/82:240		Use the DMP-3 digital plotter to get color graphics. (Model II)
Colorful Computer, Pt. I	Miller	8/82:94		Twenty-one graphics programs. (CC)
Colorful Computer, Pt. II	Miller	9/82:152		See Part I.
Colorful Computer, Pt. III	Miller	10/82:254		See Part I.
Computer Etch-a-sketch	Mustico	2/82:70		See Programming Techniques.
Conversion	Osborne	9/82:238		Bob Boothe's graphics on the CC.
Different Perspective	Nielsen	5/82:242		Use shadows to gain perspective in graphics. (Model I)
Editor's Choice, The Epson Airfoils	Gesamte/Commander Boothe	3/82:78 11/82:230		Graphic patterns. (CC) Plot airfoils for planes on your Epson printer. (Model I)
Flaky	Garrison	12/82:94		Graphics techniques. (CC)
Is a Rose in Color/ a Rose	Green	3/82:142	6/82:26	Earlier 80 Micro graphics programs converted to the CC.
Joystick Paintbrush	Sprouse	9/82:230		Draw on the screen with joysticks. (CC)
Mirror Imagining	Boothe	3/82:112		Plot spheres, paraboloids, and other high-resolution shapes for the Epson. (Model I)
Paper Graphics	Rosenberg	3/82:270		See Utilities.
Pictures at a Mod II Exhibition	Baker	3/82:280	6/82:26	Bob Boothe's techniques on a Model II.
Pixel Print	Gillen	11/82:364		Send screen graphics to the printer. (Model I)
POKE Graphics	Schaefer	12/82:384		Speed up Basic displays. (Model I)
Polar Generator	Webb	2/82:204		See Programming Techniques.
Random Picture	Swarts	2/82:194		Let the computer be the artist. (Model I)
Shady Characters	Ramella	3/82:258	6/82:26	Get silhouette printouts. (Model I)
Smooth Graphics	Goodman	3/82:304		See Programming Techniques.
Spiromania, Pt. I	Commander	5/82:88		Draw spirographs on the Color Computer.
Spiromania, Pt. II	Commander	6/82:106		See Part I.
Sublime Simulations	Keough	4/82:258		How computer simulation/modeling works.
Super Banner	Balewski	5/82:282		Print out banners on a Centronics 737. (Model I)
When Black Is White	Tache	3/82:294		Reverse graphic printouts. (Model I/III)

HARDWARE

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
Bare-bones	Hart	6/82:128		Get a communications system without the expansion interface or RS-232 adapter, with software. (Model I)

Battery Back-up	Batie	2/82:126		Build a battery back-up unit.
Building an M-80	Hawkes/Reese	3/82:172		Build a single-board microprocessor with the Z80.
Cablebrew	DeFrancis	11/82:287		Make your own MX-80 cable.
Cheaper Upgrade	Tucker	9/82:186		Install the Extended Color Basic ROM yourself. (CC)
Color Computer Upgrade	Murphy	3/82:102		Go from 4K to 16K. (CC)
Color from a Model II?	Ward/Deninger	3/82:102		See Graphics.
Computerized Engraving	Joffe	5/82:318		Drive a pantograph with your 80. (Model III)
Cybernetics and Jelly Beans, Pt. I	Davids	10/82:190		Build a robot to detect jelly beans. (Model I)
Cybernetics, Pt. II	Davids	11/82:264		See Part I.
Cybernetics, Pt. III	Davids	12/82:312		See Part I.
Digital Doodles	Sehmer	1/82:244	9/82:30	Build a graphics plotter. (Model I)
Do-it-yourself Disks	Shaefer	1/82:172		Install your own disk drives in a Model III.
Double Your Density	Domuret	1/82:294		Adding double density to your system. (Model I)
Four Into One Will Go, Pt. I	Hawkes/Reese	2/82:226		Put a 4K program in 1K by bank section. (Model I)
Handy Dandy Tandy Table	Langston	4/82:328		Build a desk for your computer.
Hardware Hacker, Pt. I	Van Praag	10/82:216		Connect a Centronics-compatible printer to the Model I.
Hardware Hacker, Pt. II	Van Praag	11/82:112		Add 32K RAM. (Model I)
Hardware Hacker, Pt. III	Van Praag	12/82:173		Add a disk-drive controller. (Model I)
Hydra-disk	Robins	3/82:206	6/82:26	Add dual-headed drives. (Model I)
Joy of Interfacing, The	Batie	3/82:242		Joystick interface. (Model I)
Juicing Pin 18	Gorodetzer	9/82:288		Use pin 18 on the MX-80 printer connector with the buffered cable. (Model I)
Look into Disk Drives, A	staff	1/82:179		Buyer's guide to disk drives.
Modem Auto-answer	Westbrook	6/82:229		Build an auto-answer device.
Multi-programming/Micro	Genovese	1/82:278		See Programming Techniques.
Networking on a Shoestring	Meinke	2/82:184		Build your own networking system. (Model I)
New Generation of Characters	Park	4/82:220		Install the AXX3027 character generator chip. (Model I)
Programmable Baud Rate	Cottle	5/82:306		Device for the LNW interface to get a programmable baud rate. (Model I)
RAM Wars	McClenahan	3/82:156		Get 64K RAM on the CC.
Singer Printer Interface	Mailhot	6/82:374		Interface the Singer printer.
Sixteen Channel A/D Board	Haan	6/82:310		Interface eight joysticks. (Model I)
Smarten Up, Color Computer	Esposito/Thiel	3/82:126		Add memory to the CC.
Straight Shooter, The	Quindry	1/82:318	10/82:30	Build an inexpensive light pen. (Model I)
Telephone Dialer	Hickey	6/82:160		Device to let your computer dial phone numbers. (Model I)
\$30 System Desk	Asman	12/82:166		Build a desk for your computer.
Those CLOAD Blues	Hartjes	1/82:288		Build a data compensator and audio amplifier. (Model I)
Video Snow Shovel	Smith	3/82:290	9/82:30	Get rid of those black streaks against white characters. (Model I)
Voice-Controlled Typewriter	Rigsby	12/82:72		Use your computer and printer as a sound-activated typewriter for the handicapped. (Model I)
We Interrupt This	Workman	11/82:396		Build interrupt capabilities into your Model I.
Where There's a Will...	McClenahan	3/82:84		Device to let the Color Computer print while on CompuServe.

HOME/HOBBY

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
Bringing the Supermarket to Its Knees	Kraynak	4/82:270		Grocery-list program. (Model I)

Computer Racing Form	Bobo	5/82:252		Handicap horse races on your micro. (Model I/III)
Family Medical History	Diaz	11/82:90		Keep your family's medical records. (Model I/III)
Fore! Scorekeeper	Wells	5/82:298		Keep track of your golf scores. (Model I/III)
Gentle Reminder, A	Rosen	6/82:348		Schedule your work projects. (Model I/III)
Home Budgeteer— Reprise	Pablo	5/82:238		Keep track of household expenses. (Model I/III)
Homebrew Librarian	Hamilton	11/82:436		Keep track of your books. (Model I)
If This Is Tuesday, It Must Be...	Atkins	1/82:308	5/82:26	Date program. (PC)
Income Tax Estimator	Stark	10/82:168		Figure your income tax on the CC.
Model III Biorhythms	Anderson	5/82:280		Find out what your good and bad days will be. (Model II)
No More 90-lb.	Stevens	1/82:174		Exercise log program. (PC)
Phonfind	Eldridge	6/82:358		Phone-log program. (Model I/III)
To Catch a Thief	Kuhn	4/82:274		Home-inventory program. (Model III)
Trick or TRS-80	Keller	10/82:104		Have a jack-o-lantern on your screen greet trick-or-treaters. (Model I/III)
Two Stroke a Side	Avery	5/82:264		Figure your golf handicap. (Model I/III)
Ultimate Parts Manager	McCalley	1/82:140		Keep inventory of Model T parts. (Model I)
You're in the Money	Montgomery	10/82:140		Project the impact of personal savings and borrowing plans. (Model III)

PROGRAMMING TECHNIQUES

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
Add That Professional Touch	Steelhammer	1/82:258		Make DBMs easier to use. (Model I/III)
Alpha-graphics	Basch	1/82:190		Technique to build graphic strings. (Model I/III)
Basic Word Processing	Cutrona	9/82:140		See Utilities.
CC on Parade, Pt. I	Barden	10/82:82		See Graphics.
CC on Parade, Pt. II	Barden	11/82:80		Learn how to use Line, Circle, Draw, Paint, Get, and Put. (CC)
Colorful Computer, Pt. I	Miller	8/82:94		See Graphics.
Colorful Computer, Pt. II	Miller	9/82:152		See Part I, Graphics.
Colorful Computer, Pt. III	Miller	10/82:254		See Part I, Graphics.
Computer Etch-a-sketch	Mustico	2/82:70		Add graphic routines to educational programs. (Model I)
Conversion	Osborne	9/82:238		See Graphics.
Different Perspective	Nielsen	5/82:242		See Graphics.
Dizzy Decimals	Shore	3/82:326		Eliminate round-off errors. (Model I/III)
Do-it-yourself DB, Pt. I	Townsend	6/82:176		
Homebrew, Part II.	Townsend	9/82:242		See Do-it-yourself DB, Part I.
Homebrew, Part III	Townsend	10/82:332		See Do-it-yourself DB, Part I.
Easy Picture Editor	Ginger	12/82:388		See Utilities.
Editor's Choice, The	Gesamte/Commander	3/82:78		See Graphics.
Flasher, The	Mickey	1/82:276		Flash prompts. (Model I)
Graftrax Tricks	Schneider	12/82:118		New things to do with your MX-80. (Model I)
I Have a Secret	Demberger	10/82:296		See Utilities.
I Program, Therefore ISAM	Adcock	5/82:302		Use the indexed sequential addressing mode.
Mirror Imaging	Boothe	3/82:112		See Graphics.
Model I Do Files	Jackisch/Knapp	4/82:254		Ease program operation by using Do files. (Model I)
Model III Machine- Language Mods	Koch	12/82:320		Tricks to convert Model I programs to Model III
Multi-programming/ Micro	Genovese	1/82:278		Execute several programs simultaneously. (Model I)
On Break GOTO	Donais	11/82:390		Another way to use break. (Model I)
Ordered Chaos	Webb	1/82:310		Using randomness in programs. (Model I/III)
PCLEAR 0	Heusinkveld	9/82:282		Make high-resolution graphics use high memory. (CC)
PEEK of Its Career, The	Wilson	6/82:308		Simulate PEEK and POKE on the Model II.
Performance Analysis	Ballard	2/82:240		Detail the execution path of your programs. (Model I/III)

POKE Graphics	Schaefer	12/82:384	See Graphics.
Polar Generator	Webb	2/82:204	Generate a map of the Arctic on the screen. (Model I)
Priming the Data Base	Ring	3/82:152	Use prime numbers for labels in DBMs for fast sequential searches. (Model I/III)
Printer Color Art	Kalinowski	9/82:168	Get color printouts on your MX-80 using colored ribbons. (Model I/III)
Programmers for Hire	Gillig	1/82:274	Techniques of a professional programmer.
Programming Pitch, Pt. I	Davis	5/82:142	How to program pitch in music-generation programs. (Model I)
Programming Pitch Pt. II	Davis	6/82:362	See Part I.
Programming Pitch, Pt. III	Davis	10/82:228	See Part I.
ROM Breakout	Sprott	6/82:350	Use the interpreter's build-in exits to make modifications. (Model I/III)
Screen Strings	Davidson	12/82:360	Make efficient screen routines. (Model I)
Sling Some Hash	Knecht	9/82:124	Use hashing to store and retrieve items in an unsorted list. (Model I/III)
Smooth Graphics	Goodman	3/82:304	Add precision to animation. (Model I/III)
Sound OFF!	Thiel	11/82:422	See Education.
Spanning of Mod II Disks	Keen/Dischert	1/82:110	Link files with multi-disk Model IIs.
Stewise Refinement	Boasso	6/82:232	Exercise using psuedo-code.
STRINGS's the Thing, The	Knight	6/82:298	Use STRING\$ to pack strings. (Model I/III)
Subchaser!	Steiner	3/82:106	See Games.
Super Banner	Balewski	5/82:282	See Graphics.
To Baffle a Pirate	Hawksins	11/82:404	See Utilities.
To Err Is... Okay	Adcock	3/82:230	Use On Error GOTO to work out of programming problems.
Total Recall	Bender	4/82:332	Get direct access to anything in memory with Fortran. (Model I)
Using Print Using	Rende	1/82:290	Tips on using the Print Using command.
Worm Pills for Basic	Keen/Dischert	4/82:290	Find the most efficient way to use Basic keywords.

SCIENCE/MATH

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
Algebraic Archery	Duffin	11/82:426		Polynomial factoring on your TRS-80. (Model I/III)
Analysis of Variance	Gille	11/82:392		Use this statistical method from IBM on your TRS-80. (Model I)
Astrodynamics for Beginners	Fowler	11/82:205		Explore the laws of gravitation. (CC)
Bemusing Triangle, The	Honess	2/82:210		Use the TRS-80 to implement the trapezoidal rule. (Model I/III)
Colorful Titrations	Wood	2/82:202		Isolate specific elements in chemical solutions. (CC)
DIGRAPH Digressions	Gorney	6/82:192		Use a directed graph to learn graph theory. (Model I/III)
Extra-terrestrial	Wells	2/82:112		See Education.
Find a Number's Roots	Cecil	11/82:440		Five programs to give high-precision answers to roots of numbers. (Model I)
Heat Stress Index	Heckenlively, et al	11/82:148		Determine if the heat generated at work is harmful to you. (Model I/III)
Learning the Elements	Wood	2/82:116		See Education.
Micros in Medicine	Vose	11/82:74		How micros are used in the medical profession.
Micros in the Lab	Hager	11/82:174		How micros are used in lab research.
Model III Biorhythms	Anderson	5/82:280		See Home/Hobby.
Nike Sport Research Lab	Larsen	11/82:188		How Nike uses computers in shoe design.
Propagation Prediction	Chipman	6/82:272		Predict high-frequency wave propagation. (Model I)
Relativity and the TRS-80	Levin	11/82:222		See how the theory of relativity works via your computer. (Model I/III)
Sieve of Eratosthenes	Cecil	11/82:306		Find prime numbers. (Model I/III)
TRS-80 Laboratory	Keller	11/82:197		How a hospital uses TRS-80s in the lab and day-to-day chores.

Two-way ANOVA	McGarvey	3/82:234		Get two-way analysis of variance. (Model I)
You Light Up My Life	Wood	3/82:330		See Education.
TUTORIALS				
<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
Another Sort of Sort	Townsend	12/82:276		Position and chain sorts.
APL Primer, Pt. I	Grothman	12/82:376		How APL works.
BBS Primer	Wright	6/82:284		What you need to hook onto a bulletin board.
Bit Smitten, Pt. II	Chidsey	9/82:268		Formerly "For the Novice;" heat build-up, turn-on and turn-off shock, and more discussed.
Bit Smitten, Pt. III	Chidsey	10/82:96		What a baud is, screen-dump routines, and more.
Bit Smitten, Pt. IV	Chidsey	11/82:92		Learn how to use the Basic Read...Data function. (Model I/III)
Bit Smitten, Pt. V	Chidsey	12/82:101		Gain access to string data. (Model I/III)
Boolean Logic Operators	Crew	12/82:366		How they work in Basic and Fortran.
Breaker 19	Busch	6/82:96		How to use CompuServe's CB simulator.
Color Computer Pointers	Gilliland	11/82:288		Combine programs and save memory. (CC)
Damping Cassette Output	Sinclair	5/82:324		What to do when CLOAD problems are really CSAVE problems.
Data Communications— TRS-80 Style	Derfler	6/82:82		How to set up your TRS-80 as a data-communications terminal.
Do-it-yourself DB, Pt. I	Townsend	6/82:176		See Programming Techniques.
Do-it-yourself DB, Pt. II	Townsend	9/82:242		See Part I, Programming Techniques.
Evolution of the Language	Waltjen	11/82:359		How a language works with the hardware. (Model I)
Extended Color Basic	Miller	6/82:266		A look at Extended Color Basic. (CC)
For the Novice, Pt. I	Chidsey	6/82:148		What MEM SIZE?, high and low memory, high and low-level languages are all about. (See Bit Smitten for subsequent parts.)
Graftrax 80	McNamee	9/82:190		Use bit graphics on the MX-80. (Model I/III)
Inside Scripsit, Pt. I	Lindley	9/82:222		Learn how Scripsit works before you modify it. (Model I/III)
Inside Scripsit, Pt. II	Lindley	10/82:276		See Part I.
Inside Scripsit, Pt. III	Lindley	12/82:130		See Part I.
Learn a Little Pascal, Pt. II	Grothman	1/82:80		Program using RS Tiny Pascal.
Make Butterflies—Not Bugs	Commander	4/82:152		Tips on using utilities.
Master Muses, The	Heath	8/82:186		Author of Master Reversi talks about computer Othello.
Mod III Notes	Ratzlaff	2/82:200		Model II monitors and cassette I/O.
Model I, Meet Model III	Barlow/Brydges	1/82:316		Convert programs from Model I to Model III.
Model II Primer	Baker	5/82:260		Tips for the new Model II owner.
NEWDOS80 Files	Resnick	12/82:344		How some NEWDOS files work.
Open Cartridge Surgery	Grout	12/82:343		Replace printer ribbon cartridge ribbons.
Ordered Chaos	Webb	1/82:310		See Programming Techniques.
Plant a Binary Tree	Knecht	11/82:242		Use a one-key binary tree in your random disk files. (Model III)
Practical Regression Analysis	Hinrichs	11/82:96		Use this method to get the most from your data. (Model I/III)
Printing Perfection	Phillip	9/82:126		Control print density and size options of the MX-80 while in Scripsit.
Radio Shack Repairs	Kepner	10/82:101		What Radio Shack charges to repair specific things.
Scripsit Makes It Easy	Bennett	11/82:456		Merge a mailing list with a standardized letter. (Model I)
Stewise Refinement	Boasso	6/82:232		See Programming Techniques.
Technological Destiny, Pt. I	Dillio	4/82:264		What a job in data processing requires.
Technological Destiny, Pt. II	Dillio	5/82:228		See Part I.
Technological Destiny, Pt. III	Dillio	6/82:186		See Part I.
Technological Destiny, Pt. IV	Dillio	9/82:260		See Part I.

Technological Destiny, Pt. V	Dillio	10/82:246		See Part I.
Things Still Crawl in the LII ROM	Marshall	11/82:444		Why System loads crash. (Model I)
TRS-80 Tongues	Nicholas/Martel	12/82:216		Intro to Basic, Fortran, Cobol, Pascal, APL, and Forth.
Using Print Using Utilities Buyer's Guide	Rende staff	1/82:290 4/82:135		See Programming Techniques. Stats on various utilities for the TRS-80. (Model I/II/III, CC)
Welcome to Cobol	Keen/Dischert	1/82:92		Introductory look at Cobol.
Worm Pills for Basic	Keen/Dischert	4/82:290		See Programming Techniques.
Z80 Bit Tables	Robinson	3/82:260		Op-code secrets revealed. (Model I)

UTILITIES

<i>Title</i>	<i>Author</i>	<i>Issue/Page</i>	<i>Debug</i>	<i>Annotation</i>
16, 10, 2, or 8—Which Base Do We Appreciate	Sarnow	6/82:334		Decimal to octal to hex conversion. (Model I/III)
Add CRC ASAP	Baker	1/82:204		Perform cyclical redundancy code checks for tape- based systems. (Model I)
Another Major Operation on Scripsit	Graves	1/82:230		Add serial printer capabilities to Scripsit. (Model I)
Array I/O	Neff	1/82:200	5/82:26	Machine-language routine for fast Basic data transfer. (Model I)
As the Screen Scrolls	Keller	2/82:264	6/82:26	Protect some of your screen from scrolling. (Model I)
Autokey	Rigg	12/82:280		Modify Uni-key for the Model III.
Back to the Drawing Board	Rappaport	3/82:120		Design graphic displays on the screen and let the com- puter produce the code for it. (Model I)
BAM!	Byrkit	4/82:167		Change one-letter commands in your monitor pro- gram to a full word. (Model I)
Base 2 Screenprinter	Kent	3/82:214		Get screen dumps on the Base 2 printer. (Model I)
Basic Communication	McGarvey	6/82:324		Terminal program in Basic. (Model I)
Basic Compiler in Basic	Bertsekas	10/82:122		(Model I)
Basic Translator	Miller	6/82:194		Translate different Basic dialects for communication with other computers.
Basic Word Processing	Cutrona	9/82:140		Basic word processor. (CC)
Can You Get Me a Date?	Phillipp	2/82:220		Routine to let you enter a date in any format you like. (Model I)
Certify Your Cassettes	Bigelow	12/82:266		Eliminate bad saves. (Model I)
Checksum	Batie	11/82:410		Aid debugging by producing checksums for main listing. (Model I/III)
Clean Up Your TRON/TROFF	Rohde	11/82:406		A trace table to avoid a cluttered screen. (Model I)
Color Assembler	Heusinkveld	11/82:213		Assembler for the Color Computer.
Color Diskdump	Knecht	12/82:354		Examine those files. (CC)
Colormon	Cook	3/82:212		Monitor program. (CC)
Command Interpreter	Alford	4/82:244		Directly access machine-language routines. (Model I)
CP80	Cameron	4/82:306		IBM-like monitor program. (Model I)
Curse You, Cursor!	Frese	11/82:182		Control your Model II's cursor.
Datagen	Heusinkveld	6/82:346		Convert machine code to Basic statements. (CC)
Direct Access	Fink	4/82:214		Access Disk I/O routines from Basic using string variables as input buffers. (Model I)
Diskmap	Harrell	12/82:236		Eliminate disk file placement worries. (Model I)
Does Format Get Your Backup?	Hart	1/82:217		Use glitched disks. (Model I)
Easy Picture Editor	Ginger	12/82:388		Simple commands for art or games graphics. (CC)
Error Code Expanded	Alford	2/82:260		Get full error messages. (Model I)
Expand It—Burn It In	Alexander	6/82:344		Test program for memory upgrade. (Model III)
Fill in the Blanks	Schuldenfrei	1/82:224		Pack records before sending them to tape. (Model I/III)
Forms Cleanup	Barbarelo	12/82:125		Printer driver. (Model II)
Graphics for Profile	Wood	3/82:284		Get graphics with Model II Profile.
Half Duplexer	McGarvey	5/82:172		Get screen echo for typed communications. (Model I)
Hoodwinking TRSDOS	Anderson	6/82:296		CP/M printer driver for Model II TRSDOS.

Horizontal Scrolling	Foley	6/82:318		Scroll back and forth and up and down. (Model I)
I Have a Secret	Demberger	10/82:296		Data encryption-decryption program. (Model I/III)
JKL Minus Blanks	Straw	9/82:290		Modify the NEWDOS + JKL so it doesn't print blank lines. (Model I)
Liberated CPU	Shield	12/82:228		Spooler. (Model I)
Loc-Editor	O'Connor	4/82:206		A spelling checker for program listings. (Model I)
Looking-for-Z\$ Blues	Hieber	12/82:194		Search function. (Model I)
Lost and Found	Athanasiou	6/82:288		Disk-directory program. (Model III)
Lost in Basic	Paxton	1/82:304	5/82:26	Find variables in Basic programs. (Model I)
Lots of Little Letters to Litter Your Listings	Olsen	2/82:262		Convert upper to lowercase. (Model I)
LP VII Patch for the CC	Degler	10/82:304		Eight-bit printer driver. (CC)
Matter of Compatibility	Huston	12/82:146		Make your program compatible with more systems. (Model I/III)
Memory Size?	Jackson	4/82:226		Store machine-language routines as string variables in Basic programs. (Model I)
Micro Melodies	Gibbs	5/82:234		Music-generation program. (Model I)
Model II Disassembler	Faber	4/82:182		A disassembler for the Model II.
Model II Terminal Driver	Korenthal	4/82:176		Terminal driver for use with Lifeboat's CP/M. (Model II)
Model III Master Director	Muehlig	4/82:250		A master-directory program in 32K. (Model III)
Neatlist	Ewart	1/82:196		Produce neat program listings. (Model I)
One-drive Bulletin Board	Hodgson	3/82:314		Set up a CBBS with one disk drive. (Model I)
Paper Graphics	Rosenberg	3/82:270		Get graphics printouts on an LP IV. (Model I)
Play a Trick on Profile	Scott	6/82:306		Directly access profile files. (Model I)
Prinput	Mills	11/82:386		Get enhanced printouts from a limited system. (Model I)
Print That Index	Everett	6/82:184		Print out an address file. (Model I/III)
Print Whiz	Parker	2/82:250		Routine to use Electric Pencil and the RS LP IV to their full extent. (Model I)
Program Begat, Son of Program Begat	Christensen/Sater	6/82:320		Self-reproducing program. (Model I)
Quicksort	Brumm	11/82:414		Quick-sorting algorithm. (Model I)
Rapid System Loader	Hedinger	4/82:188		Software tape-load speedup. (Model I)
Reading, Writing, and AL	Morgan	3/82:318		Routines for disk I/O. (Model I/III)
Recover	Gobel	9/82:256		Recover from unwanted exits from Scripsit. (Model I)
Relocated ULCBAS	Pincus	11/82:420		Protect high memory. (Model I)
Screen Veil	Keller	9/82:286		Temporarily hide your screen's contents. (Model I/III)
Screenplay	Merkey	9/82:204		Print out anything in memory. (Model I)
Scroll Your Listings	Paxton	12/82:370		Scroll listings. (Model I)
Search Them Strings	Gunter	12/82:262		String-search utility. (Model I)
Secrets	Mills	3/82:216		Hide sensitive data and protect your software. (Model I)
Show the Score	Battista	11/82:272		Put numbers on the screen while in the graphics mode. (CC)
Snapshot	Rice	2/82:272		See how the values of your variables change during program execution. (Model I)
Systemized Basic	Browne	4/82:234		Save Basic programs in System format. (Model I)
Tab Extender	Hedinger	2/82:248		Put 127 more spaces on your tab limit. (Model I)
Tape Spate	Bowman	1/82:240		Shorten time for cassette data saves and recoveries. (Model I)
TDRELO	Kornfeld	11/82:424		Send Tape-Disk to high memory. (Model I)
Test Patterns	Kilmon	11/82:304		Adjust color and centering with this program. (CC)
To Baffle a Pirate	Hawkins	11/82:404		Make your programs difficult to copy. (Model I/III)
Trick Your ROM	Boothe	11/82:190		Use CHR\$(0) for speedy bit graphics on your printer. (Model I)
TRSDOS 2.0 Fix	Mornini	3/82:332		Keep from exiting to DOS. (Model II)
Two Transfers Please	Hollins	2/82:188		Put Eliza and Micromusic on disk. (Model I)
Using Test1A	Moultrie	4/82:240		Use TRSDOS's memory test with other DOSes. (Model I)
Varispeed	Evans	3/82:336		Control the speed of your Basic interpreter. (Model I)
Zubroutines	Ashley	4/82:209		Fifty short subroutines to aid your programming. (Model I)

1982 Review Index

Books

Product

101 Color Computer Programs
 55 Color Computer Programs
 6809 Assembly-Language Programming
 8080/Z80 Assembly-Language Techniques
 Basic 2nd Edition
 Basic Adventures
 Basic Conversions Handbook
 Basic Faster and Better
 Basic for Home Computers
 Basic Handbook, The
 Bibliography of Computer Music
 Computer Programming Basic Self Instruction
 CP/M Primer
 Custom TRS-80 & Other Mysteries
 Data File Programming/Basic
 Don't
 Elementary Basic/Pascal
 Fast Basic
 Graphic Software/Micros
 How to Make Money
 Intro/8080/8085 Assembly Language Programming
 Learning TRS-80 Basic I-16
 Learning with Computers
 Microcomputer Data Base Manager
 Microcomputer Math
 Microsoft Basic Decoded
 Murder in the Mansion
 Pascal
 Pascal Handbook
 Pascal Primer
 Robot Intelligence/Experiments
 RS Model III Service Manual
 Starting Forth
 TRS-80 Assembly Language Subroutines
 TRS-80 Graphics
 TRS-80 Means Business
 Using CP/M
 Videotext, Coming Revolution

Manufacturer

Arcsoft Publishers
 Arcsoft Publishers
 Osborne/McGraw Hill
 John Wiley & Sons
 John Wiley & Sons
 80-NW Publishing
 Hayden Books
 IJG Inc.
 John Wiley & Sons
 Compusoft Publishing
 University of Iowa Press
 Cambridge Learning Enterprises
 Howard W. Sams & Co. Inc.
 IJG Inc.
 John Wiley & Sons
 Sybex
 Random House
 John Wiley Books
 Kern Publications
 Dilithium Press
 John Wiley & Sons
 Compusoft Publishing
 Digital Press
 Howard W. Sams & Co.
 Micro Applications Publishers
 IJG
 Arcsoft Publishers
 TAB Books
 Sybex
 Howard W. Sams & Co. Inc.
 TAB Books
 Tandy/Radio Shack
 Prentice-Hall
 Prentice-Hall
 Tandy/Radio Shack
 John Wiley & Sons
 John Wiley & Sons
 Knowledge Industry Publications

Issue/Page

9/82:64
 3/82:62
 2/82:310
 2/82:310
 8/82:37
 9/82:66
 5/82:37
 2/82:310
 2/82:312
 5/82:36
 4/82:63
 4/82:65
 10/82:66
 2/82:310
 9/82:72
 12/82:44
 11/82:62
 5/82:37
 10/82:32
 2/82:310
 11/82:40
 2/82:310
 10/82:45
 3/82:64
 1/82:38
 2/82:326
 1/82:27
 1/82:42
 1/82:40
 6/82:51
 3/82:65
 10/82:80
 10/82:41
 3/82:63
 10/82:32
 2/82:310
 1/82:36

Hardware

Product

AD-III Audio Amplifier
 AJ 841 I/O Terminal
 AN-551 Eprom Programmer
 Base2 850
 C. Itoh Daisy Wheel Printer
 C. Itoh 8510 Printer
 Centronics 737
 Cheaptalk
 Color Computer Disk System
 Color Computer Disk System
 CPrint Parallel Printer Interface
 Disk 80
 Drive Control Unit
 EPS-80 Word Processor
 Epson MX-80
 Escon Selectric Interface
 ETF-80 Electric Typing Fingers

Manufacturer

Thomas Engineering/TCS
 Anderson-Jacobson
 Design Solutions Inc.
 Base2
 C. Itoh Electronics
 C. Itoh Electronics
 Centronics
 Alan Saville
 Tandy/Radio Shack
 Tandy/Radio Shack
 Micro Labs Inc.
 Micromint Inc.
 Optronics Technology
 PMC Inc.
 Epson of America
 Escon Products Inc.
 PMC Inc.

Issue/Page

2/82:316
 4/82:56
 6/82:68
 4/82:278
 2/82:316
 5/82:184
 4/82:278
 5/82:54
 9/82:72
 6/82:48
 3/82:56
 3/82:62
 12/82:62
 9/82:78
 4/82:278
 6/82:47
 9/82:78

Floppy Disk Controller	A.M. Electronics	4/82:53
Gold Plug 80	E.A.P. Co.	5/82:50
Hayes Stack Smartmodem	Hayes Microcomputer Products	10/82:47
IDS 445 Paper Tiger	Integral Data Systems	4/82:278
IDS 460 Printer	Integral Data Systems	4/82:54
Line Printer VII	Tandy/Radio Shack	4/82:82
Line Printer VIII	Tandy/Radio Shack	4/82:70
LN Doubler 5/8	LNW Research Corp.	12/82:104
LNW-80	LNW Research Corp.	5/82:206
LSI Soft-View CRT	Langley-St. Clair Inst.	12/82:51
MDX-2	Micro-Design	4/82:58
MDX-3 Interface PC Board	Micro-Design	10/82:60
Memory Box, The	Displayed Video	5/82:224
Micro Cue Print Buffer	Microcompatible	3/82:58
Micro Mainframe Disk Controller	Micro Mainframe	11/82:58
Microline 80	Okidata	4/82:278
Microline 82A Printer	Okidata Corp.	5/82:56
Micromouth	Micromint	4/82:59
Modem 80	ICROM Enterprises Ltd.	6/82:45
Modem I	Tandy/Radio Shack	1/82:51
Novell Image 800 Printer	Novell	5/82:57
Patch 2.0	Cecdat Inc.	6/82:62
Percom Doubler II	Percom Data Corp.	12/82:104
Percom SFD-51-A	Percom Data Corp.	12/82:104
PI80C Parallel Printer Interface	The Micro Works	6/82:46
Plotter Printer	Tandy/Radio Shack	1/82:122
Plug 'N Power Controller	Tandy/Radio Shack	3/82:61
PMC SFD-51-A	Personal Microcomputers I	12/82:104
Power Pack ROM Package	Computerware	6/82:118
Printer/Cassette Interface/PC	Tandy/Radio Shack	4/82:60
QuCeS Hard Disk Subsystem	Quality Computer Services	10/82:154
Selectronic 841	Anderson-Jacobson	4/82:56
SK-2	Mumford Micro Systems	2/82:180
Snapp Spooler	Snapp Inc.	9/82:80
Sooperspooler	Compulink	9/82:66
Sprinter II	Holmes Engineering	11/82:56
Starbuck 8882	Starbuck Data Co.	8/82:42
Strobe 100 Drum Plotter	Strobe Inc.	9/82:58
Tandy 6-Pen Plotter	Tandy/Radio Shack	10/82:58
TP-1/Smith-Corona Printer	Smith-Corona	11/82:61
TRS-80 Color Disk System	Tandy/Radio Shack	6/82:48
TRZ-80		1/82:218
UPI-3, UPI-4 Serial Printer Interface	Speedway Electronics	2/82:314
Video 1	Archbold Electronics	5/82:54
Wolfbug 64K CC Upgrade	Atomic City Electronics	12/82:42

Software

<i>Product</i>	<i>Manufacturer</i>	<i>Issue/Page</i>
ACCEL2	Allen Gelder Software	5/82:218
Ace Automated Communications	Ace Computer Products	10/82:47
Aircraft Instrument Approach	J.C. Sprott	2/82:318
Alcatraz II	Spectral Associates	8/82:40
Alien Defense	Soft Sector Marketing	8/82:50
Ann Rose	Sturdivant and Dunn	5/82:42
Ants	Synergistic Solar Inc.	4/82:46
Arcade 80	Datasoft Inc.	2/82:320
Armored Patrol	Adventure International	8/82:36
ASPTCH 3.2	Byte Miser Software	2/82:322
Asylum	Med Systems Software	5/82:41
Attack Force	Alpha Products	1/82:51
Auto-Writer	Software Options	9/82:110
Autobasic	Schneider Enterprises	9/82:82
Basic Compiler (BASCOM)	Microsoft Consumer Products	5/82:218
Basicpro	Softworx Inc.	1/82:49

Bounceoids	Cornsoft Group Inc.	12/82:54
C. C. Writer	Transformation Technologies	3/82:50
Cassette Comm	Tandy/Radio Shack	1/82:44
Cave Hunter	Mark Data Products	9/82:76
CCForth	Frank Hogg Laboratory Inc.	11/82:45
Check Register Plus	Softco	6/82:338
Checkwriter 80	Tandy/Radio Shack	6/82:338
Chextext	Apparat	9/82:119
Chextext	Apparat	4/82:98
Chromasette Magazine	CLOAD Magazine	3/82:52
Codes II	Nelson Software	9/82:96
Color Assembler	Computerware	6/82:116
Color Berserk	Mark Data Products	9/82:76
Color Editor	Computerware	6/82:116
Color Pac Attack	Computerware	8/82:45
Color Scripsit	Tandy/Radio Shack	10/82:40
Color Space Invaders	Spectral Associates	3/82:48
Colorforth	Armadillo International	12/82:80
Colorterm	Martin Consulting	11/82:63
Commbat	Adventure International	1/82:43
Compiler Basic, I & III	Tandy/Radio Shack	2/82:164
Compiler Basic, II	Tandy/Radio Shack	2/82:148
Computer Downs	Ernest H. Fellows	2/82:327
Computer Major League	Avalon Hill	5/82:38
Conflict 2500	Avalon Hill	8/82:46
Copyart	Simutek Computer Products	9/82:108
Crush, Crumble, and Chomp	Epyx, Automated Simulations	2/82:324
Data Ace	Computer Software Design	10/82:266
Datahandler	Miller Microcomputer Services	6/82:150
Date-O-Base Calendar	Custom Software Engineering	12/82:61
DBase II	Ashton-Tate	6/82:53
Defense Command	Big Five Software	8/82:50
Direct File Transfer/DFT	Big Systems Software	6/82:66
Disk Doctor, The	Superior Graphic Software	12/82:54
DOSPLUS 3.4	Micro Systems Software	10/82:244
DOSPLUS 3.4	Micro Systems Software	12/82:104
Dragons of Hong Kong	Adventure International	8/82:52
Draw5	Wilson Software Division	1/82:42
DSMBLR	Misosys	9/82:85
Dynamic Report Generator	Dynamic Software	10/82:56
Dynasoft Pascal	Computerware	6/82:198
Edit	Southern Software	6/82:71
EDTASM + /C.C.	Tandy/Radio Shack	11/82:142
Electric Pencil 2.0	IJG Inc.	9/82:98
Electric Spreadsheet	Exatron	1/82:49
Electric Webster	Cornucopia Software	9/82:118
Eliminator	Adventure International	8/82:54
ENHBAS	Cornsoft Group	1/82:320
Faster 1.2	Prosoft	4/82:40
FED File Editor for LDOS	Galactic Software	12/82:53
Finance Loans & Investment	Computerware	11/82:58
Flextext/80	Apparat	9/82:100
GEAP	J.F. Consulting	10/82:184
Grammatik	Aspen Software	9/82:120
Graphics Editor/Programmer	J.F. Consulting	3/82:57
GRBasic 3.0	Med Systems Software	6/82:54
Hexspell	Hexagon Systems	4/82:98
Hexspell 2	Hexagon Systems	9/82:116
HORKS	Edu-Ware East	9/82:70
Hypergate Centurion/Patro	Synergistic Solar Inc.	12/82:60
ICL	XYZT Computer Dimensions	6/82:64
IDM/V	Micro Architect Inc.	6/82:150
Institute, The	Med Systems Software	9/82:64
INTASM 2.0	Singular Systems	9/82:68

KWICOS	Kwik Software	2/82:322
Labmaker	ETS Center	10/82:34
Laser Defense	Med Systems Software	8/82:39
Lazy Writer	Soft Sector Marketing	9/82:102
LCA-47 Lowercase Adapter	Micro Technical Products	12/82:56
LDOS 5.1	Logical Systems Inc.	9/82:252
LDOS 5.1	Logical Systems Software	12/82:104
Letter-Writer	Astro-Star Enterprises	9/82:112
Life List	Manhattan Software	5/82:46
LISP	Supersoft	12/82:46
Litigation Support System	Tandy/Radio Shack	6/82:50
Local Call for Death	Adventure International	8/82:52
LZ Patcher	Imaginuity Inc.	9/82:104
Maces & Magic	Adventure Int./Chameleon	8/82:38
Macro-Mon, The Shadow	Advanced Operating Systems	9/82:292
Mailmerge	Micropro	9/82:94
Master Control	Soft Sector Marketing	3/82:49
Master Reversi	Instant Software	11/82:66
Maxi Check Register Acct.	Exador/Adventure Intl.	6/82:338
Maxi Manager 3.1	Adventure International	6/82:150
Maxprint	Peggytronics	10/82:33
Meteoroids	Spectral Associates	3/82:48
Micro-Typit	Coolidge & Associates	9/82:114
Microcosm III	Basics & Beyond Inc.	1/82:48
Microproof	Cornucopia Software	9/82:116
Microproof	Cornucopia Software	4/82:98
Microstat	Ecosoft	6/82:280
Mind Thrust	Hayden Software	8/82:56
Miz' Spell	Programs Unlimited	4/82:98
Miz' Spell	Programs Unlimited	9/82:120
Mod II Game Package	Small Business Systems	5/82:52
Multidos	Cosmopolitan Electronics	12/82:104
muMATH/Extended	Microsoft	11/82:42
MZAL	Computer Applications Inc.	10/82:160
New Starship Battles	Synergistic Solar Inc.	4/82:46
NEWDOS80 Ver. 2.0	Apparat Inc.	2/82:152
NEWDOS80 Ver. 2.0	Apparat Inc.	12/82:10
NewScript	Prosoft	9/82:104
NewScript 6.0	Prosoft	3/82:53
NewScript 7.0	Prosoft	10/82:52
Newtalk	Star-Kits	10/82:38
Newtrieve	Unique Printing & Stationery	10/82:42
Odin	Odesta Publishing	11/82:66
Omniterm	Lindberg Systems	4/82:94
On Her Majesty's Ship Impetuous	Adventure International	8/82:52
Orchestra-85, 90	Software Affair	6/82:326
Packer 1.5	Cottage Software	6/82:60
Parsector 8	Synergistic Solar Inc.	4/82:46
Pascal-80	New Classics Software	12/82:210
Pencil Plus	Dan Robinson	9/82:96
Penetrator	Melbourne House Software	9/82:112
Pensawrite 1	Pensadyne Computer Services	9/82:74
Pensawrite 2	Pensadyne Computer Services	9/82:106
Personal Finance for C.C.	Tandy/Radio Shack	10/82:38
PL/I-80	Digital Research	6/82:122
Powerdraw	Powersoft	10/82:40
Profile II	Tandy/Radio Shack	4/82:48
Profile III Plus	Small Computer/Tandy	10/82:308
Profile Plus	Tandy/Radio Shack	4/82:48
Proofreader	Aspen Software	4/82:98
Proofreader/Proof-Edit	Aspen Software	9/82:118
QSD Utility Disk #1	Quality Software Distributors	4/82:41
Quest	Aardvark-80	12/82:48

Qwerty	Med Systems Software	10/82:34
Qwerty	Med Systems Software	9/82:102
Refware Thesaurus	David C. Whitney Associates	4/82:52
Robot Attack	Big 5 Software	8/82:39
RPM	Prosoft	4/82:40
Scarfman	The Cornsoft Group	3/82:53
Scriinput	ACR Consultants	4/82:44
Scriplus	Quality Software Distributors	9/82:101
Scripmod	MG Products	9/82:102
Scripsit	Tandy/Radio Shack	9/82:98
Scripsit Dictionary	Tandy/Radio Shack	9/82:120
Scripsit, Mod II	Tandy/Radio Shack	2/82:222
Scriptr	Pioneer Software	9/82:102
SDS80C Editor/Assem/Mon	The Micro Works	6/82:70
Sea Dragon	Adventure International	12/82:40
Search and Sort	Micro Pro Systems	8/82:56
SECS	Datasoft Inc.	3/82:52
SFinks 3.0	William Fink	9/82:80
Sigmon	Datasoft Inc.	3/82:52
Smart Terminal Program, STERM	Howe Software	6/82:60
Snapp III Extended Built-In Functions	Snappware	1/82:134
Snapp IV Auto Map	Snappware	1/82:134
Snapp V Extended File Map	Snappware	5/82:216
Softext/Softscreen	Aspen Software	9/82:106
Sole	Misosys	11/82:48
Space Ace 21	Synergistic Solar Inc.	4/82:46
Space War	Spectral Associates	3/82:48
Space Waste Race	Storybooks of the Future	5/82:42
Special Delivery	Software Concepts	9/82:110
Spectaculator	Tandy/Radio Shack	11/82:49
SpellGuard	Innovative Software Applications	9/82:95
Spell 'N Fix	Star-Kits	11/82:68
SpellStar	Micropro International	9/82:95
Star Blaster	Micro Works	8/82:44
Star Warrior	Automated Simulations	4/82:50
Starfighter	Adventure International	2/82:320
Statistical Analysis	Tandy/Radio Shack	6/82:280
Stud5	Wilson Software Division	1/82:42
Super Color Writer 1.0	Nelson Software	9/82:62
Super Micro Pro Football	Micro Pro Systems	6/82:54
Superscript	Acorn Software	9/82:101
Supersort	Micropro International	9/82:94
Tanktics	Avalon Hill	4/82:63
Tape Downloading System/TDS	Big Systems Software	6/82:66
TASMON	Alternate Source	1/82:126
Telewriter	Cognitec	5/82:208
Temple of Apshai	Automated Simulations	2/82:323
Tower of Orlandor	Compu-Things	8/82:46
Two Heads of the Coin	Adventure International	8/82:52
Uniterm	B.T. Enterprises	6/82:56
UOLISP	Far West Systems & Software	12/82:46
Utility Pack, The	B.T. Enterprises	4/82:42
VisiGraph	Micro Software Systems	10/82:54
Voyage of the Valkyrie	Advanced Operating Systems	5/82:44
Word IV/Word V	Micro Architect	9/82:110
Word Machine/The	GB Associates	9/82:112
Wordslinger/The	Instant Software	9/82:114
Wordsmith	ABS Suppliers	6/82:63
Wordsmith	ABS Suppliers	9/82:112
WordStar	Micropro International	9/82:92
XBug	Computer Applications Unlimited	3/82:54
XTEND40	Prosoft	4/82:40
ZBasic 2.0	Simutek Computer Products	5/82:48

1982 Load 80 Index

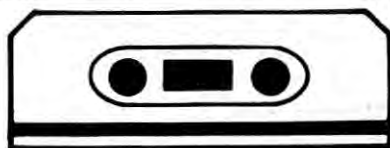
Month	Year	Program Name	Page Number
January	1982	PALLETS	98
		SURVEY	102
		RULE300	116
		MODEL T	140
		ALPHGRPH	190
		NEATLIST	196
		SCRIPGRAFT	230
		TAPESPTE	240
		MARS	265
		VARMAP	304
February	1982	GSETTR	70
		PUNCTUAT	82
		TESTMAKR	104
		PLANETS	112
		CAPCHEM	116
		BOGGLE	166
		GETTEAM	196
		KINGSCAT	232
		SALECAST	268
		SNAPSHOT	272
March	1982	THREEDDEE	138
		PRMSRCH	152
		HUMANS	154
		GRADES	184
		SCRNPRNT	214
		CENSOR	216
		OTHLLO80	252
		RGRAPHIC	294
		BLTNBRD	314
		(pub. in Dec. 1981) FLPYFIXR	326
April	1982	BASICK	86
		BAM	167
		RSL	188
		ZUBRTNES	208
		DISKRD3	214
		COMMAND	244
		MASDIR3	250
		SHOPPING	270
		RULER	302
		CP80	306
May	1982	MUSIC	142
		NAMESONG	234
		EXPENSE	238
		RACES	252
		HANDICAP	264
		BANNER	282
		SPCCHASE	292
		GABBY	322
		MONEYDOS	382

Month	Year	Program Name	Page Number
June/July	1982	SMPLZAP1	232
		SMPLZAP2	232
		SURVEY	248
		QUESTION	248
		LOADFILE	248
		PPREDICT	272
		DIRECTRY	288
		AIRTRAVL	300
		LEARN A	326
		MERLIN	330
August	1982	PROJCAL	348
		HFLYNN46	66
		SPY	80
		SPYFIELD	80
		CUBE80	106
		SLALOM	112
		KALAH/SRC	132
		LUCKY13	156
		ROUNDEND	156
		STAR	156
September	1982	DBLTRI	156
		SUBCHOP2	216
		SLOTMACH	222
		CRAM	234
		ACROSTIC	240
		KUNGFU	248
		MEMALPHA	254
		TERMITES	274
		PITTYPAT	270
		THRUASTR	280
(pub. in Aug. 1982)	1982	LOCO	286
		RAMMER	296
		CARDON12	302
		MOBYDICK	139
		COLORART	168
		TRAINART	168
		CHARTART	168
		BTFLYART	168
		CSTLEART	168
		SNPYART	168
October	1982	SCRNPLAY	204
		ORDRFORM	270
		SIM	276
		VEIL/SRC	286
		HOTDOG	330
		MTRMOUTH	330
		PACHINKO	330
		FUNHOUSE	330
		HAMMING	342
		MDOS1	364
(pub. in Aug. 1982)	1982	MDOS2	364
		SQUARE1	358
		SQUARE2	358
		SQUARE3	358
		SQUARE4	358
		QUIKCALC	114
		BASICOMP	122
		AUTOTRK2	203
		MUSIC1	228
		MUSIC2	228
October	1982	SCRPTCH1/SRC	276
		SCRPTCH2/SRC	276
		CRYPTO	296
		INVENTORY	342

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Month	Year	Program Name	Page Number
November	1982	MEDHIST	90
		REGRESS	96
		HEATSTRS	148
		EINSTEIN	222
		DRAWPOKR	246
		BABYCASS	282
		KWIKMAZE	318
		PIXLPRNT	364
		GENEOLOGY	398
		ANCESTRY	398
		FAMILY	398
		TRON/SRC	406
		QUIKSORT/SRC	414
		BKINVTRY	436
		KTAABA	450
		December	1982	VOICE/BAS	72
MAKEGFTX/BAS	118		
READGFTX/BAS	118		
SPOOLER/SRC	130		
DSPOOLER/SRC	130		
UNIPOKE/BAS	146		
LVL2SRCH/SRC	194		
DISKMAP/SRC	236		
SEARCH/SRC	262		
SEARCH1/BAS	262		
AUTOKEY/SRC	280		
AUTOKEY/BAS	280		
POKEGPHS/BAS	296		
MAZE19/BAS	341		
SCROLL/SRC	370		

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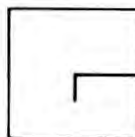
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