80micro 5/83 #40

Buyer's Guides to Graphics and Printers

May 1983
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80micro

A WAYNE GREEN PUBLICATION

the magazine for TRS-80 users*

The Colorful 80

High-Resolution Graphics For Your Model I/III

Also Inside:

Pencil-Plus 2.0
A CoCo Light Pen
Dvorak Meets Scripsit
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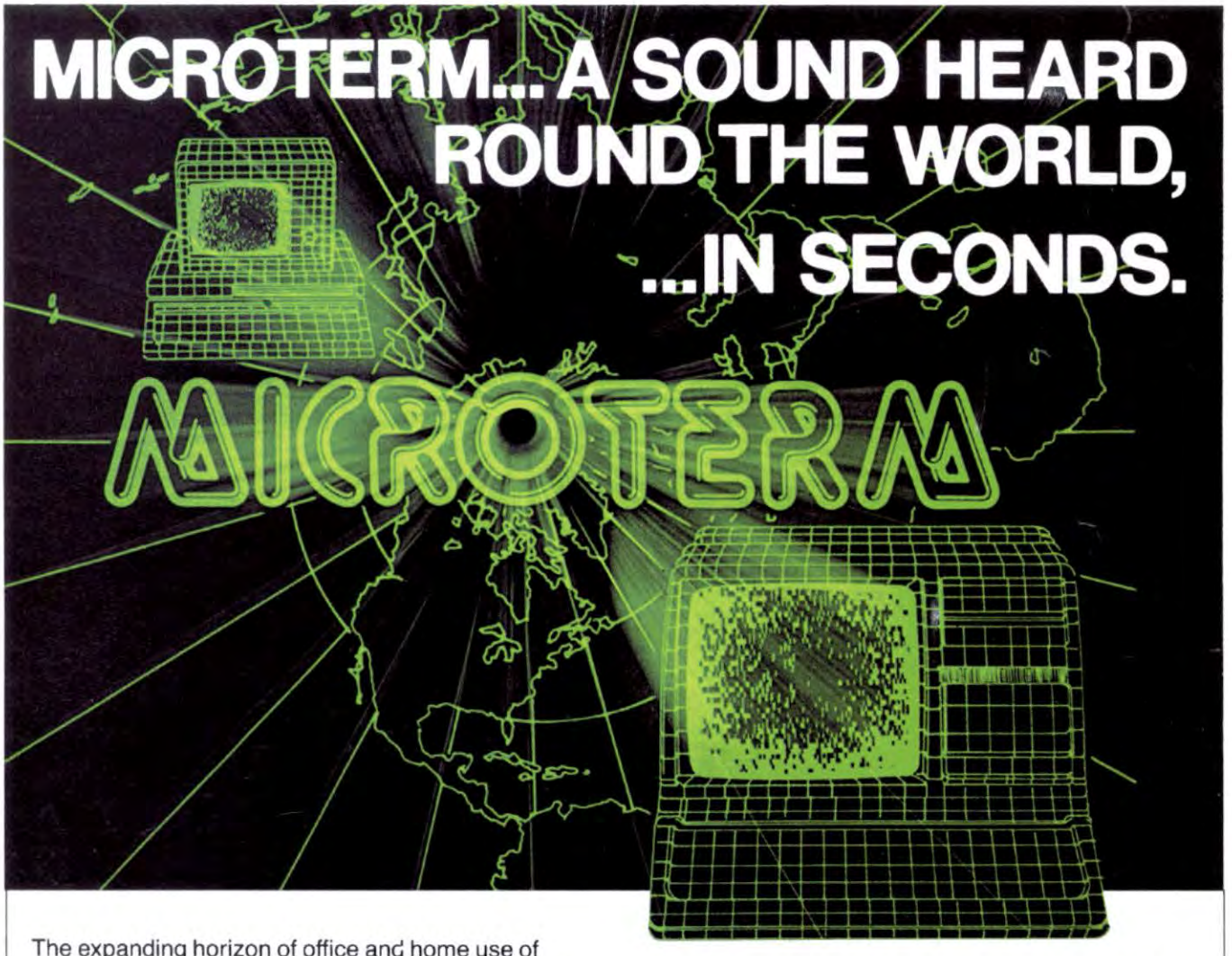

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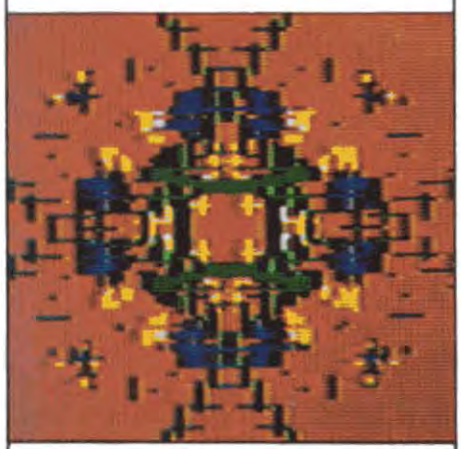

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MAY 1983
ISSUE #40

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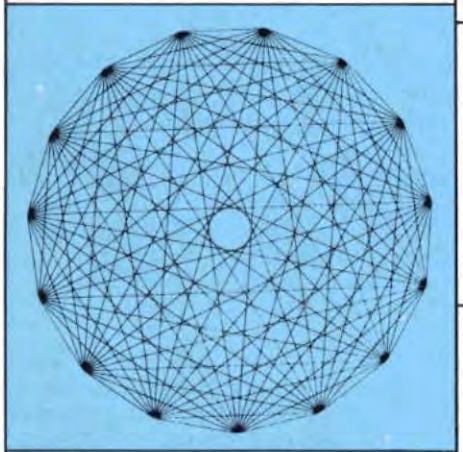

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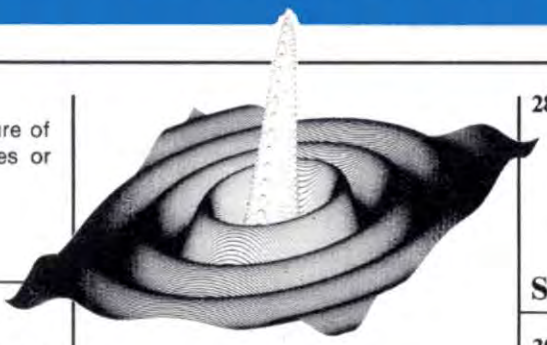

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Sherry Smythe-Green
ASSISTANT TO PRESIDENT
Matt Smith
GENERAL MANAGER
Debra Wetherbee
ASSISTANT PUBLISHER
Jeff DeTray
CORPORATE COMPTROLLER
Roger Murphy
ASSISTANT TO COMPTROLLER
Dominique Smith
CIRCULATION MANAGER
603-924-9471
Patricia Ferrante
BULK & NEWSSTAND SALES MANAGER
Ginnie Boudreau
ADVERTISING, 603-924-7138
Advertising Manager: David Schissler
Sales: Penny Brooks, Mary Hartwell
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New England
Advertising Representatives:
John A. Garland, Frank Surace,
Garland Associates, Inc., Box 314 SHS,
Duxbury, MA 02332 617-934-6464

PRODUCTION
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Frances Benton, Michael Ford,
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Kimberly Nadeau, Lynn Parsons,
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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.

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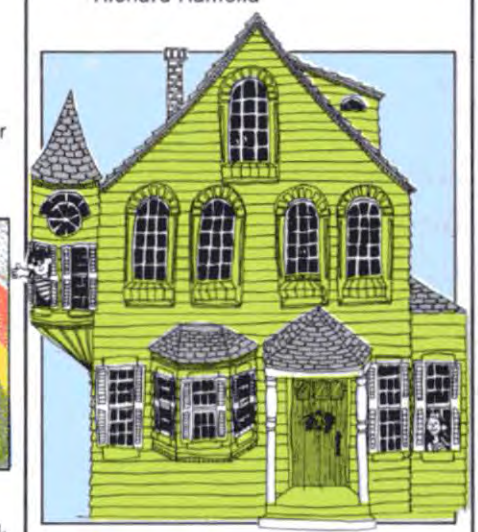

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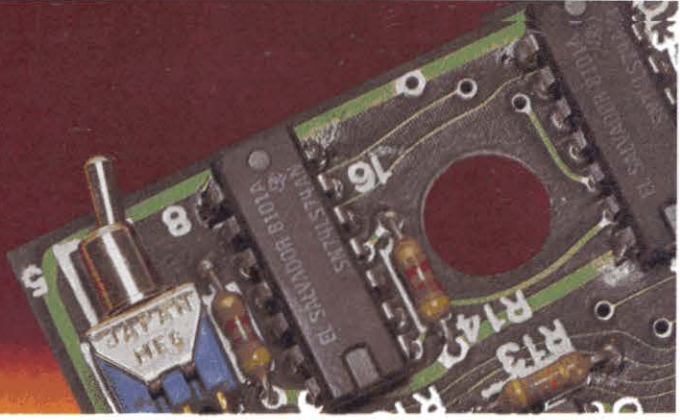

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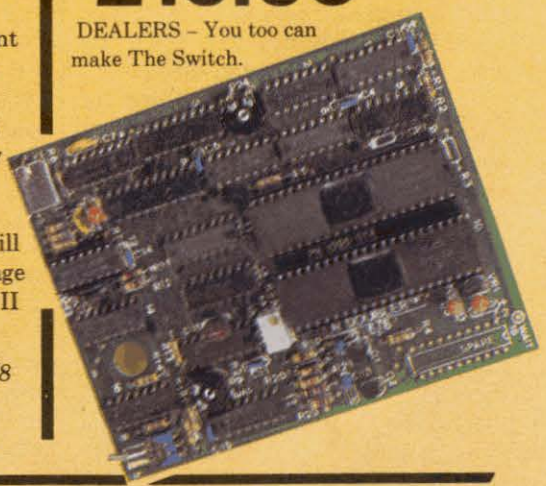

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REMARKS

by Wayne Green

Time for a Radio Shack comeback

Recent articles in *Time* and other general interest magazines have made it clear that Radio Shack's share of the market has been dwindling. *Time* says they've fallen from a 13 percent to a 10 percent share. This would indicate that it is time for some serious reevaluation of the market and marketing by Radio Shack.

In the past, the Consumer Electronic Shows (CES) have had a few low-end computer systems, but nothing really exciting. This January, the Winter CES in Las Vegas was mainly a computer show. Microcomputers were the big news, while everything else kind of went downhill.

The battle in the under $200 range is getting fierce. Texas Instruments came in with both a $100 model and a $200 model, as did Sanyo. Timex countered with a new $150 model and dropped their $100 TS-1000 with a $15 customer rebate, putting the system in the $54 to $64 range, depending on discount.

Panasonic was there with their JR-200, though it was priced at $300 instead of the expected $200. Jupiter came in with a ZX-81-like system. Commodore was there pushing their VIC and a new hand-held unit.

But Radio Shack, despite recently opening the CoCo to wider distribution, was not present.

The early Radio Shack edge lay in their 10,000-store chain. But with Timex selling through 14,000 outlets, and Commodore getting up there too, Radio Shack needs to do some fast thinking if they're going to stop their slide.

The fact is that it is past time for Radio Shack to reduce the chip count on their CoCo so they can get the price down below $200 and be competitive. It's time for them to do a major update on the Model III. After all, the III is merely a slightly cleaned up Model I, built into one cabinet. When Sinclair got the chip count for the ZX-81 down to six, a new era in microcomputers dawned.

By getting further and further behind in technology, and by refusing to cooperate with supporting firms, Radio Shack has gotten way behind in sales.

The action on the low end at CES was indicative of the market. This *is* where the market is going to grow the most during the next year...and not all for home use, either. Schools are going to be buying heavily. And, unless I miss my guess, we'll see some fast action for business develop in the second half of the year, once businessmen realize what's out there for them. More on that shortly.

Radio Shack doesn't talk to me these days, so I don't know how much effort they are going to put into getting the CoCo down in price. I've heard some strong rumors that they are about to update the Model III.

As soon as some networking programs are written to allow low-end computers to act as remote terminals and accessory computers with a larger host system, the market for business uses is going to open up with a vengeance. Whether businesses are going to use TI, Sanyo, Commodore, V-Tech, Jupiter, Timex, or Radio Shack low-end computers depends on how well each of these firms keeps up with the state of the art. This means getting the chip count down with specially designed chips. It means improving the character generator chips. It means putting networking into ROMs.

Radio Shack has been moving more and more of its manufacturing to Asia. They will probably have to have all of the low-end equipment made there if they're going to stay competitive. The Asian plants I've visited have a combination of the latest in high-speed automatic assembly lines combined with relatively low-wage workers...an unbeatable combination. They need American chip technology, Japanese circuit design, and Korean manufacturing if they are going to keep ahead.

They also, as I have been a pest about, need to start cooperating with supporting small firms so they'll have the software and accessories that are needed and that, for all the size of Tandy, are more than they can manage by themselves.

The *Time* Study

A recently released *Time* study of their readers showed that of those who have owned a computer for more than a year, 23.3 percent own Apples, 22.4 percent own TRS-80s, and 2.6 percent own Ataris. Of those who have owned a computer for less than a year, the percentages are quite different, with 21.8 percent Apple, 14.9 percent TRS-80, and 13.8 percent Atari. This would indicate a severe loss on the part of Radio Shack, a slight loss by Apple, and an enormous gain by Atari. Other large gainers were IBM, going from 3.4 percent to 8.0 percent, Sinclair, going from 2.6 percent to 9.2 percent, and Commodore, going from about zero to 6.9 percent.

On the low end, Radio Shack is still leading with 24.6 percent, to 19.3 percent by Sinclair and 7.0 percent by Commodore. Considering that the general Radio Shack store is mostly a toy store, this makes sense. Until some major changes are made in the approach to computer sales by most Radio Shack stores, I expect that businessmen will be put off by the adjacent counters of toys

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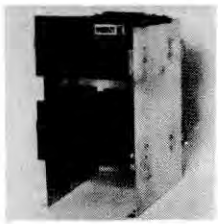

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and gadgets.

We see this in particular when we look at the over-$1,000 computer sales and see Apple with 34.6 percent, Radio Shack with 16.2 percent, Atari 8.5 percent, Heath 6.2 percent, and IBM with 5.4 percent. The new Lisa and Apple IIe could hit Radio Shack hard in this department, as will increased enthusiasm over the IBM...plus some possible pressure from DEC, Wang, and so on.

To get more competitive on the higher-end systems, I suggest that Radio Shack makes sure that from now on every piece of equipment they put out be upward-compatible with current models. Then I'd suggest testing a more formal computer selling-area in some of their stores and see if that overcomes the reluctance of businessmen to buy computers from what looks like a toy store.

Third, I would suggest a series of video training programs to help their salesmen cope with computers. They might even want to try some video programs to supplant the salesmen and do the actual demonstrations for them... showing a data base in operation, spread sheets being used, accounting in action...and so on...aimed at the customer.

On the low end, where the toy store motif doesn't hurt, it's a matter of getting the chip count down, improving the system, cutting manufacturing costs, and cooperating to the fullest with supporting firms providing accessories, software and instruction on the use of the computers. It might be worthwhile to try a TRS-80 Color Computer show somewhere, complete with all supporters of the system invited to come and show their products. I think that could fly. ■

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The trouble with bigness

We like being thick. It means that we can publish more articles and columns. But bigness has its problems, as we and our readers are finding out.

For starters, we can't seem to find a wrapper that'll hold the thing together in the mail. The wrapping just bursts like a milkweed pod. With no wrapping, the magazine has no address label, and it never reaches its destination.

We've tried gluing the wrapper to the back of the magazine. Unfortunately, glues strong enough to hold the wrapper on also tear the cover apart when the subscriber tries to take it off.

Our other option is shrink-wrapping. There's no question that this method would work, but it's expensive. We'd have to pass the costs on to you, which we'd rather not do.

Many of you have complained about receiving damaged copies. We understand—you want to save your *80 Micros*, and don't appreciate torn or missing covers. Be assured that we're working on the problem.

Speaking of size, we've had some complaints that the many ads in the magazine are crowding out the editorial material. Au contraire—the more ads we have, the more editorial pages we have. Our policy is to run at a ratio of about 50-50. In other words, 20 more ad pages means 20 more editorial pages.

Of course, all those pages can make it hard to find material quickly and easily. We've tried numerous ways to alleviate this problem in the table of contents: more subheads, color-coding the Color Computer articles, cross-indexing the Model II articles. In addition, our Anniversary Issue includes our most comprehensive index to date, and we're looking at ways to make it even more complete.

And then there is the vast quantity of editorial matter that must be processed each month. We operate under the voodoo theory (or V theory) of publishing: We gather around a pile of manuscripts, say a few chants, and hope that a magazine materializes. It happens so fast that much of the material never touches the ground—it levitates through the editorial and production cycles. The result is that we don't run many of the programs through their paces as well as we should.

But this, too, is changing. We've increased the size of our technical staff, and have made quality control our number 1 priority. We're determined that no program will be published before its time.

Largeness unquestionably breeds a host of problems. But we think you'll agree that the advantages far outweigh them. And with a little bit of effort, even those problems will soon disappear.

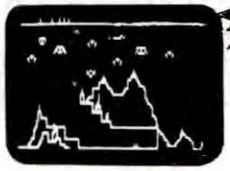
* * * * *

With sadness we announce that Jake Commander will no longer be serving *80 Micro* as technical consultant. Jake has been with *80* since the beginning and, as consultant and submissions editor, has been a major reason for *80*'s success. Jake will, however, be serving our sister publication *Microcomputing* in a similar capacity.

With Jake's departure, we've decided to create a submissions committee to handle incoming articles. This committee will comprise members of the editorial and technical departments. Future submissions should be addressed to the Managing Editor, *80 Micro*, 80 Pine St., Peterborough, NH 03458, and should be labeled as submissions. Queries should be sent to the same address. ■

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 of lightening 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

PANIK

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 sea-scrape and sound from Adventure International. Price: B

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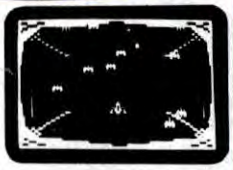
TOP TEN

1. SCARFMAN *All time favorite*
2. PANIK *Remarkable Voices*
3. PENETRATOR *Rave reviews*
4. ARMORED PATROL *Super 3D graphics*
5. CATERPILLAR *Good rendition*
6. CRAZY PAINTER *Unique game concept*
7. DEFENSE COMMAND *Tough struggle*
8. STELLAR ESCORT *Fast and Challenging*
9. ROBOT ATTACK *With voice*
10. SEA DRAGON *Amazing Seascape*

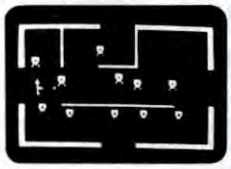
STELLAR ESCORT

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

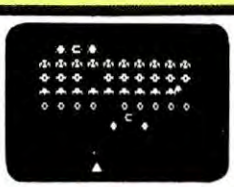
As a vast panoramic moonscape scrolls by, select one of many landing sights. The more perilous the spot, the more points scored — if you land safely. You control LEM main engines and side thrusters. One of the best uses of TRS-80 graphics we have ever seen. From Adventure International. With sound. Price: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

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

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



GALAXY INVASION

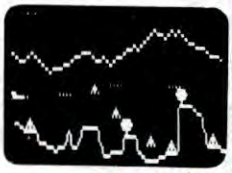
The sound of the klaxon is calling you! Invaders have been spotted warping toward Earth. You shift right and left as you fire your lasers. A few break formation and fly straight at you! You place your finger on the fire button knowing that this shot must connect! With sound effects! Price: A

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 humourous 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

DEFENSE COMMAND

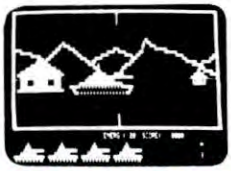
The invaders are back! Alone, you defend the all important nuclear fuel canisters from the repeated attacks of thieving aliens, repeatedly. An alien passes your guard, snatches a canister and flys straight off. Quick! You have one last chance to blast him from the sky! With sound and voice. Price: A

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

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



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INPUT

Interrupted Article

In reference to Douglas Fisher's article "Interrupt Your 80" (*80 Micro*, January 1983, p. 258), I should point out that it is possible to use at least one interrupt mode on the Level II 16K machine without making hardware changes.

Both mode zero and mode 1 interrupts do return to Basic. However, the mode 1 returns the program counter to 0038H, and at this location there is a JP 4012H. This latter address is in RAM, and a user routine can place a further jump to an interrupt subroutine here.

Program Listing 1 is a combined Basic/machine-language program that can be used as a real-time clock in the LII machine (keyboard only). It's possible to use mode zero in a similar manner, since the restarts are ultimately vectored into RAM.

The mode 1 interrupt can be implemented with only a simple self-powered interface and one additional chip: a 74LS74 flip-flop. The interrupt request pulse causes pin 6 to go low (active state). The CPU immediately responds with INTAK (active low), which clears the FF and makes it ready for the next interrupt signal.

The system can interrupt the CPU for any asynchronous type of task. The 10-HZ pulse can be obtained from a 60-HZ line frequency that has been conditioned and divided down, or from a crystal module available at many electronic supply houses.

William H. Emerson
115 Westgate Road
Wellesley, MA 02181

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. Address all letters to the appropriate column, 80 Pine St., Peterborough, NH 03458.—Eds.*

Who, Us?

If your flinty heart has an ounce of compassion remaining, you will publicly admit to overt sadistic tendencies. For two years, the impenetrable mysteries of the Model III have driven me to near dementia.

I subscribed to so many computer magazines that for months I had no time to go anywhere near my computer. I have attended classes, and joined both a computer society and a TRS-80 user's group. The Clubmen talk in a strange argot, seem endlessly concerned to put program segments in odd places like "Top RAM," and crusade for the latest DOS.

I've taken it as Holy Writ that here and there in the world there are types who used floppies as teething rings, and whose first spoken words were in Assembly language.

Now you rub my nose in it by proving beyond any shadow of a doubt that the average 8-year-old knows more than I ever will (Young Programmer's Contest, *80 Micro*, February 1983, p. 84).

Francis F. Heaton
Darcom Software
3277 Berger Ave.
San Diego, CA 92123

Maybe you'll have a second childhood.—Eds.

```
10 REM REAL TIME CLOCK PROGRAM 12/22/80 - 12/12/821
20 REM BY BILL EMERSON
25 FOR LII 16K KEYBOARD
30 DATA 245,229,33,0,126,52,62,10,190,32,26,54,0,35,52
40 DATA 62,60,190,32,17,54,0,35,52,190,32,10,54,0,35,52
50 DATA 62,24,190,32,2,54,0,225,241,251,201,237,86,251,201
60 FOR I = 0 TO 45
70 READ D : POKE 32000 + I, D
80 NEXT I
90 INPUT "SET HOURS"; H
100 INPUT "SET MINUTES"; M
110 INPUT "SET SECONDS"; S
120 POKE 32259, H
130 POKE 32258, M
140 POKE 32257, S
150 POKE 32256,0
160 PRINT
170 POKE 16402,195:POKE 16403,0:POKE16404,125 'CALL INTERRUPT
180 'SERVICE ROUTINE.
190 POKE 16526,42:POKE 16527,125 ' USR CALL
200 A = USR(0)
210 CLS
220 PRINT@ 95, "HOURS,MINUTES,SECONDS"
230 PRINT @ 160, PEEK(32259)   'HOURS
240 PRINT @ 167, PEEK(32258)   'MINUTES
250 PRINT @ 175, PEEK(32257)   'SECONDS
260 GOTO 230
270 PRINT
280 END
```

Program Listing 1

The II/16 in Chicago

The first Chicago-area Model II/16 user's group has been formed. We are known as T-BUG, Tandy Business User's Group.

Membership is restricted to Model II and Model 16 users who are interested in business applications. We meet on the second Thursday of each month for dinner at Hans Bavarian Lodge.

Further information is available by contacting me at 312-362-0016 or writing to the address below.

Lauren R. Januz
P.O. Box 631
Lake Forest, IL 60045

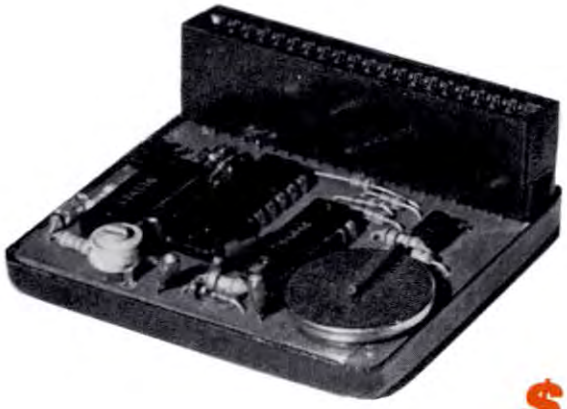
Placing the Blame

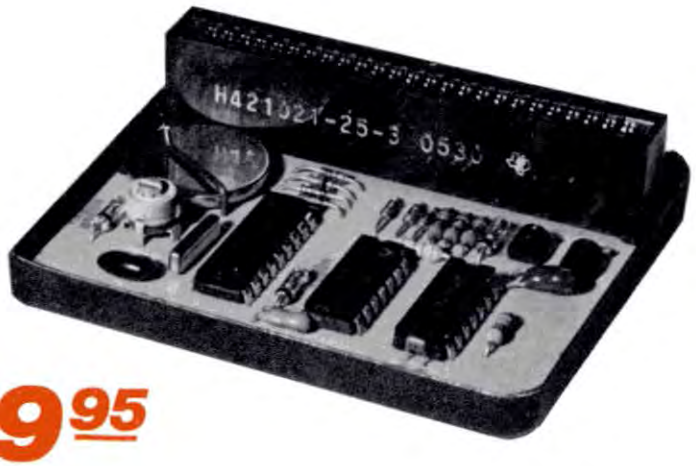
Eric Maloney's Proof Notes about Custer's Revenge (*80 Micro*, January 1983, p. 12) makes a judgment totally unrelated to the issue. The question is not whether Atari has a corporate social conscience, but whether it has a right to

NEWCLOCK·80

MODEL I

MODEL III





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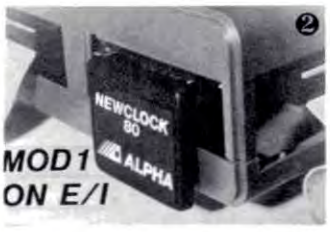

Wouldn't it be nice if your computer could always boot up with the right time and date and then stay accurate. Newclock-80 will enhance your Model I or III system with powerful clock/calendar/timer functions.

Using LSI (large scale integration) and custom circuits, Newclock-80 provides MO/DATE/YR, HR:MN:SEC plus AM/PM and day of week and even takes care of leap years! It continues to keep time and date with quartz accuracy when the computer is turned off or experiences a power failure. A single battery lasts over 2 years.

Compatibility: Newclock-80 is compatible with any operating system, including DOSPLUS, NEWDOS, LDOS. With its fully decoded circuitry it will work with any other hardware you may own. Bus expanders are available.

Installation is very simple, no tools, no disassembly, no soldering. Just plug it in, that's all. There is no power supply or messy cable. Newclock-80 plugs into the rear of the keyboard ❸ or side of the Exp. Int. ❷. Model III Newclock fits the 50 pin card edge (underneath) ❶

The Software: Newclock-80 is as easy to use as it is to install. -"SET", a Basic program, is used only once to set the time and date and select 12 or 24 hour format. -"TIMESTR", also in Basic, patches your computer "TIME$" function to read Newclock-80. It also adds "TIME$" to keyboard-only systems, a short routine is simply "poked" into low memory.

Newclock-80 uses 12 ports (176 to 188): 6 for the time, 6 for the date. The data is conveniently stored in decimal form, no conversion is needed. You can read or modify any digit using simple Basic "INP" and "OUT" statements.

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protest tasteless and vulgar uses of its product.

However, in an effort to be objective and see both sides, the editorial practically condemns Atari for not having affirmative-action software. That might be another relevant issue in itself, but the treatment in the editorial left American Multiple Industries in the background, and went after Atari!

Robin D. Sayler
P.O. Box 464
Highlands, NC 28741

MONEY DOS Loss

For a few weeks it looked as if I had found the key to the vault. I had implemented the commodities futures program from MONEY DOS (*80 Micro*, September 1982, p. 364), and it was working fine.

"Do exactly as I say," it said, and I did. Mr. Keynes said that he had used the System for 12 years and had never had a losing year or a margin call. He reported 40 percent gains. How could I lose? The System should tell me to get out of a losing situation and should keep me in a gaining position past the peak.

I found that it is possible to lose substantially before the moving averages indicate a trend reversal. In less than three months, I had lost over 90 percent of the original investment. Making gains is very difficult after losing so many of the game tokens.

Since I scrupulously observed the rules, only Monopoly money was involved, so it was good entertainment.

Harry H. Bowen
2207 Glendale Ave.
Pekin, IL 61554

Keynes Explains

Mr. Bowen's observation about the System is partially accurate, as from September through December it did indeed lose—but not 90 percent.

He didn't say which commodities he followed. If he followed only gold, silver, cattle, and hogs, it would have been very unprofitable. If he followed T-Bills, T-Bonds, Swiss Francs, D-Marks, Japanese Yen, and sugar, he would have made a bundle; they all trended well.

That is why diversity is vital. Trading 15 commodities, the System showed a loss of about 16 percent in the last quarter of 1982, one of the worst quarters it has ever had.

One point I neglected to include in the article: If the approximate risk shown is in excess of 8 percent of your bankroll, you decline the trade. Further, one only takes a position on a trend reversal.

In spite of the performance in the last quarter of 1982, I'll still bet the 50 G's.

J.M. Keynes

". . . diversity is vital. Trading 15 commodities, the System showed a loss of about 16 percent in the last quarter of 1982, one of the worst quarters it has ever had."

muMath Fix

I recently purchased Extended muMath from Microsoft (reviewed in *80 Micro*, November 1982, p. 42), and found it to be a remarkable piece of software.

The package had a serious flaw, however. Assignment of elements of an array could not be performed from a symbolic subscript. That is, when the packages named ARITH and ARRAY were loaded, the following command sequence produced an error message:

```
? A:<<1,2,3>>;
? I:2;
? A<<I>>:4;
```

Typing in the following corrected subroutine will fix this problem:

```
? SUBROUTINE UPDATE (EX1, LEX1, EX2),
    ASSIGN (EX1, UPDATE1 (EVAL(EX1),
    EVAL(LEX1))),
    ENDSUB$
```

Richard H. Rand
Dept. of Theoretical and Applied Mechanics
Cornell University
Ithaca, NY 14853

For More Information

Professor Rand is quite correct. The initial evaluation of subscripts required for his example to work properly is not provided for in ARRAY.ARI. The program authors, the Soft Warehouse, noted the limitation several months ago.

Subsequently, they published a modification to ARRAY.ARI in their newsletter that provides this capability. The modification is very similar to Professor Rand's and easy to make.

Besides being a vehicle for publishing bug fixes and enhancements, this newsletter is an active forum for users of the muMath and muLisp family of products to exchange application notes. Contact the Soft Warehouse, P.O. Box 11174, Honolulu, HI 96828-0174 for subscription information.

Gregory J. Fowler
Microsoft Corporation
10700 Northup Way
Bellevue, WA 98004

Users in Charlotte, NC...

I am pleased to announce the formation of the TRS-80 User's Group of Charlotte. We are three months old with an active membership.

Any TRS-80 users in the Charlotte area, who are interested in learning more about their computer and in sharing their experiences with the group, should contact Bill Hardin at 704-542-9959 after 6 p.m. or write to the address below.

Bill Hardin
TRS-80 User's Group of Charlotte
6613 Summerlin Place
Charlotte, NC 28211

Southern CoCo

We are forming a Color Computer user's group for the Memphis, TN area. For more information, contact me at 901-362-5945, or mail inquiries to the address below.

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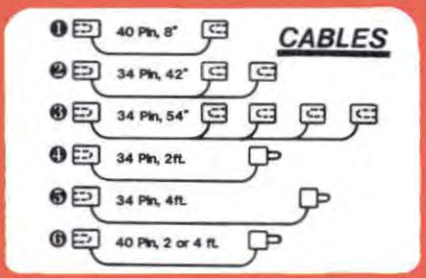

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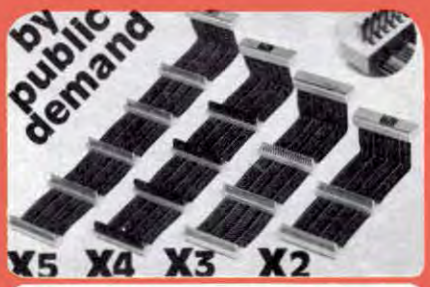

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GREEN SCREEN WARNING

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.
- The filter material that we use is just right, not too dark nor too light. The result is a really eye pleasing display.

We are so sure that you will never take your Green screen off that we offer an unconditional money-back guaranty: try our Green Screen for 14 days. If for any reason you are not delighted with it, return it for a prompt refund.

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?

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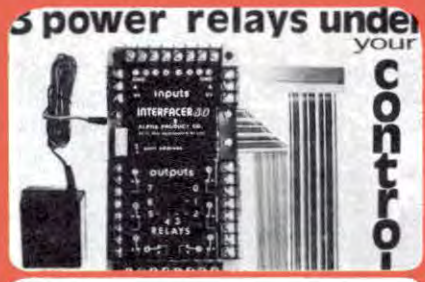

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Utility Plus is rather hypocritical in light of the rest of your comments.

You state that you will accept advertising from people who wish to sell this type of program; you even identify one of your letter writers as a person with a Super Utility back-up program for sale.

I see no difference between selling these programs and giving them away, except that persons doing the former must pay for advertising in your magazine. Software piracy is okay as long as *80 Micro* gets a cut of the profits.

If the author had written saying he would sell this program for $3 (just enough to cover the cost of a disk and postage), we would now have his name and address.

Wayne Pickett
5 Buttonwood St.
Trenton, NJ 08619

The Corvus Battle

We have discovered the utterly apalling fact that NEWDOS80 for Model III will not run the Radio Shack accounting software.

Since the Corvus hard disk requires NEWDOS80 and won't run on TRSDOS, anyone buying a Corvus must be prepared to buy all new software and lose all his files as well!

Thus, improving the speed of the TRS-80 Model III by adding a Corvus disk is a Pyrrhic victory.

James A. Williams
Turbine Alloy Corp.
280 Belvidere Ave.
Washington, NJ 07882

Model III Merge

"Cassette Merge," by John Nicolettos (*80 Micro*, January 1983, p. 310), presented ways to merge several Basic programs using the Color Computer.

Using Table 1 of this article as a guide, I have written a simple program, together with a simple POKE statement, to permit use of these techniques to merge programs for the TRS-80 Model III. Programs can be merged very easily, as long as each program has line numbers higher than those of the preceding program.

Unless you want to do a lot of retyping, you must first buy a program that will scan a Basic program and renumber all the lines automatically. There are several on the market and they are not expensive.

"Software piracy is okay as long as 80 Micro gets a cut of the profits."

Assume that you have three programs, called A, B, and C, that you want to link together. Type in Program Listing 2 and save it on cassette by typing CSAVE"L".

As you can see, line 9 is the only one that does anything useful, so the others are deleted on the first run to save memory space. It is important to write down the POKE information contained in line 5 before it is wiped out.

To get ready to link programs A, B, and C, first load your "renumber" program. Then load program A, renumber it so that the first line is 30000, and CSAVE the renumbered version. Do the same for B and C.

Next, CLOAD"L", the link program shown in Listing 2. Run the link program and write down the POKE information because it is important and will not appear again. Running the link program moves a pointer so that the next program loaded will be linked to the end of the link program.

For the actual linking of A, B, and C, CLOAD"A". Then type the POKE information to reset the pointer. Renumber what is in memory so that the first line is 10 and the interval is 10. Then type RUN; this runs "link" to move the pointer to a new start.

Next, CLOAD"B" and repeat the steps used for A. CLOAD"C" and repeat except for RUN, which is unnecessary on the last link. Delete line 10, which is the link program, renumber as desired for neatness, and CSAVE the new program.

Don't panic if you type LIST and some information is missing. The only time LIST will show everything is right after you have entered the POKE information. Also, don't renumber until just after the POKE.

W.B. Callaway
104 Midstream Place
Lincroft, NJ 07738

Not Trash

In my review of Prosoft's Trashman (*80 Micro*, January 1983, p. 53), two minor errors appeared that should be clarified. First, the Trashman utility is not available for the Model II. I'm sorry if I got your hopes up on that one.

Second, if it seems that I am less than enthusiastic about the program, I want to assure potential users that I am fully satisfied with Trashman. It has proven to be a valuable utility and I recommend it to anyone with string-compression time delays. It is fast, easy, and virtually invisible except for the increase in program speed.

Richard C. McGarvey
221 Hirschfield Drive
Williamsville, NY 14221

Draw A Flush

I enjoyed "Casino Draw Poker" by Ron Balewski (*80 Micro*, November 1982, p. 246). However, because of an error in the name of a variable in lines 8120, 8140, and 8150, the program will not run properly for the poker hands royal flush and four of a kind. The problem is easily corrected by changing

```
1 PRINT "RUNNING THIS PROGRAM SETS A POINTER TO MAKE"
2 PRINT "PROGRAMS LOADED LATER LINK TO THE END OF"
3 PRINT "PROGRAMS LOADED EARLIER. TO RESET THE POINTER"
4 PRINT "SO THIS PROGRAM CAN BE RUN AGAIN, YOU MUST"
5 PRINT "TYPE POKE 16548,233:POKE 16549,67 AND PRESS"
6 PRINT "ENTER. WRITE THAT DOWN BECAUSE THESE LINES"
7 PRINT "WILL BE DELETED AFTER THE FIRST RUN."
8 DELETE 1-8
9 POKE 16548,PEEK(16633)-2:POKE 16549,PEEK(16634):STOP
```

Program Listing 2

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the manual:

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the software: "An excellent Word Processor" (D.H.); "Absolutely fantastic" (S.E.S.); "You have features that I cannot duplicate on my $14,000 system" (J.B.)

the support: "Your phone information system and the prompt and courteous staff that you provide to help your clients...are worth the cost of the system." (V.H.H.)

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† Some features work only if your printer has the mechanical capability.

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"WT" to "WV" in those lines.

Also, it is useful to insert a couple of reference lines:

```
8030 ' SORTING HAND BY VALUE AND
SUIT
8130 ' 4 OF A KIND
```

W.B. Callaway
104 Midstream Place
Lincroft, NJ 07738

Only One?

I feel obliged to take exception to Wayne Green's comments in Remarks (*80 Micro*, January 1983, p. 8). Referring to the recent Northeast Computer Show, he states: "There were Apple computers all over the place at the show, but only one TRS-80 that I saw."

Radio Shack and the Tandy Corporation were well-represented at the show. Mr. Green, by virtue of his position as Publisher/Editor of *80 Micro*, has a great influence on present and prospective computer owners. I feel that his readers should receive the whole story and reach their own decisions.

Thomas J. Hamre
59 Hadley Village Road
South Hadley, MA 01075

```
4411            00200           ORG     4411H
82AF D5         00330           PUSH    DE      ;SAVE DE ON STACK
82B0 CD3B00     00340           CALL    003BH   ;MOD 3 - PRINT CHARACTER
82B3 D1         00350           POP     DE      ;RESTORE DE
                00360 ;
                00370 ;
00000 TOTAL ERRORS
```

Program Listing 3

Error Trap

Two photographs were switched in the March 1983 issue of *80 Micro*. The photo on p. 48 of the Review section should have appeared as Photo 1 in the article "Real World, It's About Time!" on p. 342. The photo on p. 342 is actually the completed MDX-4 board.

"Inside AIDS-III" (*80 Micro*, March 1983, p. 136) contained the wrong area code for author Robert A. Fiorelli's telephone number. The correct number is 216-289-2002.

Program Listing 3 is a Model III patch to Listing 5 of Thomas Tinsley's article, "Graphics on the Line Printer VII" (*80 Micro*, April 1983, p. 306).—Eds.

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RADIO SHACK	DWP-410	↓	↓	↓		↓	$21/3	$84/12	$504/72	
DAISY WHEEL II Carbon Film (26-1419)	¼ x 145	$25/6	$48/12	$270/72		$15/3	$18/3	$70/12	$408/72	
COLORS Red, Green Blue, Brown Long-Life Fabric (1449)	¼ x 130	$30/6	$58/12	$324/72		$18/3	$21/3	$82/12	$480/72	
	¼ x 25 NOT EZ LOAD	$24/3	$47/6	$90/12	$9/1	$8 ea./2 or more	$20/2	$58/6	$112/12	
LP I-II-IV 700 Zip-Pack (1413) 730/737/739/779	9/16 x 16	$13/3		$48/12	.....		.....			
DMP-200 (26-1483)	½ x 20	$18/3		$66/12	$9/1	$8 ea./2 or more	$30/2	$90/6	$180/12	
DMP-500 (26-1482)	½ x 20	$18/3		$66/12	$9/1	$8 ea./2 or more	$24/2	$72/6	$144/12	
LP III-V (26-1414)	½ x 15	$18/3	JAM RESISTANT SUPER FABRIC	$66/12	$9/1	$8 ea./2 or more	$25/2	$75/6	$150/12	$12/3 $44/12 $252/72
LP VI-VIII DMP-400 (26-1418)	5/16 x 14	$17/3		$62/12	$9/1	$8 ea./2 or more	$22/2	$66/6	$132/12	$11/3 $40/12 $228/72
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	½ x 30	$21/3		$78/12	$10/1	$9 ea./2 or more	$30/2	$87/6	$168/12	$18/3 $66/12 $360/72
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NEC 8023 Series	½ x 18	$18/3		$66/12	$9/1	$8 ea./2 or more				
Spinwriter Fabric	½ x 18	$18/3		$66/12	$8/1	$7 ea./2 or more				
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COLORS Red, Green Blue, Brown	¼ x 130 NOT EZ LOAD	$30/6	$58/12	$324/72		$18/3				

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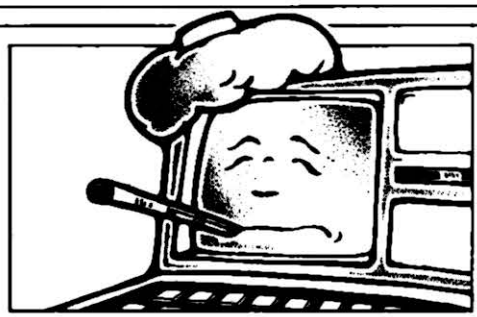

Problems, problems, problems

$50 Joystick?

I'd like to know if a potentiometer joystick with interface is available for under $50.

Joseph Lynds
Box 22
Plymouth, VT 05056

Can You Make Sounds?

I am fascinated by program games that make sounds like "zap, bang, pop," or "you're dead." If anyone knows how to make these sounds, please write to me.

Greg Van Doorn
835 South Yonge St.
Ormond Beach, FL 32074

Desperate Fan!

I have searched far and wide for *80 Micro* back issues, and have rounded up all issues except for July 1980. Will someone please help me? I'm getting desperate!

Ed Noble
P.O. Box 759
Mesilla Park, NM 88047

An Incompatible System

I recently had the Radio Shack double density option installed on my Model I, and found that the TRSDOS 2.7DD was incompatible with Radio Shack Scripsit. Does anyone know of a solution of how I can reliably use TRSDOS 2.7DD with Scripsit?

Eric Rosenfeld
60 Winter St.
Ashland, MA 01721

Zaps and SuperScripsit

Does anyone have zaps to allow new SuperScripsit to work in double-density on NEWDOS 2.0?

Eddie Harrison
130 W. Third St.
Tustin, CA 92680

Contractor Needs Programs

I plan to start my own business as a plumbing and heating contractor. I would like to find software for my Model III that will help me in determining estimations, accounts received, and accounts payable.

Also, does anyone know of a source of programs that would supply references of small plumbing contractors in my state?

Jim Youells
36 North St.
Plymouth, PA 18651

A Sticky Relay

I have a problem with the recorder relay (k1) sticking in my Color Computer. This is frustrating when trying to retrieve data from my CTR-80A. A swift kick in the assembly usually unsticks the relay. Has anyone else experienced this problem?

Doug Gilmore
1015 K St.
Reedley, CA 93654

ASCII Conversions Needed

I need information on ASCII to Baudot and Baudot to ASCII conversions for data input and output. I have a Model I Level II computer that I would like to make an RTTY program for. Please contact me.

Mike Waldrop
P.O. Box 537 FTG
FBPO Norfolk, VA 23593

Bibliography Program Please

I am looking for a bibliography maintenance program to run on the Model II/16. It should permit up to 12 fields per entry with at least 200–250 characters per field and permit a minimum of 1,500 characters per entry. The program should also allow searching on any word in any field using AND, OR, and NOT.

Although some data-base management programs can do some of this, I prefer a program specifically designed for maintaining a bibliography that permits user-specified searching, ordering, and formatting of references and citations.

Joel Samoff
3527 South Court
Palo Alto, CA 94306

Is It True?

Help! The Radio Shack Bisync Communications manual states that record lengths can be up to 256 bytes. Has anyone been successful in doing this with communication to an IBM System 34? If so, I'd like to hear from you.

Marvin Lanahan
24935 Roesner Road
Katy, TX 77450

Wanted: Model III Conversion

The merge utility mentioned by John Megson in "Video Genie" (Input, January 1983, p. 22) is just what I've been looking for. Unfortunately, it doesn't work on my Model III. Does anyone have a fix?

Russ Kincaid
11 Summer St.
Milford, NH 03055

Making a Connection

I have an Osborne I attached to a BMC monitor and an Okidata 82A. I would like to connect my Color Computer to the Osborne I so that data and program files on the Color Computer can be saved and printed from the Osborne I. Can anyone advise me in finding a cable for this connection?

John Toh
1851-H, Block 331
Avenue 1, Ang Mo Kio
Singapore 2056

Needs High-Speed Advice

Can someone tell me how to use high speed (1500 baud) with INPUT #-1 and PRINT #-1? I have a Model III.

Kenneth Armstrong
8020 Perry
Chicago, IL 60620

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Schematics Anyone?

I need a schematic for my TRS-80 Color Computer. Can someone help me?

Wendy A. Archinal
46 Rolling Green Apts.
Amherst, MA 01002

A City Trade

The city of New Haven, CT is currently operating a microcomputer network using six Model II's in various departments. We would like to trade information, experiences, and applications with other municipalities that are using Radio Shack computers.

Anne Kessen
Office of Housing & Neighborhood Development
157 Church St.
New Haven, CT 06510

Converting Signals

Can anybody tell me how to convert and format incoming Motorola Teleprinter signals for a Model I computer with printer?

David Youngs
519 North Pine Way
Anaheim, CA 92805

Wants to Renumber Lines

I am interested in obtaining a program to renumber lines on my Model III. If anyone has done this, please contact me.

D.F. O'Brien
35 Deerfield Road
Norwood, MA 02062

Level III Info Needed

I was given some Model I tapes. Among them was a Level III Basic tape from Microsoft, but with no documentation. Can someone help me find documentation for this software?

Also, does anyone know of a way to clearly disable the List command on a Model I?

J.E. Phinney
5041 East Cooper
Stockbridge, MI 49285

General Ledger Problem

I'm less than enchanted with the inability of Radio Shack's Model II General Ledger program to print out directly the contents of the various account files. I have discussed this with the Radio Shack hotline people, and their reaction was one of indifference. I can't believe that there isn't anyone out there with the same problem, and I'm wondering if anyone has found a solution?

Henry W. Merrill Jr.
P.O. Box 640
44 Main St.
St. Johnsbury, VT 05819

Wants to Write to Disk

I have an LNW-80, 48K, two-disk system. I need a modification or patch to Radio Shack's Editor/Assembler Series I that will allow me to write to disk instead of cassette. Does anyone know of such a program?

Wes Fritschle
P.O. Box 224
Fort Knox, KY 40121

Write to Me!

I would like to patch various utilities with my Beta-80 tape operating system. Has anyone disassembled and analyzed the Beta-80 operating system? I would like to correspond with others using this system.

Dave Goucher
P.O. Box 882
Wolfeboro, NH 03894

A Program to Sort

We operate a Radio Shack Model II in our business and would like to find a program to sort our key blanks, first in a numerical sequence and then alphabetically under this sequence. Can someone help us?

Dan C. Sanderson
4301 Rivers Ave.
No. Charleston, SC 29405

More LP VII Info!

Can someone recommend any books or articles that would explain the basics of dot matrix printer operation and driver program usage to supplement the LP VII manual from Radio Shack?

Also, does anyone have a patch or machine-language printer-driver program that can be used with cassette Scripsit to utilize the LP VII's proportional spacing and right justification capabilities?

George S. Carlsen
2608 Greenacre Drive
Findlay, OH 45840

Eliminate My Interference!

I know of a person with a similar computer to my Model I that has a buffer cable from the keyboard to expansion interface that eliminates interference with VHF TV stations. My present cable causes no interference with VHF, only with UHF stations. Can someone tell me where I can find this cable?

William C. Jarvis
2 Hamilton Road
Whitehouse Station, NJ 08889

Flag Problems

I have the Radio Shack Time Manager program, and I'm having a problem with the Flag function. The disk boots to default even if the flag settings are rewritten. If anyone has information on how to correct this so that it runs as it should, please contact me.

Donald J. Gloistein
2500 Fairway Drive #922
Alvin, TX 77511

Superterminal Patch

Our firm has a Model III with an RS-232 card. The computer is connected to a Lynx modem. We recently purchased the Superterminal program but found that it doesn't work at the same baseport address as the modem. Does anyone have a patch that will fix this?

Eugene A. Marconi
9 Mason St.
Torrington, CT 06790

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★ With CP/M and TRSDOS, your TRS-80 can run twice as much software as other computers. You get to choose the best from both worlds.

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★ Unlike TRSDOS, CP/M programs can be transferred to your next CP/M computer. All of the money you spend on CP/M software can be considered an investment in the future.

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DEBUg

Changing the Weather

I've discovered an error in the "Weather Forecast" program that is listed in the January 1983 Feedback Loop column (p. 400).

I typed in the data and kept receiving a forecast that was 180 degrees out of sync with my local weather forecaster. A change in line 110 solves this problem:

```
110 FC$(1) = "CONTINUED LOUSY
WEATHER. NO CHANGE DUE FOR 24 TO
36 HOURS."
```

Rea Plowman
100 Ranchoma Court
Weatherford, TX 76086

FTOS Fix

I found a few errors in the Special Anniversary Issue.

First, take a look at lines 500–510 in Robert Jacobs' "Election," found on page 148. Line 500 takes the percentage vote gained from campaign money spent and adds it to the Democratic vote. Line 510 is supposed to do the same for the Republicans, but it doesn't. Line 510 should read as: 510 IFC$ = ''R''THENRP = RP + MF: DP = 100 – RP – UP.

The only other problem occurs in Michael Pollard's article "Fast Tape Operating System" on page 220. The program produces a checksum error whenever you try to read anything written with FTOS. To correct this problem, change line 04540 to: 04540 LD B,27H.

Gregor Moody
10402 Basel Drive
Cheltenham, MD 20623

Make It Run Faster

The listings in Duane Hope's "New Tricks for an Old Dog" (January 1983, p. 200) repeat a flaw in Hinrichs' original program.

Line 30 in both program listings has this flaw: The DEFINT A-Z statement precedes the clear statement. Any clear statement not only resets all variables to zero, but it also undoes all previous variable declarations and makes all variables single precision unless accompanied by a type declaration character.

To obtain the speed improvement caused by using only integer variables, the DEFINT A-Z must come after the clear statement. This simple change greatly increases the speed of the Hinrichs Basic Word Processor and any other Basic program that uses integer variables.

Winfield Smith
5825 South Blackstone Ave.
Chicago, IL 60637

A False Command

There is a case of wishful thinking present in Michael Chuck's "CC CQ" Program Listing 2 (December 1982, p. 200). Extended Color Basic doesn't have an ON ERROR GOTO command. Lines 980–990 don't catch errors because Extended Color Basic sees the ON ERROR GOTO as ON 0 GOTO, which means that we aren't going anywhere.

Golden Richard III
5815 Annunciation
New Orleans, LA 70115

A Mistake Corrected

The "CASS-80" program listing (February 1983, p. 152) has several undefined line numbers. The GOSUBs and GOTOs to these lines were accidentally left in when this program was updated. The correction follows.—*Eds*

```
8 GOSUB 24900
40 '
3000 CLS:PRINT"Goodbye... Want to leave a
message to the SYSOP (Y,N,A)?";
3004 '
```

Dreidel Line Correction

There is an error in Richard Ramella's "Dreidel" program (Fun House, December 1982, p. 421). Lines 660 and 670 should be:

```
660 IF C < 1 GOSUB 1130: PRINT @ 768, "I
WIN.": GOTO 700
670 IF G < 1 GOSUB 1130: PRINT @ 768,
"YOU WIN.": GOTO 700
```

Matthew Castelli
5302 Knole Court, Apt. 42
Alexandria, VA 22311

Model III Merge

I have found a fix for John Megson's Merge program (January 1983, p. 22) for the Model III. I changed the two occurrences of 114,0 to 46,2 in line 190. 114,0 is a ROM return address that makes no sense in the Model III; 46,2 returns to Basic ready.

Russell Kincaid
11 Summer St.
Milford, NH 03055

Remedy To a Problem

There has been a slight mix-up in the program listings of my article "Colorful Language Instruction" (Anniversary Issue 1983, p. 442). Program Listing 1 has been left out entirely. It should read:

```
10 PCLEAR 5
20 CLEAR 50
30 CLS0:PRINT"PRE-LOAD PROGRAM.
ON THE 'OK' PROMPT, TYPE 'RUN'
AGAIN TO EXECUTE MAIN PROGRAM.";
40 CLOAD
```

What is labelled Program Listing 1 is actually Program Listing 2. Page 448 is the continuation of this second program listing. The number 10 on the first line is just the continuation of line 3100 from page 446: "...:GOSUB60 – 10: GOSUB 4000..."

Dr. Alan F. Lacy
526 North 14th St.
Milwaukee, WI 53233

I Found It!

If some of you have been wondering where the sound went in Ron Balewski's "Casino Draw Poker" (November 1982, p. 246), I found it!

In line 11180 of the Basic listing, the first data element of the line, a 3, should

be changed to a 4. This critter also appears in the Assembly listing in line 1700. In addition, the AND 3 instruction should be changed to AND 4, and the label WT should be changed to WV in lines 8120, 8140, and 8150.

By doing all these changes, you'll have sound produced for this program on your Model I.

David E. White
P.O. Box 34
Menwith Hill Station
APO, NY 09210

Don't Jump!

Gerald Sprouse's "Mailing List Compiler" program (January 1983, p. 126) ends on page 128. The jump line is our mistake. We apologize for any inconvenience this error may have caused.

—Eds.

No Longer Disabled

One of the POKE addresses in my article "Partially Disabled Break" (January 1983, p. 197) is wrong in several locations.

The value 16397 should be 16396 in line 1010 of the program listing (p. 197), and in the last three paragraphs on page 198.

Dr. Stephen Mills
315-K Bargate Drive
Cary, NC 27511

FlexCat Lands On Its Feet

A bug exists in my "FlexCat Sort" program (Anniversary Issue 1983, p. 264). The symptom is a Subscript out of Range error which occurs when loading a file solely composed of an odd number of single-field headings.

Make the following adjustments to correct this problem:

```
290 CLS: FOR X = 1 TO H STEP2: PRINT
B$(X,1);:IF X<H PRINTTAB(40) B$(X + 1,1)
ELSE PRINT
295 NEXTX
```

Lawrence A. Terre
1101 West Thach Ave. #16
Auburn University, AL 36849

A Bold Correction

My hat's off to Robert Campbell for pointing out an error in the program of my article "To Boldly Go . . ." (Anniversary Issue 1983, p. 156). Change line 2620 to:

```
2620 SV = SM + SE: SF = (1 + (.01672
•COS(SV•RA)))/(1 - .01672↑2): SR =
149595850/SF: S0 = SF•.533128: TM = S0:
SR = INT(SR): RETURN
```

Joey Robichaux
1036 Brookhollow
Baton Rouge, LA 70810

Put In a PEEK

There's a problem with the program listings for my article "Disk Index Program" (Anniversary Issue 1983, p. 546). OCT$ should be changed to PEEK in lines 10460, 10470, and 10480 (p. 552).

Charles R. Perelman
9777 Wilshire Blvd., Suite 700
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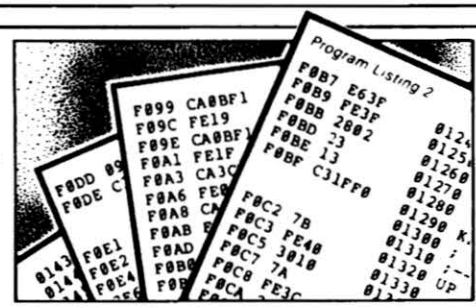

Exploring screen routines

Passing values between Basic and a machine-language routine is a simple concept but can become amazingly complex to execute. This month, I'll start with a simple machine-language routine—a screen white-out—and by modifying it, explore some of its complexities.

Program Listing 1 is the Assembly-language listing of the screen white-out. The program assumes that you want to fill the entire screen with CHR$(191), and it does this task in only 14 bytes. Even though the routine is relocatable, the Basic program in Program Listing 2 assigns it to a fixed point in memory (7F00H), protects it there, and then calls it as a fixed-location routine.

Listing 2 produces a screen that alternately flashes black and white. Since this is not very remarkable, I'll explain how to jazz it up a bit. First, you must change the character that is flashed on the screen when the USR routine is called. Second, make the USR routine tell Basic how many times it has been called (up to a maximum of 255 times). Program Listing 3 is the new Assembly-language routine, and Program Listing 4 is its Basic program.

Listings 3 and 4 show four important programming concepts. First, if you want to pass a single value from Basic to a USR program, place the value inside the USR call's parentheses (see line 180 of Listing 4). The parentheses can contain any number between -32768 and +32767, a variable name that holds such a value, or a complex expression that evaluates to a number within that range.

Each of the following is a legitimate call to a USR routine:

```
J=USR(523)
J=USR(-32743.26)
A=1300 : J=USR(A)
J=USR(VARPTR(C$)+1)
```

Each time Basic finds such a USR call, it evaluates the expression in parentheses and places the result in a buffer in low memory. Then it passes control to the USR program.

Next, if your USR routine starts with a Call to 0A7FH (Listing 3, line 180), the value in the buffer is converted to a signed integer (through use of the CINT function), and the result is placed in the HL register pair. Your machine-language routine now has the value passed from Basic and can work with it.

If your routine needs to pass a value back to Basic, it must load that value into the HL register pair and return to Basic by a JP 0A9AH instruction (Listing 3, line 280). The routine at 0A9AH places the value in HL into the low memory buffer, sets a flag to indicate that the value is an integer, and then returns control to Basic. Finally, the value that is returned by the USR routine is available to Basic in the variable that was originally used to call the USR routine (J in the four examples given above).

Passing Multiple Values

If you don't want to fill the entire screen with a character, you can further modify Listings 1 and 2 to fill only a specified portion of the screen. The Basic program must pass at least three values to the USR routine: the beginning address for the screen fill, the length of the field to fill, and the character to use for the fill. USR only allows one value to be passed, so you need a new technique.

```
                00100 ;*******************************
                00110 ; A Simple Screen White-Out
                00120 ;*******************************
                00130 ;
7F00            00140          ORG     7F00H
7F00 21003C     00150          LD      HL,3C00H        ;HL==> TOP OF SCREEN
7F03 11013C     00160          LD      DE,3C01H        ;DE==> 2ND SCREEN POS'N
7F06 01FF03     00170          LD      BC,03FFH        ;BC=# OF SCREEN POS'NS -1
7F09 36BF       00180          LD      (HL),0BFH       ;WHITE TO FIRST POS'N
7F0B EDB0       00190          LDIR                    ;WHITE TO ALL OTHERS
7F0D C9         00200          RET                     ;BACK TO BASIC
00BF            00210          END                     ;THAT'S ALL
00000 TOTAL ERRORS
```

Program Listing 1

```
10 '***********************************************
20 ' Normally, Memory Size should be
30 ' set to 32512 (7F00H) before running
40 ' this program. However, since no
50 ' strings are used, Memory Size can be
60 ' ignored.
70 '***********************************************
80 '
90 FOR I=32512 TO 32525
100 READ D: POKE I,D
110 NEXT I
120 DATA 33, 0, 60, 17, 1, 60, 1, 255
130 DATA 3, 54, 191, 237, 176, 201
140 '
150 'Now the routine is loaded into memory
160 '
170 DEFUSR=&H7F00       'For Tape Basic, use
                          POKE 16526,0: POKE 16527,127

180 CLS
190 FOR I=1 TO 100: NEXT I
200 A=USR(0)
210 FOR I=1 TO 100: NEXT I
220 GOTO 180
```

Program Listing 2

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```
                00100 ;************************************
                00110 ;   Fill the screen with any given
                00120 ;   character and report how many times
                00130 ;   (up to 255) this routine has been
                00140 ;   called.
                00150 ;************************************
                00160 ;
7F00            00170          ORG     7F00H
7F00 CD7F0A     00180          CALL    0A7FH           ;GET CHAR. VALUE IN HL
7F03 7D         00190          LD      A,L             ;XFER CHAR. TO A
7F04 21003C     00200          LD      HL,3C00H        ;HL==> TOP OF SCREEN
7F07 11013C     00210          LD      DE,3C01H        ;DE==> NEXT SCREEN POS'N
7F0A 01FF03     00220          LD      BC,03FFH        ;BC=# OF SCREEN POS'NS -1
7F0D 77         00230          LD      (HL),A          ;PUT CHAR. IN 1ST POS'N
7F0E EDB0       00240          LDIR                    ;NOW FILL SCREEN
7F10 21157F     00250          LD      HL,COUNT+1      ;HL==> COUNT VALUE
7F13 34         00260          INC     (HL)            ;INCREMENT COUNT VALUE
7F14 210000     00270 COUNT    LD      HL,0000H        ;SET ORIGINAL COUNT TO 0
7F17 C39A0A     00280          JP      0A9AH           ;SEND VALUE TO BASIC
                00290                                  ;AND RETURN
0000            00300          END
00000 TOTAL ERRORS
```

Program Listing 3

```
10 '**************************************
20 '  Fill screen with a random character
30 '  and then report cumulative count of
40 '  number of screen fills.
50 '**************************************
60 '
70 FOR I=32512 TO 32537
80 READ D: POKE I,D
90 NEXT I
100 DATA 205, 127, 10, 125, 33, 0, 60, 17
110 DATA 1, 60, 1, 255, 3, 119, 237, 176
120 DATA 33, 21, 127, 52, 33, 0, 0, 195, 154, 10
130 '
140 DEFUSR=&H7F00        'For Tape Basic use
                         POKE 16526,0: POKE 16527,127
150 '
160 CLS
170 A=RND(255)
180 J=USR(A)
190 FOR I=1 TO 100: NEXT
200 CLS: PRINT J
210 FOR I=1 TO 100: NEXT
220 GOTO 170
```

Program Listing 4

You could POKE the necessary values directly into the USR routine before it is called. Program Listing 5 demonstrates how to do this with the original USR routine. Since the routine is set at a fixed location, you can easily determine where each value should be POKEd.

A critical look at Listing 5, however, shows two flaws with the POKE technique. The USR routine is only 14 bytes long, and yet it takes seven lines (190–250) and a total of 176 bytes of Basic to change four values in that USR routine. The other, less obvious flaw is that if you modify the USR during the debugging process, you could have to change seven lines of Basic routine and calculate seven new addresses.

The second problem is more easily attacked than the first. Instead of POKEing the values into the USR routine, the Basic program could POKE them into a table in some section of protected memory. The USR routine could pick up the values from the table, do its own processing, and then put any values it needs to pass back to Basic into the same or a different table before returning. Fixed-location tables are used fairly often for passing values to both relocatable and fixed-location USR routines. You can use the same tables to pass values between various USR routines.

If you are using a fixed-location USR routine in protected high memory, the table will probably also be in protected high memory. But you could use other memory locations such as:

- Video memory—some programs use a "window" in the screen to pass values to a USR program. If you have a Model I without a lowercase modification, however, you are limited in the values you can store on the screen. Also, use of the screen as a window creates a distracting display.
- Unused low memory—several bytes of low memory (4000H–4200H) are not used in tape-based systems and are open for your use, but you need a detailed memory map to find them.
- Basic's input buffer—there is a pointer a 40A7H and 40A8H (16551 and 16552) to a 240-byte buffer that Basic uses to accept and tokenize new program lines, and to analyze direct commands. Assuming your USR routine does not Call Basic's keyboard input routines, and assuming that you won't type in data while values are being passed to or from Basic, this buffer is an excellent choice for storing a temporary table without eating into available memory.
- DOS's input buffer—some DOSes use an input buffer separate from Basic's (NEWDOS80 is an example). With a little experimentation and use of Debug (or by reading the documentation) you should be able to find the location and use of this buffer.
- Disk Basic file buffers—when you enter Disk Basic and specify a number of files, a 256-byte buffer is set aside for each one. Either reserve an extra buffer, or use an existing one when its file is closed, as a temporary table. To find the location of the buffer, open a file with known contents, get the first record, and then use Debug to search memory for the location of the buffer.
- Below Basic—a pointer at 40A4H and 40A5H points to the beginning of Basic's Program Statement Table (the Basic program). You can have as many protected bytes of memory available as you want by adjusting the pointer after entering Basic but before loading your program.
- Inside a variable string in high memory—set up a variable string (as opposed to a literal string) using a command like STRING$ to allot sufficient room for the table. Your Basic program

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```
10 '*********************************************
20 '  Pass four values to screen-fill routine:
30 '  Beginnning of field (32513,32514)
40 '  Beginning of field + 1 (32516,32517)
50 '  Length of field  (32519,32520)
60 '  Character for fill (32522)
70 '*********************************************
80 '
90 FOR I=32512 TO 32525
100 READ D: POKE I,D
110 NEXT I
120 DATA 33, 0, 60, 17, 1, 60, 1, 255
130 DATA 3, 54, 191, 237, 176, 201
140 '
150 DEFUSR=&H7F00       'For Tape Basic use
                          POKE 16526,0: POKE 16527,127

160 T=RND(1023)+15359
170 L=RND(16383-T)
180 C=RND(255)
190 POKE 32513,T-256*(INT(T/256))
200 POKE 32514,INT(T/256)
210 POKE 32516,(T+1)-256*(INT((T+1)/256))
220 POKE 32517,INT((T+1)/256)
230 POKE 32519,L-256*(INT(L/256))
240 POKE 32520,INT(L/256)
250 POKE 32522,C
260 J=USR(0)
270 FOR I=1 TO 100: NEXT
280 CLS
290 FOR I=1 TO 100: NEXT
300 GOTO 160
```

Program Listing 5

```
                00100 ;**********************************
                00110 ;  Screen-fill routine using a
                00120 ;  fixed-location table to receive
                00130 ;  values from Basic.
                00140 ;  Table is located in REM statement
                00150 ;  in last line of Basic Program
                00160 ;**********************************
                00170 ;
7F00            00180          ORG     7F00H
7F00 DD2AF940   00190          LD      IX,(40F9H)      ;IX==>TO END OF PROGRAM
7F04 DD6EF8     00200          LD      L,(IX-8)
7F07 DD66F9     00210          LD      H,(IX-7)        ;HL=STARTING ADDRESS
7F0A DD4EFA     00220          LD      C,(IX-6)
7F0D DD46FB     00230          LD      B,(IX-5)        ;BC=LENGTH TO FILL
7F10 DD7EFC     00240          LD      A,(IX-4)        ;CHAR. FOR FILL
7F13 E5         00250          PUSH    HL              ;MOVE VALUE TO
7F14 D1         00260          POP     DE              ;  DE
7F15 13         00270          INC     DE              ;DE=START ADDR. + 1
7F16 77         00280          LD      (HL),A          ;SET 1ST POSITION
7F17 EDB0       00290          LDIR                    ;AND SET THEM ALL
7F19 C9         00300          RET                     ;RETURN TO BASIC
0000            00310          END
00000 TOTAL ERRORS
```

Program Listing 6

can locate the string using the VARPTR command and can pass the string's address to the USR routine. Do not store the values in a literal string; any zero byte causes a syntax error if you stop the program and try to run it again.

● Inside a REM statement—make the last line of your Basic program a REM statement including enough asterisks (or any other character) to save sufficient bytes for your table. The table can then end at the address pointed to by 40F9H – 4 and 40FAH – 4 and work backward toward the beginning of the REM statement. (You can store up to 234 bytes in the REM statement with no danger of the bytes being overwritten.) Before running your program, Save or CSAVE it to avoid any problems with zero bytes in the table.

Bytes of zero in a REM statement or literal string cause problems, because the Basic interpreter reads any zero as an end-of-line marker. When the interpreter comes across a zero in a line, it assumes that the next 4 bytes are the pointer to the next line and the line number. It continues interpreting 5 bytes past the zero. A zero at the end of a line causes the interpreter to become out of sync with the program; errors in non-existent lines will probably result.

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Totals	1:02:30 hrs.	13:50:08 hrs.

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```
10 '****************************************
20 ' Pass three values (5 bytes total) to
30 ' USR routine by poking them into REM
40 ' statement in last line of program
50 '****************************************
60 '
70 ' ** Type Last Line exactly as shown.
80 ' ** SAVE or CSAVE program BEFORE running.
90 '
100 FOR I=32512 TO 32537
110 READ D: POKE I,D
120 NEXT I
130 DATA 221, 42, 249, 64, 221, 110, 248
140 DATA 221, 102, 249, 221, 78, 250, 221
150 DATA 70, 251, 221, 126, 252, 229, 209
160 DATA 19, 119, 237, 176, 201
170 '
180 DEFUSR=&H7F00       'For Tape Basic use
                          POKE 16526,0: POKE 16527,127

190 S=PEEK(16633)+256*PEEK(16634)     'S==> LAST LINE OF BASIC
200 T=RND(1023)+15359
210 L=RND(16383-T)
220 C=RND(255)
230 POKE S-8,T-256*(INT(T/256))
240 POKE S-7,INT(T/256)
250 POKE S-6,L-256*(INT(L/256))
260 POKE S-5,INT(L/256)
270 POKE S-4,C
280 J=USR(0)
290 FOR I=1 TO 100: NEXT
300 CLS
310 FOR I=1 TO 100: NEXT
320 GOTO 200
330 END   'Do not let the interpreter see the next line
340 REM*****
```

Program Listing 7

Program Listing 6 and Program Listing 7 show how to set up and use a table. This table is stored in the REM statement in line 280 of Listing 7. As you can see, the technique is straightforward but still does not make programming easier nor help you use memory efficiently.

Use of Integer Arrays

Perhaps the easiest and most efficient way to pass multiple values between Basic and a USR routine is to set up a table in an integer array in Basic. Each element of the array should hold a 2-byte integer value. You can find the address of the array and pass it to the USR routine with the VARPTR function. For an array, V%(x), VARPTR (V%(0)) returns the address of the first element of the array; the other elements are in successive memory locations.

Program Listing 8 and Program Listing 9 show how the technique is used. Notice how much more easily you can handle the values to be passed in Listing 9 than those in Listing 7. This simplicity is the great advantage of using an integer array. The disadvantage

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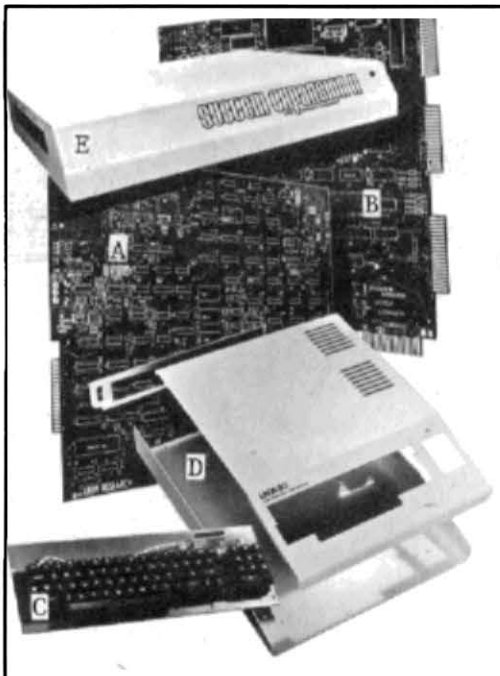

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is that every time Basic has to shuffle its variables around in memory, the table must also be moved. If you have more than 30 or 40 bytes of integer-array tables, your program becomes sluggish (one cure: define all variables at the beginning of the Basic program so that none are ever moved in memory).

In all the techniques discussed this month, your programs are limited to passing integer values (−32768 to +32767 or 0000H–0FFFFH) between Basic and a USR routine. There are ways to pass single and double precision values, but they are much more complicated. The simplest is to pass the address of the variable that holds the value and have your USR program access the value accordingly. In general, integer values will meet most of your requirements—let Basic do the complicated number crunching.

For Model III Users

Model III TRSDOS's Debug doesn't let you examine or change memory locations below 5600H. This protection scheme is merely an annoyance, because you can always use an LDIR instruction to move any block of memory into visible range. The following patches to Debug let you view all of RAM and ROM (try them on a backup disk first):

PATCH *5 (ADD=4ED9,FIND=0056, CHG=0000)
PATCH *5 (ADD=4EFF,FIND=0056, CHG=0000)
PATCH *5 (ADD=5068,FIND=0056, CHG=0000)

These changes work on TRSDOS versions 1.2 and 1.3. ■

Write to Hardin Brothers, c/o 80 Micro, *or contact him through CompuServe. His e-mail address is 72165,735.*

```
                00100 ;*******************************
                00110 ; Screen-fill routine using a
                00120 ;  relocatable table to receive
                00130 ;  values from Basic.
                00140 ; Table is in an integer array;
                00150 ;  its location is passed here
                00160 ;  by USR call
                00170 ;*******************************
                00180 ;
7F00            00190         ORG     7F00H
7F00 CD7F0A     00200         CALL    0A7FH           ;GET ADDR. OF TABLE
7F03 E5         00210         PUSH    HL              ;ADDR. ON STACK
7F04 DDE1       00220         POP     IX              ;IX==>TABLE
7F06 DD6E00     00230         LD      L,(IX+0)
7F09 DD6601     00240         LD      H,(IX+1)        ;HL=STARTING ADDRESS
7F0C DD4E02     00250         LD      C,(IX+2)
7F0F DD4603     00260         LD      B,(IX+3)        ;BC=LENGTH TO FILL
7F12 DD7E04     00270         LD      A,(IX+4)        ;A=CHARACTER FOR FILL
                00280 ;Notice in line 270 that for a one-byte value, only
                00290 ;  the LSB is used in the transfer
7F15 E5         00300         PUSH    HL              ;TRANSFER ADDR. TO
7F16 D1         00310         POP     DE              ;  DE REG. PAIR
7F17 13         00320         INC     DE              ;DE=START ADDR. +1
7F18 77         00330         LD      (HL),A          ;SET 1ST POSITION
7F19 EDB0       00340         LDIR                    ;AND SET THEM ALL
                00350 ;Values could now be returned to Basic through
                00360 ; the same integer array -- IX still holds
                00370 ; the address of the array.
7F1B C9         00380         RET                     ;RETURN TO BASIC
0000            00390         END
00000 TOTAL ERRORS
```

Program Listing 8

```
10 '*************************************
20 ' Pass three values to USR Screen-Fill
30 '  routine through an integer array, V%(x).
40 ' V%(0) = Address for start of fill
50 ' V%(1) = Length of field to fill
60 ' V%(2) = Character to use for fill
70 '*************************************
80 '
90 FOR I=32512 TO 32539
100 READ D: POKE I,D
110 NEXT I
120 DATA 205, 127, 10, 229, 221, 225, 221
130 DATA 110, 0, 221, 102, 1, 221, 78
140 DATA 2, 221, 70, 3, 221, 126, 4
150 DATA 229, 209, 19, 119, 237, 176, 201
160 '
170 DEFUSR=&H7F00        'For Tape Basic use
                          POKE 16526,0: POKE 16527,127

180 DIM V%(2)
190 T=RND(1023)+15359
200 L=RND(16383-T)
210 C=RND(255)
220 V%(0)=T
230 V%(1)=L
240 V%(2)=C
250 J=USR(VARPTR(V%(0)))
260 FOR I=1 TO 100: NEXT
270 CLS
280 FOR I=1 TO 100: NEXT
290 GOTO 190
```

Program Listing 9

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COMMANDER 80

by Jake Commander

What is Tandy, anyway?

What is this thing called Radio Shack?

That's an interesting question and serves to highlight what an enigma the organization represents to many people—including myself. For heaven's sake don't read this column in anticipation of me taking pot shots at those guys in Texas. I'd just like to voice a few feelings and see if anyone out there feels as I do.

The only way I'll know that, of course, is if you write. In fact, it was a letter to our Input column that prompted my pen's direction this month.

The letter's author, Golden Richard III, took issue with some of the things I said in my January column. I predicted that Tandy's Color Computer won't be successful in Britain because it costs more than its competitor, The Dragon.

Mr. Richard said that I had "foamed at the mouth at the thought of Tandy getting burned," and that this attitude "makes it seem that TRS-80 users don't have such a great magazine after all." He also told our staff that "I'm not exulted with Tandy's policies, but they did give us the TRS-80 and if you don't appreciate that, you should start a magazine for users of some other micros."

I'm rather concerned that the tone of my column conveyed the wrong sentiments about my feelings toward Radio Shack. Did I really sound that carnivorous in my tirade against the Shack? I don't think I foamed at the mouth; maybe I just drooled a bit. I don't want to see them get burned. I've made a fair living from the TRS-80 and no way am I ungrateful to the guys at Fort Worth for making that machine a success.

To be specific about my Dragon article: I was aiming my comments more at the English arm of Tandy. And I don't want to see them get burned either. But I would like to see them learn a lesson.

All this stems from my love for the TRS-80. When I first bought one for $400 in America and returned to England with it under my arm, I was appalled to see that a minimum system there was $1000. Give me a break. Nobody in England was going to pay that when the PET was about half the price. Result? The PET walked all over the TRS-80's market. The same would have happened here, as well, if the price structure had been similar.

Now what do I see four years later? The TRS-80 Color Computer being offered for inflated prices in the U.K. and The Dragon coming along at a much more reasonable price. Déjà vu! You don't get a prize to see that The Dragon is going to give the Shack a hard time and all because of the peculiar notion that people in England can afford to pay more than their richer U.S. cousins. Please Radio Shack, I wouldn't mind seeing TRS-80s take over the world, and if I have to shout at you through my column to help achieve that, then I'll do it and risk unpopularity.

So how come Radio Shack is so often seen in the role of the bad guy? Are they really the bad guys? Or are they one heck of a huge Texan corporation that comes over as a soulless business machine? I lean toward the latter.

Two years ago we had the pleasure of a visit from two Tandy bigwigs: Ed Juge and Bill Walters. No baloney, it really was pleasurable. We all met in Wayne Green's office and shot the breeze for a good two hours. The magazine's editors took the stance of asking questions from what we saw as the reader's point of view, and the Tandy executives answered as best they could.

It was good fun. We'd ask some questions about new models, and they'd tell us as much as possible without overstepping their corporate authority. That was the challenge: to ask them questions in such a way that they could imply answers instead of having to refuse to answer or give away top-secret information.

We ended up with a lot of respect for those two gentlemen—and a couple of headaches too. A session requiring that much diplomacy in the dog-eat-dog world of magazine fact-finding can be a gruelling trial. Anyhow, the final impression was that Tandy can't be all bad. In the course of publishing a TRS-80 magazine, we get to talk (directly or otherwise) with certain people at Fort Worth and they're a nice bunch of people.

So much for the bricks and mortar of the place. Here's where a weird illusion occurs. As you step back from the personnel from which the Tandy Corporation is built, it suddenly takes on gigantic proportions and acquires the image of a faceless mass. It's this faceless mass, this huge bureaucratic machine, that instigates the negative reactions from so many people, including grateful customers.

I've yet to meet anyone who enjoys dealing with organizations like the IRS or Customs and Excise. Have you ever tried doing business with a large corporation with its never-ending hierarchy of people, all afraid to make a firm decision? It is a royal pain in the neck. Radio Shack is inadvertently presenting two images: it comprises nice, ordinary people, and yet it is a massive corporation that treads on anyone who gets in its way.

O.K. Now don't get upset. This is all a personal viewpoint. I'm not sure what happens when I take a pot shot at Tandy (albeit for good reasons). Do I kick a building or smack one of the bricks in the eye? One I don't feel bad about, the other I do. I'd enjoy hearing what other folks think. I'm not in this to take a swipe at Fort Worth, but, even if I were, I'm still not quite sure what it is I'd be swiping at.

Would the real Radio Shack now stand up? ■

Telewriter-64™

the Color Computer Word Processor

- **3 display formats: 51/64/85 columns × 24 lines**
- **True lower case characters**
- **User-friendly full-screen editor**
- **Right justification**
- **Easy hyphenation**
- **Drives any printer**
- **Embedded format and control codes**
- **Runs in 16K, 32K, or 64K**
- **Menu-driven disk and cassette I/O**
- **No hardware modifications required**

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.

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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 (LPVII/VIII, DMP-100/200, Epson, Okidata, Centronics, NEC, C. Itoh, Smith-Corona, Terminet, 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 move, 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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You can no longer afford to be without the power and efficiency word processing brings to everything you write. The TRS-80 Color Computer is the lowest priced micro with the capability for serious word processing. And only Telewriter-64 fully unleashes that capability.

Telewriter-64 costs $49.95 on cassette, $59.95 on disk, and comes complete with over 70 pages of well-written documentation. (The step-by-step tutorial will have your writing with Telewriter-64 in a matter of minutes.)

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Or check your local software store. If you have questions, or would like to order by Visa or Mastercard, call us at (619) 755-1258 (weekdays, 8AM-4PM PST). Dealer inquiries invited.

(Add $2 for shipping. Californians add 6% state tax. Allow 2 weeks for personal checks. Send self-addressed stamped envelope for Telewriter reviews from CCN, RAINBOW, 80-Micro, 80-U.S. Telewriter owners: send SASE or call for information on upgrading to Telewriter-64. Telewriter-compatible spelling checker (Spell 'n Fix) and Smart Terminal program (Colorcom/E) also available. Call or write for more information.)

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80 Microcomputing, 9/82

- **SIMPLE 1 Pass Operation**
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- **JUDGED #1 In Review After Review**

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If this sounds too good to believe, you don't need to take our word for it. Take the word of the thousands of *80 Micro* readers who voted Electric Webster the #1 spelling checker. Take the word of the scores of professional software reviewers who have raved about Electric Webster. Or, ask your local computer or software dealer for a demonstration, and see for yourself!

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MICROPROOF (EW's predecessor):

"There is simply **no finer program** available . . ."
Creative Computing, March 1982

"This is a very useful product and should be obtained by anyone who uses a word processor." *80 Microcomputing*, August 1981

"The summary review of this program? **One word—Excellent.**"
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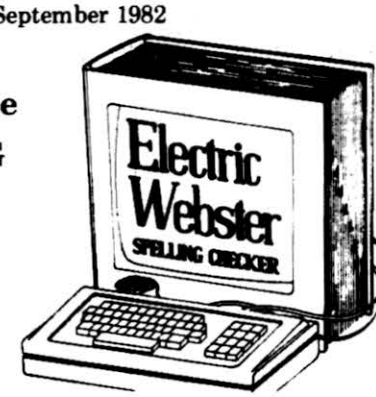

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THE COLOR KEY

by Scott Norman

High-end CoCo managers

Last month, I described the use of Ben Stokes' Homebase program for text processing. The package's data-management facility is its best feature, so I'll describe some of my experiences with it.

Homebase—Part II

I should repeat that Homebase (Homebase Computer Systems, P.O. Box 3448, Durham, NC 27702) is intended for a 32K, single-disk-drive Color Computer system. It uses nested menus and there are strong family resemblances between the text and data-management command suites.

A data file can contain up to 250 records of 255 bytes or less. Records and individual fields are accessed by user-assigned names, and there are rather complete facilities for editing, and for sorting and selecting records and fields.

For each data file, Homebase creates an ASCII disk file with a /dat extension, plus a binary /ndx index file. Only the latter is manipulated in sorting operations, thus increasing speed and conserving storage. Selection can be on the basis of either names or data values; this contributes greatly to the program's flexibility.

Homebase recognizes seven kinds of data fields, plus a comment field for straight text. Because of the specific nature of the stock data fields, it's advisable to spend a little time with pencil and paper before you attack the keyboard. That's the surest way to get the most out of the system.

There are seven types of available data fields. The first is Amount, which is always printed with a dollar sign, two decimal places, and commas. Up to nine digits are allowed, and this much room is set aside whenever the fields are printed out.

Code contains any five keyboard characters, and identification is used for nine-digit numbers without decimal places. The Other field is for a nine-digit number with two decimal places. Only Amount and Other fields can be used in calculations.

Date is always printed in MM/DD/YY format. Telephone numbers are treated as seven-digit numbers with a dash between the third and fourth figures: XXX-XXXX. Finally, Time-of-Day fields are handled in hours/minutes format.

These predefined field types are a great help in setting up a data base. The restriction to A and O fields for calculations isn't too much of a handicap, although there are times when it would be useful to subtract Date fields to find time intervals.

I concocted Projects, a fictitious data base representing the kind of data manipulation used in R & D (research and development) project management. Projects is elementary in terms of the amount of information it contains, but it provides a useful framework for describing Homebase's features.

My design for Projects required five data fields for project budgets, amounts already spent, the dates of the expenditure reports, the corresponding expenditures predicted by some fictional business plan, and the variances (differences between predictions and reality). The financial fields were Type A (Amounts), while the "As Of" items were Type D (Dates).

Each record was given a name (Project 100, for example) that was used for all further manipulations. Record names are not assigned one of the seven predefined data types.

Each Homebase data field requires 5 bytes, so the space available for a comment field is 255 minus (five times the number of data fields). The program prompts you for the space you actually want, however, and I chose to limit comments to 80 characters. Comments are printed as the last field in a data-base listing.

After setting up the framework of my data base, I loaded values for everything except the variances. I found these by using Homebase's Calculations option. The option isn't too versatile; it allows you to perform the four elementary mathematical operations on fields or records and to copy fields.

Subtraction was all I needed for this example, and the Calculations menu prompted me for the data-field names necessary to perform:

Expended - Forecast = Variance

This formula shows projects that are over budget as having a positive variance.

Homebase also provides for up to 24 miscellaneous fields that serve as scratch pads to store constants and intermediate results in more elaborate calculations.

Figure 1 shows how Projects looked after the variance calculation. You can also get on-screen listings of an individual data item, a complete record, or a complete field. The asterisk-outlined header is standard for printed listings; note the date of file creation and the user-specified page number.

Two 255-character lines are available for the title, and one logical line can be divided into a number of physical lines. For example, everything between PROJECTS and HOMEBASE is part of one title line. Print-control options include suppressing the header, field names, and record names.

Since I have an 80-column printer, the comment field wraps around at the end of each line. This, plus the fixed-field widths and lack of separation between data fields, makes Homebase listings rather difficult to read unless special precautions are taken. Fortunately, Homebase permits the user to specify a character as a field separator, and you can selectively delete fields from a printed listing to enhance readability.

To demonstrate some of Homebase's data-manipulation capabilities, I prepared a miniature version of a report abstracted from a larger data base. The concept was an exception report that informs a manager of any over-budget

```
**********12/05/82**********PAGE 1
PROJECTS
AN ELEMENTARY PROJECT CONTROL APPLICATION
OF "HOMEBASE"
BY SCOTT L. NORMAN

**********

                  BUDGET          EXPENDED        AS OF       FORECAST        VARIANCE        C
OMMENT
PROJECT 100    $  500,000.00   $  250,000.00   12/01/82   $  225,000.00   $   25,000.00   NE
W PROCESS DEVELOPMENT #1
PROJECT 200    $ 1,200,000.00  $  355,000.00   12/01/82   $  375,000.00   $  -20,000.00   PI
LOT LINE UPGRADE
PROJECT 300    $  650,000.00   $  663,985.79   11/15/82   $  650,000.00   $   13,985.79   CL
OSED 11/15/82
PROJECT 400    $   75,000.00   $   60,000.00   11/30/82   $   65,000.00   $   -5,000.00   LA
B MODIFICATIONS—LATE START
PROJECT 500    $ 1,500,000.00  $ 1,200,000.00  11/01/82   $ 1,200,000.00                   SU
BCONTRACT
```

Fig. 1. The Complete Projects Printout

projects (those with positive variances).

After saving Projects on disk, I used the program's Select option to find any records with variances between $0.01 and $9,999,999.99. I could have specified any numerical limits.

Next, I specified that the surviving subset of the data base be sorted in descending order according to the variance data. I then deleted the forecast and comment columns to ensure that each printed record would occupy only a single line. Finally, I changed the title to something more useful for this report.

The result is shown in Fig. 2, and it's more legible than the complete data-base printout. The whole exercise served as a nice demonstration of Homebase's ability to perform data-manipulation operations in sequence.

The data-base subset that survived each operation was immediately available for further work. I was also able to make include/exclude decisions based on the values of data in a specified field, or on the name of the field itself.

Homebase allows you to specify the record and field names whose intersection defines a data base entry in either order. When you're harried, it can be a blessing not to have to recall whether the rows or columns come first.

Although it is fairly complete, the manual could do a better job of explaining specific points. The use of miscellaneous fields in computations is one example. Also, the documentation would benefit from a first-rate proofreading job.

The sorting routine exhibits a quirk when dealing with mixed positive and negative numbers. Consider the set of figures:

-20, -5, 0, 15, 25

When Homebase sorts these in descending order, the result is:

-20, 25, 15, -5, 0

Apparently the sort just examines the ASCII code for each digit position, without any special treatment of the minus sign.

I would also like to see more flexibility in setting up a printed listing. Sometimes it would be helpful to change the widths of the various types of data fields, or at least to insert spaces between fields. And how about an automatic line feed between records, or a provision for multiple-line field names?

The final items on my wish list are the option of dual-drive operation to minimize disk swapping, and a capability for more complex calculations.

Most of these complaints concern cosmetic aspects of the program.

```
**********12/05/82**********PAGE 2
PROJECTS
POSITIVE VARIANCES ONLY
SORTED IN DESCENDING ORDER

'FORECAST' AND 'COMMENT' FIELDS
DELETED FOR FORMATTING

**********

                  BUDGET          EXPENDED        AS OF       VARIANCE
PROJECT 100    $  500,000.00   $  250,000.00   12/01/82   $   25,000.00
PROJECT 300    $  650,000.00   $  663,985.79   11/15/82   $   13,985.79
```

Fig. 2. Variance Report Abstracted from Projects

STRIKE GOLD

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Homebase is a powerful tool and deserves the attention of all Color Computer users interested in integrated personal data bases.

A New Spreadsheet Calculator

"I may not be fast, but I'm thorough and I'm cute." With this apocryphal quotation from a former secretary, Bill Dye (Trans Tek, 194 Lockwood Lane, Bloomingdale, IL 60108) introduced me to his latest applications program: C.C. Calc. This is a modestly priced ($25) spreadsheet for 32K disk or cassette systems.

It certainly isn't fast, and its capacity is rather limited, but C.C. Calc does lend itself to certain calculations that have always tied Spectaculator in knots. Cuteness is for someone else to judge.

C.C. Calc is written in Basic, and it gives the user a 26-by-26 spreadsheet. The display is typical for the breed: row and column labels, and a two-line header for needed information. A given cell (row/column intersection) can contain a number, a calculation formula, or a label (i.e., any set of keyboard characters).

I don't want to shortchange the program because I find it quite useful, but I can wrap up most of my evaluation by saying that C.C. Calc performs all the standard functions in a satisfactory fashion. That is, it allows the user to change a single number on a spreadsheet and then recalculate everything else with a single keystroke.

In doing so, C.C. Calc is already ahead of Spectaculator, the only other Color Computer spreadsheet I'm aware of. C.C. Calc's big advantage is replication, by which a formula written to define a single cell can be duplicated so as to define any number of contiguous cells in the same row or column.

There is also a capability for relative addressing, so that the contents of different cells can be calculated by the same general formula with different independent-variable cell addresses.

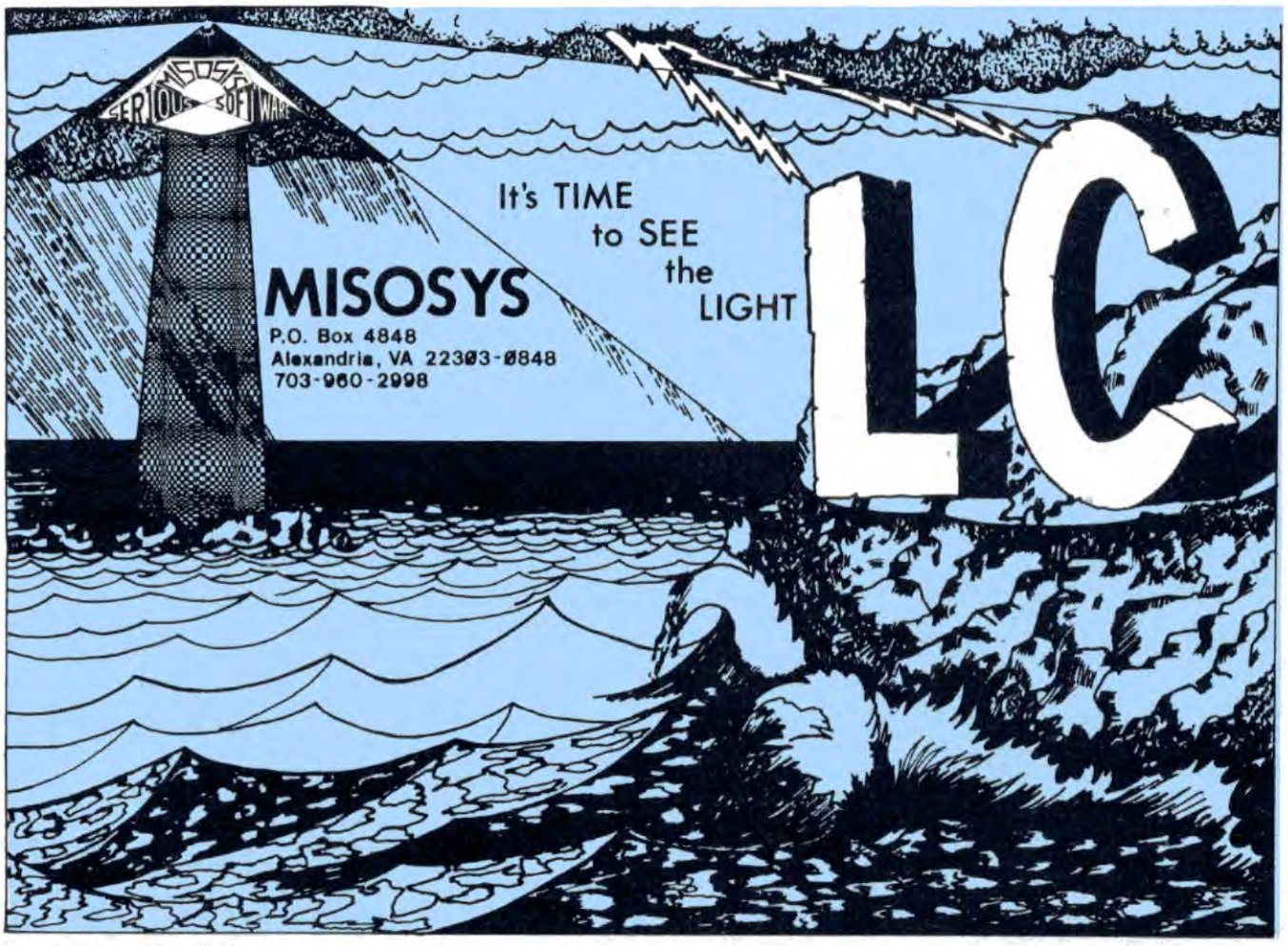
Here's an example. Fill the first ten elements of the first column with the first ten powers of 2:2-1, 024. The procedure is to enter 2 into the first cell, then move the cursor to the second element and write this C.C. Calc-style formula:

```
+AA*2
```

The leading "+" tells C.C. Calc that this is a formula instead of a literal expression, and AA is the element in the first column, first row of the spreadsheet.

As soon as the formula is entered, cell AB (first column, second row—exactly backwards from conventional matrix notation) is obtained by multiplying the contents of cell AA by 2.

Now comes the good part. To fill another eight cells, doubling the contents at each step, you need another eight formulas like the one above, with AA replaced by the correct location of the previous cell at each step. The command "/" brings up a one-line menu of editing commands, including R for replicate. The cells to be filled are AC through AJ, so the single command below generates the required copies.



/RACAJ

Each formula still specifies that the contents of cell AA are to be doubled, however; at this point, C.C. Calc gives you the option of specifying relative addressing.

This means that the individual formulas will be automatically adjusted so that the previous-cell location will be correct in all cases. In other words, cell AC's defining formula will be AB*2, AD's will be AC*2, and so on. The exclamation point is the calculate command, and now it will cause the whole string of powers of 2 to be filled in.

This has been a simple, one-dimensional example. The principle can be extended to two dimensions, so that interdependent rows and columns can be calculated at one command once the necessary formulas have been set up and the proper row-wise or column-wise order of calculation has been established. This is exactly the sort of power that makes a spreadsheet like VisiCalc so desirable to businesspeople.

"C.C. Calc. . . allows the user to change a single number and then recalculate everything else with a single keystroke."

As for other features, C.C. Calc offers the expected facilities for creating complete or partial printouts, setting the number of decimal points that will appear, and clearing all or part of a worksheet.

There is also a useful option for merging worksheets. If you load a previously saved file when another live worksheet is in memory, the newly loaded formulas and labels will replace those in the live file, while numerical values will be added to any already present in corresponding locations.

C.C. Calc does have its drawbacks. I've already mentioned the limited capacity and slow speed; C.C. Calc checks all 676 spreadsheet locations for calculation instructions when you hit !, and the checking alone takes about eight seconds. You do come to expect immediate answers once you start working with a computer. As far as spreadsheet capacity is concerned, though, VisiCalc does little better in a 64K machine.

There are a few other pitfalls; the program does not automatically readjust cell references in formulas if rows or columns are inserted after a spreadsheet is set up. This is also a result of limited memory.

Still, C.C. Calc can be a lifesaver in situations where the power afforded by relative addressing is required. My applications seem to require it all the time. ■

Scott Norman welcomes reader response to The Color Key. Write c/o 80 Micro, *80 Pine St., Peterborough, NH 03458.*

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GRASP

Finally, user customized character sets for your MX-80 Graftrax and MX-100 printers. With GRAphic Support Package you create character sets usable from any and all applications. Create character sets of single-width, double-width, & 12-pitch, using the GRASP character editor, ALTCHAR. GRASP comes supplied with 7 character sets. Print Mod3 special characters on your Epson! Set MX options from your keyboard. Invoke underlining! Written by K.A.Hessinger & S.A.Loomer. GRASP: $50+$2 S&H

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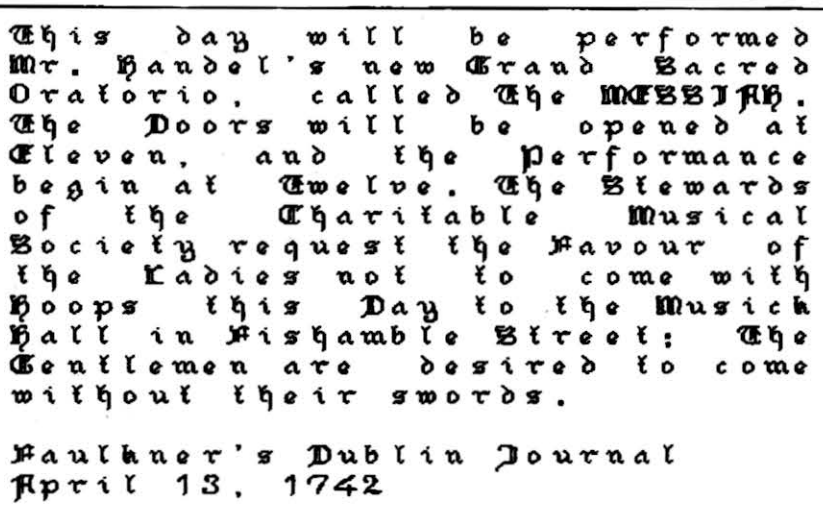
See List of Advertisers on Page 371

REVIEWS

edited by Janet Fiderio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Gentlemen are desired to come
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Faulkner's Dublin Journal
April 13, 1742

Fig. 1. The Old English Font

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★★★★

GRASP (Graphic Support Package)
Misosys Software
Alexandria, VA
Model I and III
MX-80, MX-100, and LDOS required
$50

by Charles P. Knight

GRASP is a collection of programs and filters designed to work with LDOS and make full use of the graphics capability of the Epson MX-80 and MX-100 printers. If you have the required printers and operating system, this is a worthwhile software investment.

The package consists of 17 modules (see Table 1).

The ALTCHAR group of programs for designing character sets is outstanding. Files with the /ALT extension are data files of character sets for these programs. ALTCHAR/DVR is the printer driver that lets you use a character set of your own choosing and pitch (characters per inch).

To use a special character set, type: SET *PR ALTCHAR TYPE12(WIDTH =96) where TYPE 12 is the name of the desired character-set file and Width is the number of characters that fit on a line. You must be careful not to specify a wider line than the printer can handle or you hang up the printer. After issuing this command, everything the computer sends to the printer is printed in the type font of the character set specified.

This is a powerful program, but it is not without its price. A character set consists of upper- and lowercase characters and graphics characters that use 6565 bytes of the computer's memory, just below the current HIGH$. If you have a long Scripsit file to print, you might have to break it into two smaller segments. Also, the printer double-strikes each line, which is much slower than normal printing.

I don't think this is too high a price to pay for a custom character set. I don't use custom sets all the time, but for final drafts or important work, I hardly miss the small amount of extra time it takes to use them. I rarely need to break my files into smaller segments.

ALTCHAR/CMD loads an LBASIC program that lets you design your own custom character set. The editor is superb. As you enter the program, it prompts you for a drive number and gives you a directory of all files with the /ALT extension on that drive. After it displays the directory, the program asks you for a filespec and warns you that a default extension of /ALT is assumed.

Unless you wish to use the default drivespec of :1 here, you must enter a drivespec. I would prefer that GRASP use the established TRSDOS and LDOS convention of searching all drives for the file if you don't give a drivespec, but this is only a minor inconvenience. If you program in Basic, you can easily overcome it with a minimum of effort.

At this point, the program displays the main menu. You can elect to read into memory the character set specified by the filespec, save the character set in memory to the filespec you have given, edit the character set, blank the set, print the character set, or leave the program.

You must always read the characters into memory, as this is not done automatically for you; this is more flexible. When you finish, the program neatly resets the HIGH$ value to its previous value before exiting. This software uses Basic programming techniques that you would do well to use in your own work to ensure high-memory integrity, whether you use LDOS or not.

If you select the Edit mode, it queries you on the dimensions of the character set you are using if the set is not already in memory via the Read command.

You can design characters that are 10 or 12 pixels wide. This corresponds to 10 or 12 characters per inch on the printer. You can also specify a character height of 12 or 16 pixels. Once you specify these values, the program gives you a good graphic representation of the al-

Continues on p. 48

★★★★½

Dot Writer 1.5
J.F. Consulting
74355 Buttonwood
Palm Desert, CA 92260
Model I or III
$69.95
by Jake Commander

Dot Writer consists of two graphics software modules from J.F. Consulting that allow mixing graphics, text, or a combination of both in the form of character fonts. The two subprograms are called Dot Write and Dot Print. Both modules are part of the ever-expanding G.E.A.P. (pronounced jeep) range of software.

Just to confuse everyone, G.E.A.P. is the name of the previous graphics software package *and* the generic name J.F. Consulting gives to graphics software such as Dot Writer. Even the two subprograms are further divided into modular overlays, some of which are common to the original G.E.A.P. Confused? I'll try to explain as I go along.

Dot Write and Dot Print are typical of a lot of TRS-80 software appearing today in their versatility and sophistication. Sophistication is something the discriminating TRS-80 user has come to expect, but that versatility makes the software difficult to review. So many pieces comprise the whole that it's difficult to know where to start.

Also, G.E.A.P. and Dot Writer are sold either together or separately as individual programs (using the odd overlapping module here and there). How is it possible to demonstrate its potential without skipping a feature or two? It's a testimony to the Dot Writer package when I say that it's not possible in a review such as this. Even the manuals for the package are half an inch thick! I hope my overview conveys the versatility inherent in this software.

G.E.A.P. has already been reviewed in *80 Micro* (October 1982, p. 184), so I'll concentrate on the Dot Writer package alone. The package achieves maximum performance when used in its entirety, with G.E.A.P. as the graphics-creation program. That way, many extra options are available to create and manipulate your graphic artwork. However, Dot Writer alone has more than sufficient power to generate high-resolution graphics and fancy character fonts.

Dot Writer's two main programs include Dot Print, which prints text using typefaces from the Dot Writer font library, and Dot Write, which can be used in place of G.E.A.P. to create new fonts and graphics for that library.

The G.E.A.P. program and the Dot Writer package consist of a hybrid set of modules that is called and run from Basic, but use machine-code routines to perform some of the more specialized functions. This allows you to run the software from the familiar and comfortable environment of Basic, but with all the speed and power advantages of machine code.

It's important that the Dot Writer package runs under Basic because this sometimes imposes a minor limitation on what can be achieved. For instance, when writing a Scripsit file to be typeset later by Dot Print, a sentence or paragraph can be as long as you like without pressing the enter key. This can give Dot Print more than it can take in its Basic buffer, so it's wise to ensure that your print text has a carriage return at least every 255 characters.

It can also be a surprise to hit the break key and find yourself back at the Ready prompt. These modules act so much like a machine-code system that you might find yourself a victim of the Basic interpreter if you perform irresponsible acts with the software.

Dot Writer is probably the part of the G.E.A.P. package that everyone notices first and it appealed to me the most. Basically, Dot Writer allows you to print any ASCII text using the typeface of your choice. The typeface can be one of the twelve provided with the software or you can design it by using either G.E.A.P. or the Dot Writer program itself (see Fig. 1).

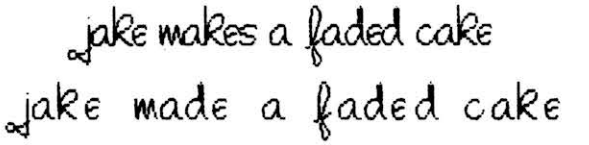

Fig. 1. Custom-Designed Typeface

Fig. 2. Old English Proportional

Fig. 2a. Old English Monospaced

Dot Writer writes dots—usually in the form of graphic symbols to your printer. The Dot Print program performs this amazing typesetting simply by asking for a file name and then going to work on it. The Dot Write program allows you to create and print graphic shapes in a manner similar to G.E.A.P. These shapes can be pictures or typefaces for Dot Print to use later at your bidding.

Twelve typefaces are supplied with Dot Writer, including a favorite—the Old English font (see Fig. 2). Three additional font disks are currently available containing an extra ten fonts each.

I have included some examples to demonstrate what you can do with your humble Model I or III and an Epson or Okidata printer (see Figs. 1-8). According to the publishers, more printer support is on the way and the C. Itoh version will be available any second.

Versatility is achieved by inserting command lines in the ASCII text you want to print. Dot Writer has 48 separate commands to embed in your text to control its printout. Some commands have options like the Darkness command—this provides four different shades of print ranging from normal to double emphasized.

An example shows how easy it is to use the Dot Writer command structure. Assume you want to print two lines, one saying "Hello" in normal darkness, the other saying "There" very darkly.

Continues on p. 53

Altchar/bas	Module for designing your own character sets
Altchar/cmd	Loader and Machine language routines for above
Altchar/dvr	Printer driver to use alternate character sets
Altline/flt	Allows underlining via user specified toggle
Altwide/flt	Allows printing certain characters double wide
Gpd/dvr	Allows LPRINTCHR$(0) and other values
Mod3char/flt	Allows printing of Mod 3 special characters Old
Oldeng/alt	English character set (double width)
Sci10/alt	Scientific character set 10 pitch
Sci12/alt	Scientific character set 12 pitch
Setmx100/cmd	Program to intialize printer via software
Setmx80g/cmd	Same as above, but for MX-80
Std10/alt	Standard MX-80 char set with Mod 3 graphics
Std12/alt	Same as above, but 10 pitch
Type10/alt	Typewriter style font 10 pitch
Type12/alt	As above, but 12 pitch
Undrline/flt	Filter to allow underlining by backspacing

Table 1. The 17 GRASP Modules

Continued from p. 46

lowable dimensions of your character, complete with reference-point row numbers.

Because of the size and limitations of TRS-80 graphics, the characters might look strange on the video compared to how they look on the printout, but you become accustomed to this quickly. No matter what editor you use, character sets can be difficult to design. GRASP is easier to use than others I have tried.

When in the Edit mode, you copy characters from one position to another to simplify entry of similar information. It is much easier to make a T into an I than to design it from scratch.

This is a thoughtful and time-saving feature, but you can only copy characters from the current character set, not from another file. You can also GOTO a specific character by specifying it

בראשית 1:1-3

בראשית ברא אלהים את השמים ואת הארץ׃
והארץ היתה תהו ובהו וחשך על־פני
תהום ורוח אלהים מרחפת על־פני המים׃ ויאמר
אלהים יהי אור ויהי־אור׃

שמע

שמע ישראל יהוה אלהינו יהוה אחד׃
ואהבת את יהוה אלהיך בכל־לבבך ובכל־נפשך
ובכל־מאדך׃

Fig. 2. Example of Hebrew Word Processing

ΚΑΤΑ ΙΩΑΝΝΗΝ ΑΠΟΣΤΟΛΟΝ ΕΥΑΓΓΕΛΙΟΝ

Ιωαννης κεφ. 1: εν αρχῃ ην ο λογος, και ο λογος ην προς τον θεον, και θεος ην ο λογος. ουτος ην εν αρχῃ προς τον θεον. παντα δι' αυτου εγενετο, και χωρις αυτου εγενετο ουδε εν ο γεγονεν. εν αυτῳ ζωη ην, και η ζωη ην το φως των ανθρωπων· και το φως εν τῃ σκοτιᾳ φαινει, και η σκοτια αυτο ου κατελαβεν.

Ιωαννης κεφ. 3:16: ουτως γαρ ηγαπησεν ο θεος τον κοσμον, ωστε τον υιον τον μονογενη εδωκεν, ινα πας ο πιστευων εις αυτον μη αποληται αλλ' εχῃ ζωην αιωνιον.

παλιν,

ΕΝ ΑΡΧΗΙ ΗΝ Ο ΛΟΓΟΣ, ΚΑΙ Ο ΛΟΓΟΣ ΗΝ ΠΡΟΣ ΤΟΝ ΘΕΟΝ, ΚΑΙ ΘΕΟΣ ΗΝ Ο ΛΟΓΟΣ. ΟΥΤΟΣ ΗΝ ΕΝ ΑΡΧΗΙ ΠΡΟΣ ΤΟΝ ΘΕΟΝ. ΠΑΝΤΑ ΔΙ' ΑΥΤΟΥ ΕΓΕΝΕΤΟ, ΚΑΙ ΧΩΡΙΣ ΑΥΤΟΥ ΕΓΕΝΕΤΟ ΟΥΔΕ ΕΝ Ο ΓΕΓΟΝΕΝ. ΕΝ ΑΥΤΩΙ ΖΩΗ ΗΝ, ΚΑΙ Η ΖΩΗ ΗΝ ΤΟ ΦΩΣ ΤΩΝ ΑΝΘΡΩΠΩΝ. ΚΑΙ ΤΟ ΦΩΣ ΕΝ ΤΗΙ ΣΚΟΤΙΑΙ ΦΑΙΝΕΙ, ΚΑΙ Η ΣΚΟΤΙΑ ΑΥΤΟ ΟΥ ΚΑΤΕΛΑΒΕΝ.

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Fig. 3. Example of Greek Word Processing

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- The built-in debugger will step though your programs one instruction at a time, showing each disassembled instruction and its effect on the registers and memory.
- The debugger can use the symbols in your source code when stepping or disassembling.
- Input and output of conventional source or condensed INTASM source.
- Assembly and disassembly of undocumented Z-80 instructions.
- Comprehensive 65 page instruction manual with many examples.

The **Instant Assembler** package includes six separate programs. The assembler itself includes the editor and built-in debugger. The **Linking Loader** is included in several versions for different memory sizes. A stand-alone version of the debugger (**MicroMind**) is also included. **MicroMind** can be relocated in memory and has commands to single-step, set breakpoints, display or alter registers or memory, find bytes or words, disassemble to screen or printer, convert between hex and decimal numbers, and write SYSTEM tapes.

INTASM 2.1 is $39.95 for the tape version and $49.95 for disk (specify Model I or Model III). The instruction manual only is $5, refundable with purchase of the program. Include $2 postage, and California residents add 6% sales tax. VISA, MASTERCARD, and COD orders are accepted. Satisfaction is guaranteed or a full refund will be made. ✓ 55

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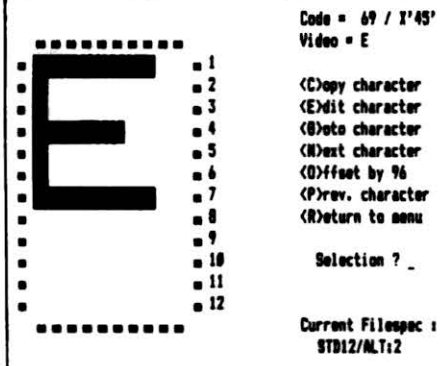

Fig. 4. The Letter E as it Appears in the ALTCHAR Editor.

directly or paging through the entire set.

GRASP always displays the current character's video equivalent as well as its value in both decimal and hexadecimal. It also shows the filespec you are working on.

Another option displayed is Offset by 96; this designs the right half of a double-wide character set. Use of the double-wide set costs you your graphics characters, but you can design some nice fonts in double width. The Old English font that comes with the package is a superb example (see Fig. 1).

When you are editing or creating new characters, the cursor is a big white block or a small black one, depending on whether the pixel it is on is set or reset. In order to set a particular pixel, you must move the cursor to that point with the arrow keys, and press the S key. To reset the pixel, press the R key. To erase a character, you must use the copy option to copy a space or another character into the current position.

When you finish editing your character set, you must return to the main menu and write it out to disk in order to save it. If you have modified the set and select the finish option, the program reminds you to save. This is a nice enhancement, but the prompt could be larger and more noticeable; you cannot recover a character set if you inadvertently exit the program.

All this discussion of programmable character sets might seem mundane until you consider what can be done with them. You can design special graphics-only sets and use them to plot graphs or draw pictures with the printer. It is even possible to duplicate the CHR$(?) codes of another computer.

GRASP does more than fun and games, however. You can design characters for use by Scripsit to perform word processing in any language. In the *LDOS Quarterly*, Volume 5, I describe Greek word processing with a Diablo printer and General Scientific printwheel.

Although my method is useful when no other is available, ALTCHAR and the MX-80 let me carry this several steps closer to perfection. I can design *any* character for *any* language, and assign it to *any* ASCII code I desire. This has made it possible to use Scripsit with the LSCRIPT patch to write documents in both Greek and Hebrew. (See Figs. 2 and 3.)

Since a high-memory driver makes the character translation to dot graphics, any word processor that uses the standard I/O calls and the printer DCB can create the text. Unfortunately, this rules out using Scripsit that has not been modified with the LSCRIPT patch provided with LDOS, and it might rule out using some other word processors. You would have to write your own special driver to use with SuperScripsit.

I usually use the MX-80 compressed print mode. The program SETMX80G/CMD makes this easy by sending the correct character to the printer. I

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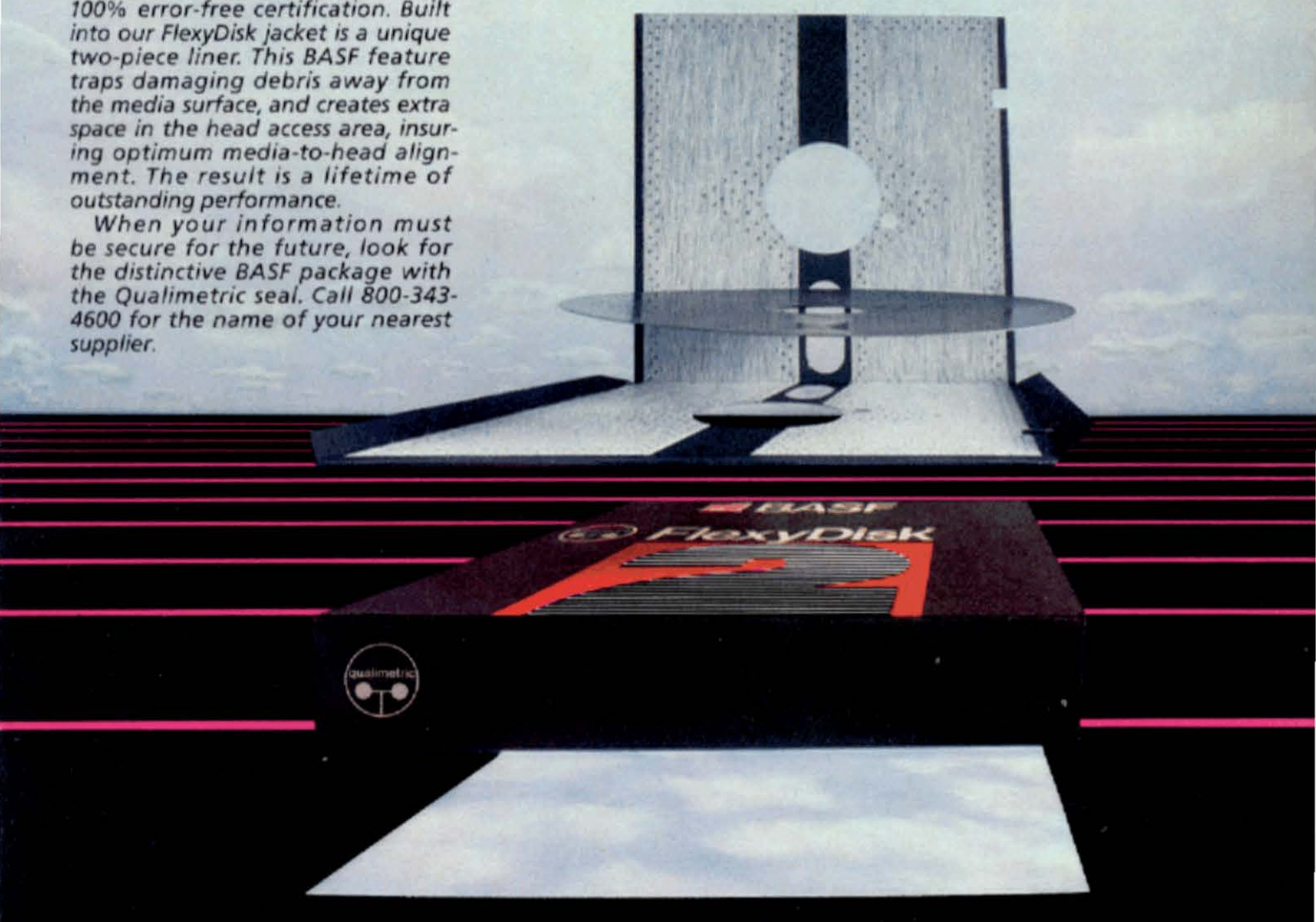

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haven't tested the file SETMX100/CMD, but it should work as well. It is easier to use than going into LBASIC and performing LPRINTCHR$(?) functions to set up the printer. You can also use this program from LBASIC via the CMD"SETMX80G" command, and it is unnecessary to remember the exact codes needed to perform a particular function.

The parentheses with each parameter separated by a comma pass the parameters to the program. The program provides parameters that initialize the Radio Shack mode, and it forms length, italic font, double spacing, compressed or emphasized type, and many others. This is a most useful, if not large, utility program.

An underlining filter program is also on the disk. This filter works with any printer that can backspace without erasing, but it could be better. It uses a toggle character that you specify. The filter defaults to character 127, which is the ASCII delete character entered by simultaneous depression of clear, shift, and enter. The filter uses this character to toggle the underlining on or off. When the toggle character is received, the printer begins underlining every character until it receives another toggle character or a carriage return.

However, I would prefer that the filter not underline spaces between words, making the trap for the carriage return unnecessary and allowing underlining to span several lines of text. Unfortunately, writing this type of filter requires some trade-off because an application program will not know of the filter's existence.

Scripsit treats the toggle character as a valid text character, and this makes justification difficult when the toggle character occurs between two words. Scripsit thinks that it's dealing with one long word. This is not the filter's fault. The only way that you can properly implement underlining is to modify Scripsit internally. This would be a mammoth undertaking for anyone, since only the author has the source code. The filter works well within these limitations and can make an otherwise impossible task possible.

"The ALTWIDE filter is out of the ordinary in concept. It lets you print some characters in double width and others in standard width."

The ALTWIDE filter is out of the ordinary in concept. It lets you print some characters in double width and others in standard width. This means you must design the character set with the proper characters as double width. The manual suggests that you might wish to print all capital letters in double width. It warns that under some circumstances the left half of a character could be printed at the end of a line and the right half at the beginning of the next.

If memory is a problem, and compressed characters or special fonts are not needed, the MOD3CHAR/FLT program prints the Model III's special characters. Since only the special characters are in memory, the printhead must home itself during printing and this slows things down. The authors recommend using the ALTCHAR driver if you want to print a large number of special characters.

This program works on a Model I also, but the video cannot display the Model III's special characters. Like the other modules, this works as documented, and I discovered no bugs. It is a nice addition to the package. The program requires a small patch to run on the Max-80.

For the Basic programmer, the GPD/DVR is an excellent inclusion. It takes over the TRS-80 ROM LPRINT routines so you can send any character to the printer. Now you can say LPRINTCHR$(12), and the printer receives a 12 instead of a calculated number of line feeds.

You can also say LPRINTCHR$(0), and it, too, goes to the printer without interference from the ROM driver. If you like to control your printer from Basic, you can throw away all those routines that POKE or OUT directly to the printer. You can, as with all these drivers, SYSGEN this to be a permanent part of your system.

The manual is written in the same clear style as the LDOS manual and punched so that they can be bound together. Unfortunately, it doesn't come with a binder.

I highly recommend this package to anyone needing the full capacity of the MX-80 series of printers. The package is an excellent value for the money. ■

Continued from p. 47

You'd place your text in the ASCII file in the following manner (bear in mind that Dot Writer defaults to normal darkness, so the first command is redundant in this context):

```
.da 0     —specifies normal darkness
Hello     —text
.da 3     —darker than dark
There     —text
```

All the options are specified similarly, using a period followed by a two-letter command.

Any ASCII text is printed this way, no matter how it is created. Normally

Fig. 3. Ifancy

Fig. 4. Antique

Fig. 5. Small Fancy

Fig. 6. Shaded (in reverse)

Fig. 7. Broadway

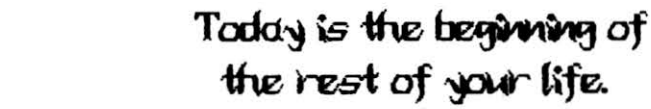


Fig. 8. Chancery Medium

you'd use a word processor and any one will do as long as it outputs an ASCII file. Scripsit is fine as long as you use the ASCII save option.

Dot Writer recommends using the Newscript word processor because both programs have a similar "dot command" format. Dot Writer does provide a painless interface to Newscript, so if you have this word processor you'll have a particularly easy time. Remember that any word processor (or even a Basic program) capable of ASCII output generates a file printable by Dot Writer.

The 12 fonts provided with the original purchase are shown in Fig. 9. I used the test program with the package. This simply checks the operation of the fonts and gives Dot Print (the actual print program) a cursory check. If this works, you'll be ready to send your friends letters in Old English or print out some documentation using proportional text.

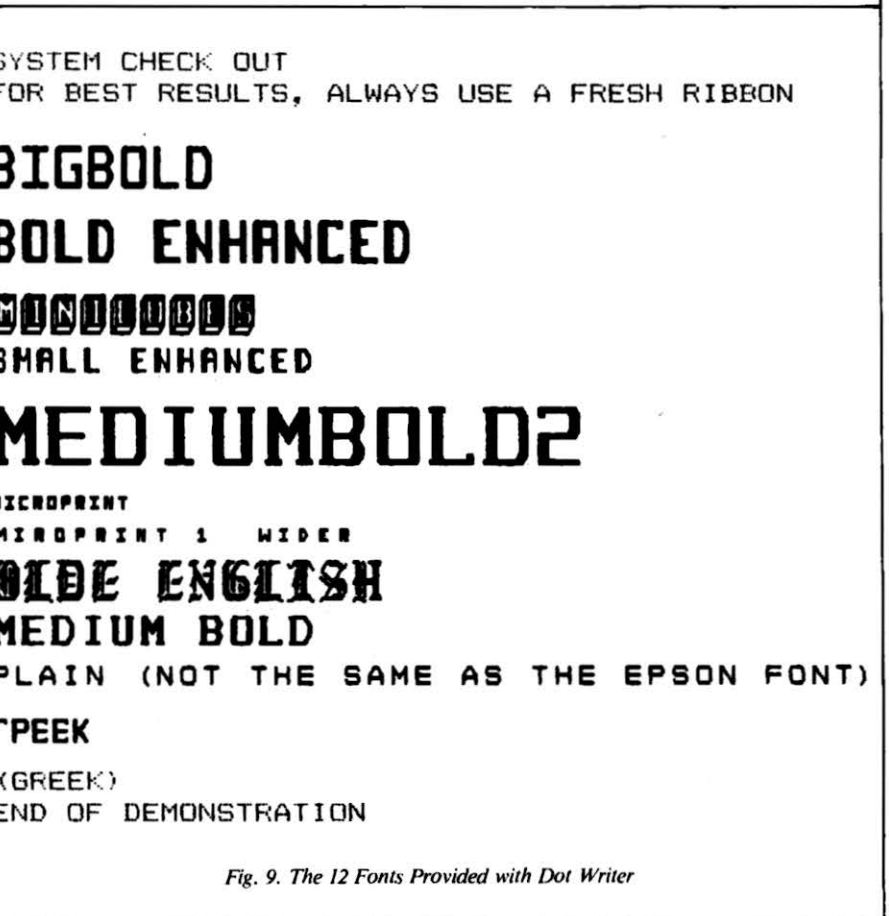


Fig. 9. The 12 Fonts Provided with Dot Writer

"Note that any of Dot Writer's fonts can print in Monospace or proportional mode."

Many more typefaces are planned by J.F. Consulting, so you might contact them if you design one you'd like incorporated into their library.

Note that any of Dot Writer's fonts can print in monospace or proportional mode to give a printout book quality. Some typefaces look better monospaced and some don't; it's a matter of try-it-and-see.

If you look at the small Old English example in Fig. 2a, you'll see that the monospaced text is easier to read, although in other samples I tried, proportional spacing looked better. Neither one is a problem, as you can change mode in mid-text by using a .pr on/off command in the regular Dot Writer manner.

Both programs come with substantial manuals that were printed by (what else?) Dot Writer. The manuals cover every aspect of the software's use so you can open at page one and walk your way through the learning process. This lowest-common-denominator approach to documentation does have its drawbacks, however. Once or twice, I scrabbled around to find some information and became drowned in words, despite a hefty index.

This clutter results from the versatility of the software; J.F. Consulting is determined to document every possibility. It takes a while to develop sufficient skill with the software so that you can use it without the manual close at hand to lead you through the splendors of graphics manipulation.

Dot Writer is a very substantial package and one that provides many modes of operation. It contains much more than I've described here and I'm sure I still have a few surprises in store, despite many hours of enjoyable experimentation. ■

★★★★

Color-Graf
Solectronics
400 Asbury Ave.
Evanston, IL 60202
Model I and III
$195

by Bruce Powel Douglass

Tired of low-resolution black-and-white graphics? Color-Graf is a peripheral that provides high-resolution color graphics for the TRS-80 Model I. It transforms a Model I into a graphics terminal using a color TV or external video monitor.

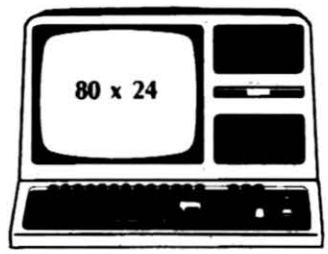
Color-Graf gives you 25-by-192-pixel resolution with several priority planes (sprite planes) for ordered figures—better graphics than the Apple II!

Color-Graf is built around the TMS 9918A video display chip and comes with 16K of RAM. No hardware modification is required—simply plug it into the expansion-interface bus or the expansion port of the Model I keyboard.

The TMS 9918A chip from Texas Instruments offers features not available elsewhere. Its distinctive feature is that a single image comprises a series of 32 overlapping images, much like overlayed transparencies. Each of the transparencies is ordered according to importance in the composite image. Therefore, if two images appear in the same place on separate sprite planes, the higher priority item appears but the other image will not.

It is simple to have moving images, such as a car driving past a tree, in which the highest priority images appear in front of lower priority images. In the case of a car driving by a higher priority tree, the car and the tree will be visible until they lie on the same position within the image. Then only the tree will be visible and the car will be obscured, as if you were looking at the street from in front of the tree. This priority feature eliminates the programming otherwise necessary to implement hidden-line algorithms on single-plane graphics systems.

A sprite is a graphics object on a particular plane. Its position is determined entirely by a 2-byte address. The entire object is moved when the value at the position address is changed. Sprites are one of two sizes: 8 by 8 pixels or 16 by



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16 pixels. A magnification option increases the size to 32 by 32 pixels. Each sprite plane can contain only one sprite object. The 32 sprite planes are ordered from zero to 31.

There are other planes available besides sprite planes, including a high-resolution pattern plane and a color-backdrop plane. Several graphics modes are available with the pattern plane. In Graphics Mode I, the screen is arranged into 24 rows by 32 columns of patterns; each pattern position contains 64 (8 by 8) pixels. A programmable pattern-generator table determines these patterns. Up to 256 different patterns can be stored in this graphics mode, and each of these can be in two of 15 colors.

Graphics Mode II allows 768 patterns instead of Mode I's 256, and each pattern can have up to 16 colors. Since there are 768 patterns and 768 distinct pattern blocks, you have a total of 2,566-by-192 resolution. With a little programming, you can perform any high-resolution task possible on the Atari or Apple on your color monitor, including plotting and line drawing.

Multicolor mode is low-resolution, and Text mode measures 24 lines by 40 columns. The latter is used primarily to display alphanumeric characters. You cannot use sprite planes in this mode, but that presents no problem. You can create your own alphanumeric characters in Graphics Mode I if you need text and sprites simultaneously.

Now you have an idea of what the TMS 9918A chip does. Color-Graf supports these features and has a fairly complete software package for using them.

The Color-Graf package includes the Color-Graf interface with the TMS 9918A chip and 16K of video RAM, an rf modulator for connecting a standard black-and-white or color TV, a power supply, a cable for connecting the TRS-80, a Texas Instruments TMS 9918A manual, and a disk or tape with supplied software. Installation requires connecting the cable to the TRS-80, plugging in the power supply, and putting the rf modulator on top of your TV. Anyone can install this system—you don't even need to open your computer.

I received the software on disk; the manual indicates that it works similarly for tape-based machines. The software for Graphics Mode I enables the user to manipulate sprites, change the backdrop color, and create, edit or position the 8-by-8-pixel patterns on the pattern plane. The pattern position is indicated by a coordinate pair (X,Y).

The program is a hybrid machine-language/Basic program with well-defined subroutines. These are called by routines within the sample program or by your own programs. The manual explains each routine in detail and provides a list of variables with explanations of their functions. A program listing is also provided.

Another program provides Graphics Mode II features in such a way that the screen is treated like a 256-by-192 high-resolution screen. Capabilities include setting or resetting individual pixels, drawing lines, circles, rectangles, or

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ASCII characters, filling in a rectangle, changing backdrop or rectangle colors, and creating a user-defined pattern.

Still more powerful routines draw and plot data on Cartesian coordinate graphs. I was impressed with both the speed and the fantastic resolution of the plots so easily created with this routine. Again, the manual describes these routines in detail with complete description of the system variables.

The Multicolor Mode software is equally easy to use. There is even a routine enabling you to draw on the screen with a blinking cursor.

The Text Mode allows you to create, edit or position the 6-by-8-pixel patterns for text. This makes Color-Graf valuable for educational purposes, since characters not available in standard ASCII sets can be created.

The use of the sprite planes is explained in the manual as well as in the TMS 9918A VDP Texas Instruments manual provided with Color-Graf.

Color-Graf is a well-designed high-resolution peripheral for the TRS-80 Model I. Its well-documented software is powerful and easy to use. This probably won't help someone interested in buying high-resolution game software for his TRS-80, but for educators or other professionals requiring high-resolution color graphics, it is an excellent system well worth the price. ■

★★★★

TRS-80 Pocket Handbook
William Barden Jr.
Tandy/Radio Shack
Fort Worth, TX 76102
Softcover, 265 pp.
$6.95

by John P. Mello Jr.
***80 Micro* staff**

For admirers of David A. Lien's indispensable *The Basic Handbook*, Radio Shack's *TRS-80 Pocket Handbook* is a welcome sight.

The pocket-sized book, penned by *80 Micro* regular Bill Barden, explains 255 commands, including editing commands, used in the Basic dialects of Tandy's microcomputers.

Organized along the lines of Lien's classic reference work, Barden's book devotes one page to each command, each listed in alphabetical order.

At the top right-hand corner of each page is an illustration of the command as it appears on the CRT screen. In the upper left-hand corner, Barden notes which of the 11 Basic Tandy dialects uses the command—Model I, Levels I, II and disk; Model II; Model III, Levels I, III, and disk; and Basic, Extended Basic, and disk for the Color Computer.

Next, Barden gives the command format, an example of its use, a description of what it does, and related commands.

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and lucid, even for elementary programmers like myself.

The handbook also includes a list of special keys used in TRS-80 Basic, error codes, common ASCII codes, and decimal-binary-octal hexadecimal conversions.

By taking Lien's basic idea and tailoring it to the TRS-80, Radio Shack and Barden have provided a dandy reference book well worth its $6.95 cover price. ■

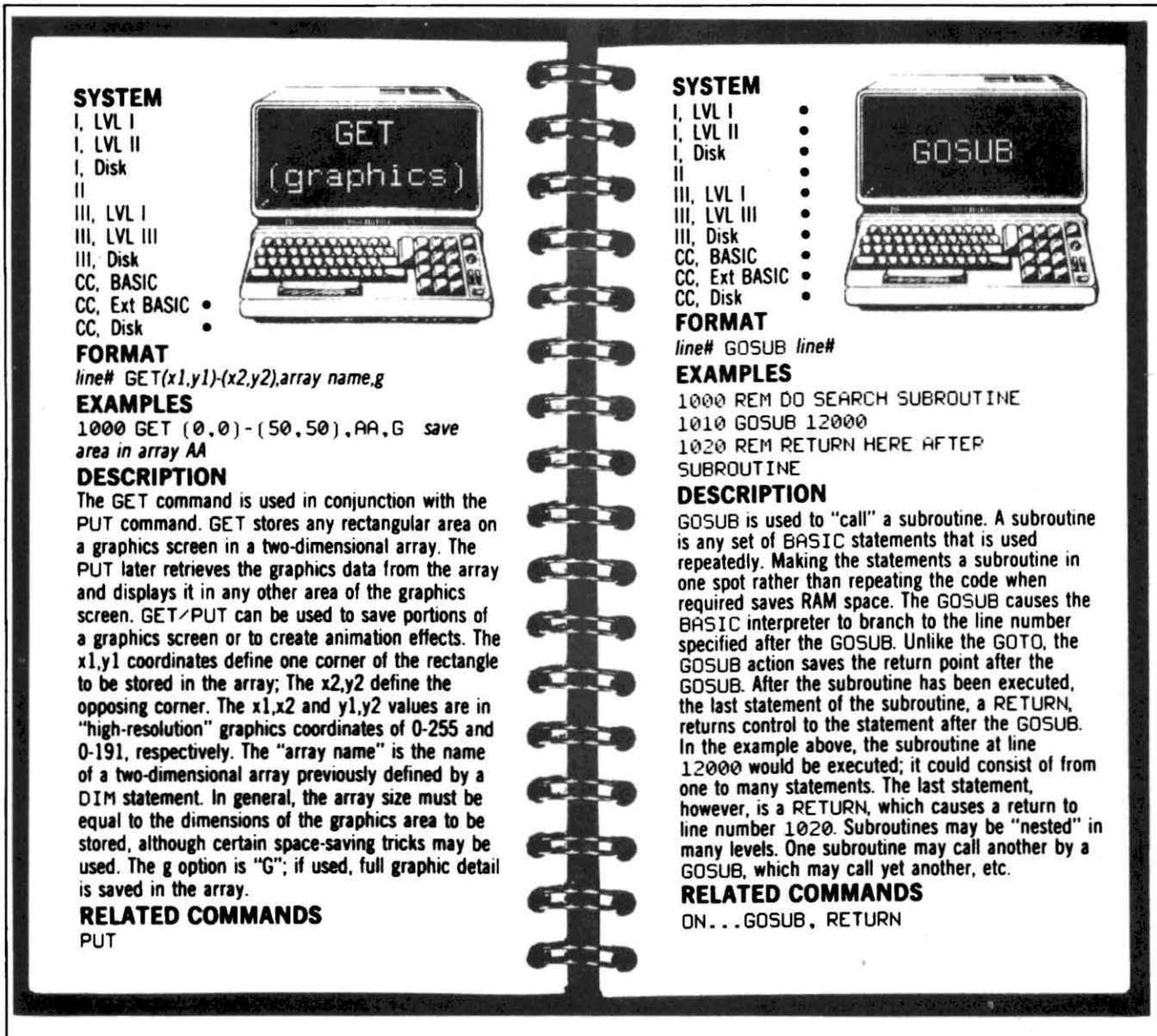

Fig. 1. Excerpt from the TRS-80 Pocket Handbook

★ ★ ★

Mindwarp
Quality Software and Consulting Inc.
P.O. Box 11355
Kansas City, MO 64112
Model I and III
$18.95 tape or disk, 32K

by Eric Grevstad
***80 Micro* staff**

An inferiority complex is an occasional hazard of TRS-80 ownership. Education, for instance, is probably the most important part of the home-computer boom; ads for Apple and Atari instructional software, from manufacturers like Xerox Education Publications and Control Data (the Plato series), look terrific. Model I and III users, on the other hand, are offered programs like Mindwarp—not a bad math drill in its way, but as advanced as Pong compared to Zaxxon.

Mindwarp is a two-person game for elementary students that combines flash-card arithmetic with the familiar premise of the game Concentration. The computer asks the players' names, the number of points required to win, and the time limit for answering ques-

tions. It then displays a board of 12 numbered squares, flashes one player's name, and shows a math problem.

If the player fails to answer within the time limit, the message is "Mindwarp—you lost your turn." If the answer is wrong, there's a limited repertoire of ripostes—"You are wrong," "Wake up," or "Are you sleepy," followed by the player's name. The right answer is flashed, and the opponent's name appears over a new question.

Correct answers bring praise—"Very good," "Excellent," or "Right on"—and a chance to pick two squares on the board, looking for a match. The chosen squares spin prettily, revealing ultra-low-resolution pictures (such as a house, a smiley face, or various abstract symbols); finding a pair is worth a point. Players are occasionally given a pass-or-play gamble, risking five points (plus or minus) on finding a match.

This is a pleasant game, but not an elegant one. The display reminds you Mindwarp is a math and not a punctuation tutor—commas appear and disappear at random ("Mary, wins with 10 points"; "Are you sleepy John"). The time-limit prompt asks for a figure such as 100 or 200, approximately equal to one or two seconds but arbitrary on first glance. The winner of the last game, whose name appears as "Champ," always goes first in a new match, with a free shot at the board and no math problem.

There's no way for one student to practice alone, unless he or she types two names. It would be nice to set different time limits, allowing a handicap for players of different ages or skills; the game doesn't permit it, though the manufacturer hints at a future version that will automatically speed things up as one gets better.

The documentation consists of two 6-by-8-inch sheets, run on a dot-matrix printer in teeny-tiny mode. The tape version comes with instructions for transfer to disk under any DOS; the disk version I tested came with no loading instructions, and required putting TRSDOS 1.3 in drive 0 and loading Mindwarp from drive 1 in Basic—all right for parents or teachers, but a bit of a chore for an eight-year-old.

Commas and loading instructions are small complaints, and it's details rather than major flaws that plague Mindwarp. There's a good variety of math

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ORIGINAL TOP TEN

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5)	CYBORG	5)	SPACE RACE
6)	LIBERATOR	6)	ASTRO BLAST
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problems, from 1 times 4 to multiple operations in parentheses; given the Model III's abysmal graphics, some of the pictures are kind of cute. The game gives math practice and memory exercise, and, at the very least, is more fun than flash cards.

Mindwarp won't draw kids away from arcades—or from an Apple running Stickybear Bop—but, once they begin, it'll hold their attention for a while. ■

★ ★ ★ ★

System Diagnostic 2.0
Howe Software
14 Lexington Road
New City, NY 10956
Model I or III
$99.95 disk
$94.95 cassette

by William D. Allen

If you use your TRS-80 Model I or III for anything other than playing Space Death Disaster, you should consider buying System Diagnostic 2.0, an effective diagnostic program especially useful in preventive maintenance (and with Tandy's recalcitrant Model I RS-232C interface board).

System Diagnostic independently tests each of your computer's major subsystems: ROM, RAM, video memory and display, keyboard, line printer, cassette data interface, disk drive and controller, and the RS-232C interface.

Options are selected from a series of menus. The first menu solicits information on your system, such as memory size, number of disk drives, and so on. This menu also gives you the opportunity to protect an area in high memory.

Note that System Diagnostic may not function properly on the Model I, depending on your operating system and lowercase hardware, *unless* you load a lowercase driver before going into the diagnostic. However, if the driver normally sits in high memory you must protect it or it can be destroyed by certain memory tests.

The second menu gives you the choice of either testing individual parts of the computer system or running a repeating series of tests.

Repeating tests check the system components most likely to cause trouble due to intermittent failure: memory, disk drives, and RS-232C interface. Each cycle includes all the tests for ROM, RAM, and video RAM, along with a subset of the program's tests for the disk drives and the RS-232C interface.

You cannot alter this testing cycle as the tests included are dictated by the program. You can, however, eliminate the disk drive and RS-232C tests by declaring on the first menu that these components are not part of your system.

Errors made by the computer are not retained on the screen or logged into a disk file for later inspection. The only way to check for failure during this cycle of tests is to log them to your line printer.

If you select the individual test option from the second menu, the program is more flexible. Also, the error messages are retained on the monitor until you can read them. But you cannot force the program to continuously repeat an individual test in order to find an intermittent fault. A selected test runs to completion and stops until you restart it or begin another test. Eight subsystems are listed on this menu.

The ROM test is a standard checksum test in which all the bytes contained in ROM are, in effect, added together with only the least significant digits being retained. Actually, three checksums are computed, one for each area of ROM so that the resulting checksums correspond to the results obtained from the Radio Shack diagnostics. ROM failures are rare, but it is comforting to see that they are OK and it takes only a few seconds to run the test.

Several different tests are provided for RAM. The first one tests RAM below the loading address of the program, 5500H, as well as that above the program. Testing RAM presents a problem in that the test can destroy the program doing the testing. This happens when the program writes over itself. Consequently, this quick, nondestructive test changes value at each location back to the original after testing. It tests all RAM except the loop doing the testing.

The next option is a much longer, more thorough test of memory that writes all possible values to all memory

Scanned by Ira Goldklang - www.trs-80.com

locations above the program area. Also included in this menu is a glitch test that tries to induce memory errors by turning the tape recorder relays on and off while running a short memory test. Finally, there is a test of the dynamic-memory refresh system.

The next item on the menu is a video display test. It lets you test the character generator, the video RAM, or the video signal and display. The video-character generator test sends all possible characters to the display. You must examine each character to see that it is properly formed. Video RAM is tested with a write/read test to see if all possible values write to and read from the video display memory.

The keyboard test is straightforward. The display requests you to consecutively press each key. If a key is pressed and the computer does not register it, an error message appears.

The line printer test is also straightforward. It prints a row of each ASCII character on your line printer. This lets you see whether or not any characters or print positions are not printing correctly. You can use this test with a serial printer if you first load a serial-printer driver. The same considerations mentioned before apply for the lowercase driver.

The cassette recorder system is tested in two steps. First the computer writes out a tape using the cassette recorder. Then the computer attempts to read the tape when you play it back. The Model III version of this test allows you to test the tape system at both high and low baud rates.

The most complete set of tests in this program is for the disk drives. Almost one-third of the manual is devoted to disk systems and tests to be run on them. There are seven tests:

- Drive select and disk-controller functions—Tests the electronics and mechanics that position the head in the disk drive.
- Track seek and verify read—A stress test of the head-positioning mechanism combined with an ASCII listing of each disk sector's contents.
- Formatting—Shows disk format including each sector's data address marks, CRC bytes, and so on.
- Write/read/verify all tracks and sectors—Writes a test pattern on each track, reads it back, and checks it against the original pattern.
- Write/read/verify without eras-

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SUPERDOS alters your present TRS-DOS master, expanding its capabilities, while correcting old problems. With SUPERDOS you'll be able to bypass any password protection, get rid of manditory clock and date operations (or keep one or both if you wish), and save precious time booting the system, backing up disks and executing files. No more error 13 messages. It will tell you in English what kind of error happened! SUPERDOS also uses two kinds of directories, the Radio Shack standard and the more common short type. In addition to all of this, you can make as many backups of VISI-CALC and SCRIPSIT as you want. The package comes complete with a high memory version of Debug to eliminate some of those conflicting lower memory problems. $19.95

SUPER DIRECTORY

STOP! Before you read this article, think about the condition of your disk library. Is it neat? Can you index any program within seconds? Are all you disks labeled and named? If you're in the majority, your answer to all three of these important questions will be, no. The big question is, why not? You've invested a lot of money on a time efficient machine like the TRS-80, but then you waste so much more time trying to find a program. The best solution is SUPER DIRECTORY by COMPUTER SHACK, the best indexing package on the market.

When we first came out with Super Directory, it was recognized as one of the fastest and most adaptable directory programs on the market, with its ability to read both model I and III disks. But now, with version 3.0 you can search the catalog by program name, disc number extension (/cmd), or even do a string search (find all occurences of any combination of letters). It will sort in seconds, on disk number, program name, remarks, extensions, or catagories. You can even add a 25 character description of each program and read any DOS on a 5¼ inch disk.

(SUPER DIRECTORY also keeps track of all free space on your disks, has a custom print driver, and is the only directory with all these features.) I could go on forever, but as you've probably already seen, SUPER DIRECTORY is the answer! And right now you can get the complete disk package for only $49.95

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ing—Same as above, except contents of track are saved in a buffer and then written back after the test.

- Disk drive timer—Measures the rotational speed of a disk.
- Disk head cleaner—Moves head back and forth for proper cleaning with head-cleaning disks.

The last tests on the menu are for the RS-232C interface. They check six functions on the Model III, seven on the Model I.

- Initialize RS-232C interface and display switch positions (Model I only)—Displays current settings of RS-232 with an option to alter the settings controlled by software.
- Connector test—Checks electrical connection of interface to computer. This is very useful for Model I.
- Transmit data test—Uses UART to transmit data. Verifies by checking UART registers.
- Framing test—Checks relation between data and stop bits.
- Data loop test—Transmits data and displays echoed data if loop exists.
- Baud rate generator test—Sets baud rate generator to each different rate.

The Documentation

The program's manual is 31 pages long. It is typed script on standard-size paper and comes in a three-ring binder. The documentation is good by any standards and excellent by microcomputer standards.

It explains why a particular test is performed and what some of the error messages might mean. For example, an error in the memory test might not be caused by a bad memory chip. In a Model I, it is more likely to mean that there was a bad connection between the keyboard and expansion interface.

Dr. Howe also writes about preventive maintenance and how to avoid problems like erratic connections between the Model I and its infamous RS-232C board.

There is only one suggestion of Howe's with which I strongly disagree: Cleaning your Model I edge connectors with a pencil eraser is not a good idea. You will get much better results if you use cotton swabs and a tuner cleaner that contains a lubricant.

My complaints are minor and mostly relate to the choices for configuring the program to your own needs. These options are too many in some cases and too few in others. Also, a few points are not adequately covered for beginners: backing up the master disk, copying the program to a system disk, and protecting drivers in high memory.

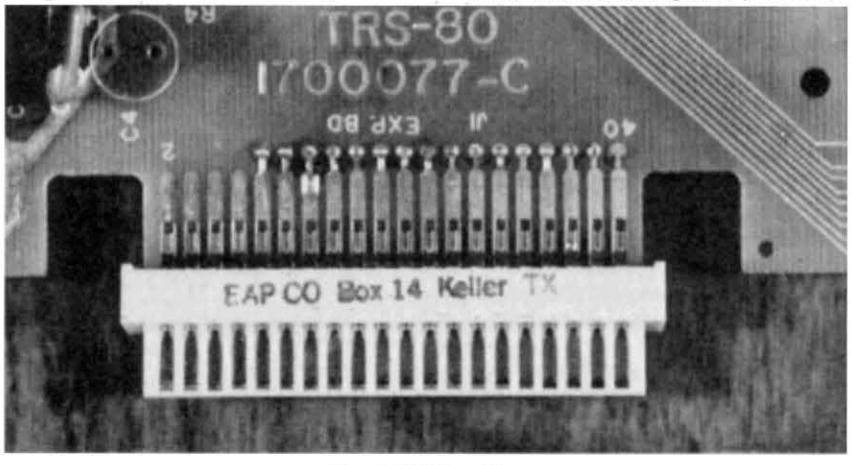
The most serious criticism I have of the System Diagnostic concerns the continuous test mode. The program cannot be configured to diagnose a particular intermittent fault and you are not allowed to decide which tests to include.

A second problem is that error messages produced during the continuous test mode are not retained without a printer that can run for perhaps days at a time. It would be nice to have the option of having the error messages either retained on the screen or written to a disk file.

$54.95 for COMPLETE SET

Ahhhh, instant relief! At last there is a permanent cure for contact oxidation on Model I edge connectors. Many TRS-80 users are familiar with the symptoms: untimely resets, spontaneous reboots, or the inability to get the computer started at all without a frustrating session with a pink eraser.

The Gold Plug 80 is a well made device consisting of an edge-card plug with gold plated contacts, available with either 34 or 40 contacts. The rear of the plug has terminal tabs which fit exactly over the existing foil fingers on the TRS-80's connectors. After installation, the original plugs have been extended about a half inch, meaning that the plastic door covers no longer fit. This did not trouble me, but you should take it into consideration. E.A.P.'s advertising leaflet, by the way, cautions you about the doors, which is refreshing. They also have the excellent policy of permitting you to return any plugs ordered for a refund if after seeing them you are unwilling to undertake the installation.



The Gold Plug 80

VISA

GOLD PLUG 80-E.A.P. COMPANY ~216

P.O. Box 14 Keller, TX 76248 (817) 498-4242

MasterCard

An excellent set of instructions accompany the plugs, and they are shipped promptly. I ordered mine by mail on a Monday and received my set of plugs by first class mail on Tuesday of the next week.

Installation

Installation requires a soldering iron (I use a 40-watt Weller), Rosin-core solder, a Phillips screwdriver, and your last Pink Pearl. The keyboard and Expansion Interface have to be disassembled to get at the connectors, which are then cleaned—the eraser's last fling. The Gold Plug 80 is fitted over the existing plug with the contacts centered, and then soldered to the board. I have some soldering experience, but it proved to be an easy, safe job. The contact is heated, a very small amount of solder applied, and then you go on to the next contact. It took about an hour to do all six plugs.

If you are a little nervous about this kind of work, note that all the contacts on the underside of the RS-232 output connector are grounded—that is, they are all connected. Start there; you can do no harm and the practice will be helpful.

The Gold Plug 80 set I bought included all six plugs. The plugs are available individually for $9.95, or you can get a pair for the keyboard to Expansion Interface cable for $18.95.

As I said earlier, I did resolder every connector on the machine, and I haven't had a single unwanted reset since. ■

I also feel that some of the error messages could be easier to understand. A counter argument to this is that if you are capable of actually repairing a computer, you should be able to figure out the error messages. Otherwise you probably do not need to.

Another minor problem is the configuration procedure. If your computer has certain types of circuit failures, the diagnostic program may be destroyed during the test. Consequently, confirming some problems requires reloading the program several times. This is tedious with the current version of System Diagnostic because you have to go through the same menu questions each time you run the program. There is no way to modify the program so that it is configured permanently to your system. This is hardly a major failure of the program, and Dr. Howe has promised to remedy this problem in the next upgrade.

One undeserved criticism of System Diagnostic is that it is an enhancement of the old System Doctor once sold by TBS, a company now out of business. Having used both, I disagree. Only the menus are similar. Howe's program is not only different, it is much better, especially the disk-drive tests.

The Model I version of System Diagnostic also works with the LNW80. Note, however, that the checksum test returns an error for ROM A because the code is slightly different. (The correct checksum for ROM A in the LNW80 I tested was AAB3H.) The RS-232C interface is also different on the LNW because the baud rates are set by the hardware rather than by the software. Nonetheless, most of the RS-232C tests are applicable. Dr. Howe is considering revising either the program or the manual to reflect this. He also tells me that the program works with the PMC, but I have been unable to confirm that.

The program is distributed on both cassette and disk. (I tested Model I and III disk versions for this review.) The disk is not a system disk, so if you're a one-drive owner, buy the tape unless you can get someone to copy the program onto a system disk for you. You should be able to dump the tape version to a disk in a one-drive system. Check your DOS manual.

All testing for this article was done with MULTIDOS, but the System Diagnostic should function with any DOS. If, however, you load the diag-

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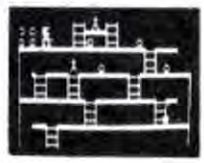


LIBERATOR by John Crane

Adventure, excitement, action, danger and even beautiful girls! Liberators got it all! This fantastic arcade game will get your heart pumpin' and your mind moving!

With your eyes glued to the screen and your fingers wrapped around the controls, move cautiously through the treacherous industrial park on a most dangerous mission. You must locate and rescue four lovely young girls from their monsterous capture. Ahh, but there's a catch! They've been captured by a 2000 pound, seven foot tall, mechanical robot gone mad. Sound easy? Just wait until you see the surprises we've got instore for you! 1982's most popular arcade game, Donkey Kong™, comes to life on your TRS-80 screen through the magic of John Cranes LIBERATOR! And if you thought Donkey Kong was fun, wait until you experience LIBERATOR's five seperate screens (more than the arcade version) each utilizing the best sound and graphics possible! Model I/III.

Tape ..... $19.95 Disk $24.95

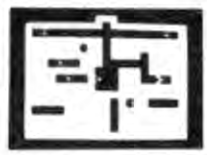
CLASH By Bill Dunlevy

Once again, one of the markets most creative programers, creator of Assault. Jovian, and the ever famous Cyborg, brings to the industry another smash hit! Yes, Bill Dunlevy has created CLASH, a fantastic new arcade simulation!

Mounted upon your great white winged stallion, prepare yourself for a clash within the arena. This day, you will be competeing against famous riders from all over the planet. As the tournament begins, their is a frenzy of flapping wings and bucking horses, but finally all riders are airborne and the contest has begun. With a firm grasp on the reins, manuever your horse above the others and then descend upon them. You must dismount the other riders, before their skill prevails and they dismount you.

Be warned, CLASH is for those riders of skill and reactions! Even one second of carelessness can prove fatal. But for those who love a challenge and an adventure, CLASH, with its multi-levels of play, will definitely become a favorite! Model I/II

Tape ..... $19.95 Disk $24.95



DIG OUT by John Crane

Uh oh! The wackiest game to ever hit an arcade is now invading your computer! Dig Out, that crazy game of dirt and rock will turn your reactions inside out.

As the game begins, you'll find yourself amidst tons of rock and earth. You must dig your way through the surrounding tunnels and hunt down the deadly monsters. But watch out!!! As the hunter, you might just become the hunted. The monsters are strangely powerful, their touch can destroy and their eggs can obliterate. Besides all this, the underground is their natural habitat. With a mere thought, they can move through tons of rock and appear before you. So, you better be quick and your reactions better be good!!!

DIG-OUT is truly another COMPUTER SHACK classic. In each of its fifteen different levels, DIG-OUT combines the best sound, fantastic graphics, and above all, exciting action for a game that surpasses even the original. Model I/III

Tape ..... $19.95 Disk $21.95

ASSAULT by Dunlevy & Frayer

Strap yourself into the dimly lit ATV (All Terrain Transport), check the motor, the laser's, and visibility, Now prepare yourself for an underground trip that you won't soon forget... If you live! After weeks of exploring and mining, you've accumulated quite a tidey sum of gold. But just as you thought the adventure to be over, you stumble upon a part of the mountain that is soon to become your battle ground, if not your grave. These wide open caverns are inhabited by strange creatures set upon stealing your gold and maybe even your life. You can battle them in your laser equipped ATV, but beware! Along the walls grow rather harmless looking mushrooms, that is until you've touched one. But all of this is childs play compared to battling NODRID, the emperor spider of this hellish place. His bloodthirsty fangs will make short work of any unwary adventurer, but you will not find him such an easy prey! Model I/III

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nostic with one DOS and then test your disk drives with disks formatted by an incompatible DOS, you might have problems.

I like Howe Software's backup, replacement, and upgrade policies. The program is not copy-protected. You can, and should, back it up as soon as you get it. Nonetheless, if you wreck the original, the company will re-record the program for you if you send the original back. This service costs two dollars. They also offer to make a backup for registered owners for two dollars if you send them a blank cassette or disk. Future upgrades are expected to cost $20.

"I like Howe Software's backup, replacement, and upgrade policies."

If you depend on your TRS-80, you need the System Diagnostic. It is not perfect, but it is the best TRS-80 diagnostic program I have used, and I have every TRS-80 diagnostic available. ■

★★★★

Interface Projects for the TRS-80 (Model III)
Richard C. Hallgren
Prentice Hall
Englewood Cliffs, NJ 07632
Softcover, 152 pp.
$12.95

by Gary A. Shade

Interface Projects for the TRS-80 details the Model III's I/O bus and the hardware and software needed to successfully interface specialty equipment to it. Although the book is written with the engineer and technician in mind, anyone knowing the basics of hardware and software construction can understand it.

Hallgren presents 10 applications. He not only explains the circuits and programs he presents, but the theory behind the circuitry as well. Most of the software is written in Basic with a few of the applications requiring Assembly language. All the software can be easily tailored to your needs.

"Although the book is written with the engineer and technician in mind, anyone knowing the basics... can understand it."

Some of the applications presented are: a slow-speed analog to digital (A/D) converter, a high-speed A/D, a joystick interface, a telecommunications program, biofeedback circuits (including a heart-rate monitor), and a circuit to control a video recorder.

The last chapter of the book describes construction methods for prototyping the circuits presented. This is quite useful for the novice circuit builder attempting to learn board layout principles.

This book is well-written and easy to read. If you're an engineer, technician, programmer, or a gamer in need of a joystick, *Interface Projects for the TRS-80* should be on your reading list. ■

★★★★★

PLAN80 (Version 2.5)
Business Planning Systems
Two North State St.
Dover, DE 19901
Model II
$495
by Charles R. Perelman

PLAN80 is a sophisticated financial modeling program in spreadsheet format. The program's features allow you to create almost any type of financial forecast or summary that does not require statistical functions. PLAN80 accommodates cost/budget estimates, sales projections, complete real-estate project analyses, and income- and estate-tax planning.

The software is distributed by Digital Marketing Corporation of Walnut Creek, CA, and the publisher, Business Planning systems, (see address above). You need a Model II or other 8-inch disk drive capability, CP/M with at least 56K and a text editor.

A helpful routine first solicits cursor-addressing information for your terminal, then graphically tests each step to be sure you have made the correct entry. (For the Model II with Pickles and Trout (P&T) CP/M, the required video display codes are listed in the P&T manual.)

Creating a model is separate from the actual display. For complex models, you'll save time by outlining requirements and structure before attempting to program. You establish a file containing parameters for columns, rows, data, rules, and any options.

Titles can be entered for printout but will not appear on the screen unless you print a model with all print commands. The system is logical and flexible.

The format of your model can vary from one row and 511 columns to the inverse. Unlike some other popular spreadsheets, PLAN80 allows you 63 rows and 50 columns. Powerful merge techniques enable you to incorporate or merge summary data from a number of files. This extends the system's potential to cover any practical amount of data in your model.

Program set-up is straightforward, accommodating labels of one to eight alphanumeric characters, the first of which must be alpha. With meaningful labels, programs are largely self-documenting, although you can enter comment lines where desired. You can assign a heading of up to three lines to label rows or columns.

The software is user-friendly, but you should read the manual from cover to cover before building a model. The documentation helps you become familiar with the many special features that speed set-up and make the system so versatile.

Error traps provide a marker to pinpoint error locations and indicate what character the program expected. This works well unless the error is due to the syntax of a prior line; then the error message is puzzling.

Column and row parameters include optional print controls for number of decimal places, dollar signs and percent signs. You can underline a row with any character that prints on the next line or overline with a character appearing on the previous line. One or more columns or rows can be selected for processing with a For statement, and one or more

of a group can be excluded with Except.

A number of special operators provide shortcuts to set up sequential data or row and column labels. For example, Y1981...8 makes eight columns labeled Y1981, Y1982, and so on.

Repetition of adjacent data values or generation of a series of values varying by absolute or relative amounts is accomplished with a starting value, adjustment factor, and arithmetic operators. Any single cell or group of cells can be filled with results of a function or particular data.

Your rules govern the interrelationships of data. The wide range of operators for rules include the garden-variety functions to addition, division, multiplication, and exponentiation, in addition to SUM, AVG, CUM, MIN, MAX, ABS, SQRT, and INT. Scientific notation can be used. The CP/M version of PLAN80 is accurate to seven significant digits.

FRAC returns the fractional part of a number; EXP and LN are natural log functions. LOG gives you the base-10 logarithm. A full range of trig operators includes all arc functions that compute in radians like most Basics. IRR figures internal rate of return, NPV calculates net present value, and AMORT produces a table of interest, principal and balance information.

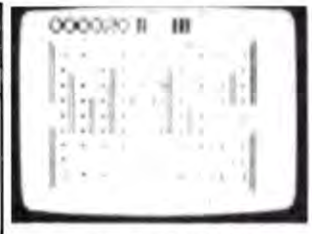
The manual errs in describing proper syntax for the AMORT function. You must put a space between each required input for the function, with or without the commas shown in the example.

If you enter more display digits than the column width selected, PLAN80 truncates the *most significant* digits and places an asterisk to the left of the mangled data. This is a little disconcerting since there's no mention of it in the documentation.

The following depreciation functions prorate initial- and final-year depreciation for equipment acquired during a fiscal year: straight line, sum of the years digits, declining balance, and declining balance with a switch to straight line at crossover. Depreciation figures are cumulative rather than yearly.

Gremlins fiddling with the algorithm for declining balance switching to straight line cause it to change over at the wrong point. Additionally, the normal declining balance function does not quit at the end of asset life, but continues for as many additional years as the model allows. BPS was responsive

COMPUTER SHACK



PACDROIDS

With its space theme, the Super Saucer lays destructomines and the Super Bomb that disintegrates everything in your path, right up to the wall. The maze changes every 10,000 points as the difficulty escalates. 1-4 players. COCO only. 16k
Tape..... **$19.95**

COLORPEDE

Colorpede has a variety of bugs ranging from a tiny bettle to the gigantic colorpede. Colorpede has better graphics than Katerpillar but the sound is not as good. Colorpede also has a more varied and complicated play routine. COCO only. 16K
Tape..... **$29.95** Disk..... **$34.95**

DONKEY KING

Using the four stages from the original acrade game, with your joystick in hand try to jump the barrels, collect the pins, manuever your way past the falling jacks, and figure out the crazy conveyor belts. Written by Tom Mix, this ones sure to become a classic! COCO 32K
Tape... $24.95 Disk... $27.95

SHARKS TREASURE

You can practically feel the suspense mount as you dive through treacherous shark infested waters in hopes of retrieving riches beyond belief. If you are quick, you may get a chance to use one of your three grenades and with some extraordinary manuevering you could make it through this deadly obstacle course. Fantastic graphics make this game a must. COCO 16K
Tape.....**$21.95** Disk.....**$26.95**

ROBOTTACK

Manuever your way around screen in a last desperate tempt to save the human fan As the robots grow in numt use your lasers to elimin them and your superior m uevering to avoid their deadly grip.
ROBOTTACK is a 100% machine language, 1 to 2 player arcade action game for the entire family. 16K COCO.
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DOODLE BUG

DOODLE BUG is a machine language high resolution graphics game for one or two players who move their Ladybugs through an ever-changing maze gobbling dots and other items while avoiding deadly enemy bugs and skulls. Excellent graphics - Similar to Lock N' Chase". 16K
Tape.....**$24.95** Disk.....**$29.95**

COLOR DIRECT FILE TRANSFER

Tape version **$24.95** Disk version **$29.95**
Now a program for the Color Computer that allows you to download basic programs from Bullet-80 systems. It will also send and receive programs from other Color Computers, Model I's and Model III's.

Direct File Transfer (DFT) is a modem program which will handle the direct uploading and downloading of machine language, word processor files, text files, and basic programs directly to tape or disk with no conversion necessary. It is the program you must have to download from any Bullet 80 system. DFT also has a chat mode, and has software controlled half and/or full duplex.

COLOR TAPE COPY $15.95

By Bob Withers
There have been a few copy programs on the market for the Color Computer but none can compare with Color Tape Copy. This program is designed so that you do not lose any of your valuable programs or data bases.

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5-83

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Dennis Kitsz
80 Applications Column
80 Microcomputing

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"Lookup is a flexible reference tool."

to inquiries about the program and documentation, and stated they corrected the problems I called to their attention.

Spread, also called ACRS (Acclerated Cost Recovery System), is an interesting new feature. You input cost and the differing percentages applicable to each year under ACRS. Depreciation is spread over the years of life on the basis of the percentages.

If you enter acquisitions for more than one year, cost is properly allocated for all assets, applying the sequential percentages to each asset from its year of acquisition. Depreciation for each year is shown rather than the cumulative totals of the regular depreciation function.

Constructing a depreciation table for a group of assets acquired at different times over several years is very fast. This function has potential for myriad uses, particularly in forecasting.

Lookup is a flexible reference tool comprising a table of ranges. Input data is compared with each value in a table and the appropriate complementary value returned. For example, a table of postage rates is used to determine the cost of mailing a package. Lookup covers situations where relationships between data are irregular.

You have full use of the powerful If...Then...Else format, as well as And, Or and logical comparisons. Complex function combinations are developed using parentheses.

The program's shifting feature uses values from one fiscal period as different variables in a subsequent period. This feature is particularly useful for cash-flow analyses and similar programs that utilize data from prior periods. For example, a second-quarter balance of inventory or cash can be used as the starting balance for the third quarter.

PLAN80 jumps over rows or columns while shifting. This permits you to mix subtotals in rows or columns that are skipped when reference is made to data for a prior period.

Include is similar to its namesake in some other compilers. With a simple file-name reference, it acts as a subroutine and calls external files into the main program. Nesting is permitted. You can build a library of modules and piece them together by including them in a larger model.

Put places data from an application into an external file. Using For you can designate specific portions of the data to be Put (saved). You can then Get the saved file data into a new program in its original form or merge it with existing data (consolidation) or scale it (multiplication or division).

PUTM and GETM will save titles, columns, rows, and options sections, but not rules or data. This saves the outline and basic structure of your model for use with different data. To copy rules from one file to another, you must use your text editor.

Options allows you to set the width of row descriptions and all columns (individual columns cannot be customized), format page length and width, print labels instead of full column or row descriptions, choose a character to print for zero values, insert commas in numbers, and use brackets for negative numbers.

After you complete the application file with your editor, run it with PLAN80. Initial experiments will probably require returning to your editor for debugging. In most instances PLAN80 lets you continue reading your application file and spot errors without aborting.

By continuing with your program as far as PLAN80 will permit and making a note of each error code, you can make multiple corrections at one time. The most annoying and time-consuming factor with a program like this is the necessity to recompile (return to edit, save, and then reload PLAN80) when debugging.

Model files with an extension must be called into PLAN80 with the complete file name. Without an extension, PLAN80 requires a period after the file name. Omitting the period yields a file-not-found error. This information, too, is missing from the instruction manual.

If you choose to put results on the screen after debugging, an entirely new interactive display mode is available. Like conventional spreadsheets, any datum on the screen can be replaced and the model run with the substituted data.

Cursor movement for vertical and horizontal scrolling and choosing data for change uses both upper- and lower-

Advertisement

Announcing an All In One Program for the TRS-80

NOW, Your TRS-80 can Write Programs for You.

Your computer is fantastically fast...once it knows what to do. You probably realize that a computer is the combination of hardware and software, working together smoothly, to give you what you want. Either one alone is useless. Software is really the key...the "mind" of a computer system. Every project or task you want to do requires a new specific software application to make your computer behave exactly the way you desire.

Of course you may be able to "force fit" your application into some existing canned database you have, but to really get results, you need a separate application 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 the standard BASIC on your computer.

A Brand New Version

A company named ICR FutureSoft has released its NEW and long awaited version of QUIKPRO+ called QUIKPRO+II. It actually writes separate BASIC Programs for you...to do exactly what you want to do. And it's simple and easy to use...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 along as a complete program that runs in BASIC. Best of all, you do not have to be a programmer to use it. The QUIKPRO+II software becomes your personal programmer, waiting to do your work for you any time of day or night you choose to use it.

The All In One Program

The custom programs you can generate from the new QUIKPRO+II will let you perform Personal Filing, Fast Data Retrieval, including Changes, Deletions and Searches. You can selectively Print Custom Letters, all kinds of forms (if you have a printer). This new feature is called Free Form Reporting. You can even include calculations in the programs you create. QUIKPRO+II is perfect for creating inventory programs. You can use QUIKPRO+II to prepare letters and selectively address the letters to only certain people. And of course you can SORT your reports so that they print out information in the order that you want it, or print out only certain information. In fact, you can actually use QUIKPRO+II to create an easy to use Data Management program or a simple spread sheet. You can do all of this and more with this All in One program...and the best part is that you need no BASIC programming experience.

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case ijkm keys or the WordStar esdx and rafc sequences. Number and letter combinations (such as 4i) move the cursor several rows or columns. You can move your display window to any location in the model.

Headings are automatically retained (rewritten) as the model scrolls, making it unnecessary to lock them in place as with some spreadsheets. Unfortunately, it is time-consuming to scroll in any direction because the entire screen is blanked and rewritten whenever you scroll.

A one-stroke print option sends the displayed data and all following portions of the model to the printer or a disk file. This gives you some degree of selective reproduction of information and the ability to produce printouts of models with different values.

By carefully locating summary sections toward the end of a model, you can substitute data until a desired result is obtained, then save the final results of a complex application without printing the details. More specific limitations print only the parts of a program with print statements in the model parameters.

If you are using a printer with Centronics parallel interfacing, you might need to suppress the extra line feed (using SETMISC in P&T) or printouts will be double-spaced.

Graphing is yet another feature of PLAN80. Up to three row variables for Y-axis variables can be plotted against columns selected for the X axis. Choose the variables to be graphed from your model with a single keyed entry. It is not necessary to create a different program file.

Four formats are offered in sequence with a press of enter: scatter, scatter of cumulative amounts, bar graph with bars for each selected variable displayed together, or bar graph with bars for different variables side by side for each period.

Scaling automatically fits the data limits. You can change the upper or lower limits for any variable and the program adjusts the scaling.

No printout can be made of the graphs unless you have a utility separate from PLAN80 that enables you to copy the screen.

With such intricate manipulations available in PLAN80, the only desirable features lacking are split-screen capability and built-in sorting offered by some spreadsheets. Since this is a financially oriented package, no statistical or engineering calculus functions are included.

The manual is nicely prepared on heavyweight 8½-by-11-inch paper, with sufficient margins for easy reading. It comes in a three-ring binder that lies flat for reference. Supplemental material for version 2.5 and a cardboard quick-reference card fit in a pocket in the front of the manual. The card was not updated to match page references in the manual and several error codes found in the manual are unexplained.

The manual includes a detailed table of contents, repetition of the contents information at the beginning of each chapter, and, with one or two exceptions, lucid explanations of the software. It is well-organized and contains a number of instructive examples for the novice as well as the experienced user; sample files are on the distribution disk.

I was disappointed by the skimpy index; it should be expanded considerably. It is inconvenient to flip through the table of contents scanning for a subject you didn't find in the index and possibly taking two or three tries to find a specific item.

Overall, PLAN80 is easy to use and written in understandable English. With practice and a good, full-feature word processor or text editor, you can set up and debug your applications quickly. Extremely complex models can be constructed in modules and combined in their entirety or selectively.

The possibilities for financial analyses are practically unlimited, including simple bank reconciliation or checkbook programs, sources and applications of funds, sensitivity analysis, cost-center budgeting, and income and revenue projections.

PLAN80 is a fine piece of software and deserves consideration if you are looking for a CP/M-based financial-modeling program that produces models of almost any complexity. ■

★★★★

Gemini 10 and 15 Printers
Star Micronics Inc.
Suite 216
1120 Empire Central Place
Dallas, TX 75247
Models I, II, III, 12, 16, Color
Gemini 10, $419; Gemini 15, $539

by John P. Mello Jr.
***80 Micro* staff**

The Gemini 10 and 15 printers beg to be compared with the Epson MX-80 and MX-100. From their appearance to their performance, the printers from Star Micronics of Dallas seem to be clones of the omnipresent Epson. However, the Gemini twins have a few selling points in their favor—price, for one.

A check of *80 Micro* advertising shows one mail order house offering the Gemini 10 for $399 and the 15 for $499. The same house sells the Epson MX-80 for $425 and the MX-100 for $640.

Also for the cost conscious: the Geminis use standard $2.75 typewriter ribbons. MX-80 ribbons cost around $8 each; MX-100 ribbons $13 each.

To that price advantage add convenience. If your Gemini ribbon suddenly dries up on you, you can bop down to the local drugstore for another one—not so with an Epson.

The Geminis are bidirectional, logic-seeking printers. Star Micronics rates their speed at 100 characters per second. Head-to-head testing against the Epson, though, showed the Geminis printed at the same speed as their competitors, about 80 characters per second.

The Gemini 10 features a 10-inch carriage while the Gemini 15 has a 15½-inch carriage. Both come with either a parallel or serial interface.

Using a parallel interface with an Epson cable (part number 8222) lets you disable the paper-out sensor. This happens because the Epson cable uses separate pins for line feed and carriage return signals. You can achieve the same effect by modifying pin 35 on a Radio Shack cable (part number 26-1401).

Without an Epson or modified Radio Shack cable, you can't disable the sensor. During single-sheet paper feeding, the printer stops after about 20 lines and the out-of-paper buzzer sounds. Tightwads who refuse to buy a new cable, as well as white belt chipsters who haven't reached hacker status yet, can "fool" the sensor by sliding a dummy sheet behind the page after it's about halfway through the printer.

In addition to friction feed, the Geminis come equipped for pin-feed

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LAN capabilities can be added to the THOR Winchester Disk System described above for just a small additional cost.

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and roller-feed operations. The Gemini 15 also accepts paper fed through a slot on its bottom.

Both Geminis have a 2.3K buffer with an optional 4K buffer.

All the print modes used by Epson—double-width, condensed, italic, proportional, and emphasized—are supported by the Geminis too. Other Epson-style features include subscripts, superscripts, underlining, and double-strike printing. All print faces have true descenders.

The Geminis use a 9-by-9 matrix to print standard characters and a 6-by-6 matrix for graphics characters. The matrices for bit imaging are 7- or 8-by-816 (single density) and 7- or 8-by-1,632 (double density).

Four indicator lights, located at the top right corner of the Geminis' molded plastic case, tell you when the power is on, the printer is on line, the data is being printed, and the paper is out. The DIP switches are located on the outside rear left corner of the printers. They are more accessible than Epson's.

One disappointing feature of the Geminis is their documentation. Their operation manual is cold, dry, and obviously written for experienced users. I borrowed an Epson manual and referred to the Gemini manuals only when necessary. This is truly a testament to the similarity of the printers. The Epson manual made working with the Geminis fun.

The Gemini printers seem to be made of a lighter weight plastic than Epson's. And they are noisy, so don't run off long program listings while the babies sleep.

The Geminis come with a 180-day warranty, excluding the ribbon and printhead, which have a 90-day warranty. Star Micronics rates the Geminis' printhead life at 100 million characters and the mean time before failure at 5 million lines. Both specs are equal to Epson's

Overall, the Gemini 10 and 15 are worth looking at if you're thinking of buying a dot-matrix printer. Even with the cost of an Epson manual added to their prices, you still save money. And you won't be trading off savings for quality. ■

Printer	Gemini 10 and 15
Type	Dot Matrix
Feed	Friction, Pin, Roll
Speed	100 cps (manufacturer's spec)
Interface	Serial or Parallel
Density	9 by 9
Graphics	Block and Bit
Character Set	Normal, Emphasized, Condensed, Double-Width, Proportional
Buffer	Yes
Logic Seek	Yes
Price	$419/$539
Manufacturer	Star Micronics, Dallas, TX 75247

Table 1. Printer Profile

★★★★½

TC-8C High Speed Cassette System
Color Computer, 4K or more
1 or 2 cassette recorders
$129.95

★★★½

JBUG Monitor
Color Computer, 16K or more
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JPC Products Co.
12021 Paisano Court N.E.
Albuquerque, NM 87112

by Scott L. Norman

Here are a pair of well-thought-out, well-documented products for the Color Computer. The TC-8C is an attractive upgrade that lets you read from or write to either of a pair of cassette recorders, while JBUG is a good monitor program with handy assembly/disassembly features.

The TC-8C

The TC-8C is intended for those CoCo owners using cassettes for mass storage, but who want more flexible file handling than that allowed by a single recorder. The system uses its own encoding format (a modified Huffman pulse code) to nearly double the rate of data transfer between recorder and computer. For this reason, recorders plugged into the TC-8C cannot be used to read conventional Color Computer tapes. You must, therefore, convert any existing tapes that you want to use with the new system. This is a simple procedure that I'll describe later in this review.

The manufacturer claims that the TC-8C doubles the CoCo's effective recording speed, and my measurements agree. For example, I converted a copy of Telewriter, which occupies the tape between index numbers 7 and 22 on my CTR-80A recorder, to TC-8C format; the new version resided between 7 and 15 on the same counter. Since the recorder runs at the same speed, the reduction in tape length for a given program corresponds to a reduction in recording (and reading) time.

The TC-8C's housing resembles a Radio Shack program pack with the free end thickened to accommodate a pair of DIN jacks. Naturally, you plug it into the CoCo's cartridge port. Inserting the review sample was a little tricky. The plastic case seemed to be a tighter fit than usual, and I had to carefully align the card edge connector with the computer's cartridge jack. Once it was seated, however, the assembly proved to be solid.

The two DIN jacks are numbered 1 (rear) and 2. If you are going to use only one recorder, plug it into the number 1 socket, since this is the system's default.

The standard Color Basic dialects include commands for handling data with just one recorder, so if you want to use two recorders for increased versatility, the TC-8C must handle the interfacing job. It does this through CCCOS, a mini-operating system contained in its EPROM.

CCCOS has its own set of commands for finding, naming, saving, loading, and verifying programs. These commands appear to be simple enhancements to Color Basic; none of the standard commands are lost. In this respect,

TC-8C operates like the EPROM-based operating system in Disk Extended Color Basic.

CCCOS does not autoexecute when the Color Computer is switched on. To bring it into action, enter EXEC 53248 or EXEC &HD000. The system executes the routines required to splice into Basic, and returns the OK prompt. CCCOS occupies about 600 bytes of RAM.

The TC-8C's 13 file-management commands and five new statements have now been added to the CoCo's vocabulary, with no noticeable time lag. Much of the new vocabulary resembles stock Color Basic, with two differences: The additions all begin with the @ character (@SAVE, @LOAD, and so on), and many of them let you specify the active drive. For example, recording a Basic program named Stuff on drive number 2 looks like this: @SAVE #2, "STUFF". Many of the commands have a similar syntax.

Commands and Statements

Now let's look at TC-8C's unique commands used for manipulating the hardware and getting complex programs on or off tape.

I've already mentioned @LOAD and @SAVE, which are used for Basic files: for machine-language material, the corresponding commands are @LOADM and @SAVEM. There is one difference here from Color Basic: the start, end, and transfer addresses for @SAVEM and the optional offset for @LOADM, must be in hex. You must omit, however, the prefix &H.

To add to your peace of mind, a pair of commands check newly-recorded files to make certain they agree with the contents of RAM: @VERIFY and @VERIFYM.

To use these verification commands, make the recording, rewind the tape past the beginning of the new file, and enter the appropriate command. The original file must be in memory, of course. Next, the tape is read and compared with the original; an error message is generated if needed. This allows you to make a new recording if need be. (In my opinion, one of the most attractive features of the original cassette version of Telewriter was the ability to check the validity of a recorded text file.)

With the @RUN command, you can load a Basic program through the TC-8C and run it immediately. Similarly, @RUNM lets you execute machine-language programs more quickly than Color Basic's CLOADM "---": EXEC combination. By the way, the TC-8C uses @GO to replace EXEC. Again, if you use an offset it must be in hex without a prefix.

In Color Basic, you obtain a tape file listing with SKIPF "XX", where XX is a dummy file name. The TC-8C uses @DIR for this purpose. If @DIR is used with a legitimate argument, the tape stops after that file is read. If you just want to position the tape at the end of the next file, simply enter @DIR without an argument.

"The TC-8C is worth a close look if you have decided against disk drives for your system. It gives you the best control you'll ever have over your cassette drives."

The last three TC-8C commands are @ON, @OFF, and @KILL. @ON is equivalent to MOTOR ON, except that you can specify a drive number. @OFF opens reed relays in the TC-8C cartridge to turn off both motors, and therefore uses no argument. @KILL exits CCCOS and returns to Color Basic.

The TC-8C has five additional program statements for handling data files. Once again, these are similar to Color Basic statements, with the added option of specifying a drive number.

- @OPEN—Prepares CCCOS to handle data files. Its mandatory arguments are I or O, which specify whether the file will be input to the computer or output to tape, and the file name. The drive number is optional. One file buffer for both input and output can be open at the same time, provided that two recorders are connected.

If you want to read the file "TESTDATA" from drive number 2, for instance, the statement: @OPEN #2,"I","TESTDATA" must appear first in the program. (Note that there is no argument corresponding to Color Basic's "#-1" to specify cassette operation; the @ prefix takes care of that, in a way.)

- @CLOSE—Closes an open file buffer. It must be used before another buffer can be opened for the same purpose—input or output.
- @PRINT—Writes numerical and string data into an @OPENed cassette file. Multiple variables are output in a single line if separated by the delimiter ;",","; as in this example: @PRINT X;",";Y;",";ZZ$(K). Admittedly, that lengthy delimiter string is not one of the TC-8C's most attractive features.
- @INPUT—Reads data from a cassette file. I'm happy to report that the delimiter in an @INPUT variable list is a simple comma.
- @EOF—This is the TC-8C end-of-file variable, and is nonzero only at the end of a data file. You use it to set up program branches: IF @EOF < > 0 THEN nnn, where "nnn" is the destination statement number for the branch.

The TC-8C manual gives clear examples of all the statement syntax options. It also contains complete listings for two Basic programs for general data-file handling: one for a single recorder, one for a pair. As they stand, the programs are useful for maintaining, say, a small mailing list. They also serve as excellent models of cassette programming for similar applications.

Converting Standard Cassette Programs

I mentioned earlier that standard cassette programs must be converted to the TC-8C's format. Here's how I did the job for my faithful old copy of Telewriter.

I connected one recorder containing Telewriter to the Color Computer's own DIN jack, and a second recorder (with a blank tape aboard) to port #2 of the TC-8C. After powering up and executing TC-8C, I loaded Telewriter as usual. I then saved it on the second recorder, using the three addresses given in the Telewriter manual: @SAVEM #2, "TELEWRIT", 1E28, 375A, 1E2E. Being a cautious sort, I rewound the tape and verified the new copy: @VERIFYM #2, "TELEWRIT". And that was it!

A couple of points about this process are worth highlighting. First, I used both the TC-8C and the Color Computer cassette ports; the implication here is that you could use three recorders.

Why would you want to? For example, you might keep a file-management program on one recorder plugged into the Color Computer's DIN jack and use another pair of recorders connected to the TC-8C for the data files themselves. The old files are now on recorder #1, and the new updated files are written to recorder #2. This system gives cassette users some of the flexibility enjoyed by disk system owners.

At the other extreme, I could have completed the whole process with a single recorder by loading the program with the recorder connected to the CoCo port, and then reconnecting it to the TC-8C to receive the conversion. It's awkward, but possible. To be perfectly honest, though, the only advantage the TC-8C offers single-cassette users is its higher operating speed, and it's questionable whether that is worth the price.

If you need multiple-recorder operation, though, it's hard to see how you could go wrong with the TC-8C. The cost of a system and a second recorder is less than half that of the Radio Shack disk controller and first drive, so there is a genuine trade-off between savings and the convenience of disks.

The TC-8C documentation is excellent as well. It clearly describes each command and statement, together with CCCOS variables and constants for those inclined to tinker. It is also presented in a very professional package.

The TC-8C is worth a close look if you have decided against disk drives for your system. It gives you the best control you'll ever have over your cassette drives—at least until someone finds a way to make them rewind under program control!

JBUG

The JPC's JBUG monitor is available in a 2732 CMOS EPROM for installation within the TC-8C cartridge. It also comes in the garden-variety cassette format.

JBUG performs the standard system-monitor functions on behalf of Assembly-language programmers. Single-letter commands, followed by hex addresses, let you examine and change values in memory, list blocks of memory contents, set breakpoints, display the contents of the 6809's registers, jump to a given location to begin program execution, and list material on a printer.

JBUG can't save and load binary cassette files—those chores are left to Basic or to the TC-8C—but it does offer a couple of features not normally expected of a monitor: direct assembly to memory and disassembly of anything already resident in ROM or RAM.

The EPROM version of JBUG resides in a 4K block beginning at 57344 (hex E000), while the cassette version automatically loads into 12288-16383. The program is written in position-independent code, though, so you can move it to the top of a 32K machine. In the same way, you can copy the EPROM version into RAM and subsequently record it on tape. Even if you upgrade to a disk system in the future, JBUG is still usable.

"JBUG can't save and load binary cassette files—those chores are left to Basic or to the TC-8C—but it does offer a couple of features not normally expected of a monitor: direct assembly to memory and disassembly of anything already resident in RAM or ROM."

JBUG's commands are fairly simple to understand. In fact, they resemble those of several other monitors. Let's take L (List) as an example. If xxxx and yyyy are any hexadecimal memory locations, Lxxxx,yyyy displays everything between them (yyyy must be the larger number). The screen display format is 16 lines of four bytes each, in both hex and ASCII. You use the spacebar to advance to the next block of 64 locations; any other key terminates the command.

The syntax of the Memory Change and Examine command is Mxxxx. JBUG displays this "pointed address" followed by its contents. You change the contents by entering any two-digit hex number, or by moving forward or backward through memory one location at a time. The enter key moves you forward, while shift-up arrow followed by enter moves you backward. Any non-hex character followed by enter returns you to JBUG's command mode.

You use this method to enter short machine-language routines through a monitor. However, JBUG also offers the A (Assemble) command for working with standard 6809 mnemonics. It is by no means a full-featured assembler, but it makes life much easier for the programmer.

The A option has a few peculiarities of its own, mostly arising from the small size of JBUG itself. All numeric values in Assembly-language input must be in hex, preceded by the $ (dollar sign). Registers are designated by single characters, so the stack pointer and program counter become S and P, respectively. Left and right square brackets are formed by the shift-down arrow and shift-right arrow combinations.

To use the command, enter A followed by the hex RAM address where assembly is to begin. The address is displayed and JBUG pauses for keyboard input. Next, enter the mnemonics for the first command. JBUG performs the translation to machine code, displays it along with the original ASCII, and proceeds to the next address. Hitting enter unaccompanied by mnemonics terminates assembly.

The D command, followed by a pair of hex addresses, results in the disassembly of any machine code located between its arguments. Ten lines of code are displayed on the screen at a time. The space bar advances everything to the next ten instructions, while enter terminates disassembly.

If an undefined instruction is encountered, a Syntax Error message terminates the process. You can use this to diagnose material entered with the A command. (Because of JBUG's limited size, it is possible to enter improper instructions that are not detected during assembly.)

Any JBUG option preceded by a P has its output directed to the printer as well as to the screen. Therefore, P, D, A000, and A100, produce a printed listing of the disassembled machine code residing between locations A000 and A100.

The remainder of JBUG's commands are fairly standard. Bxxxx sets a breakpoint at hex address xxxx; upon execution the program stops at that point and the contents of the 6809's registers are displayed on the screen. The J (Jump) option is used to transfer pro-

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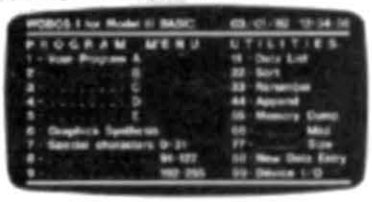

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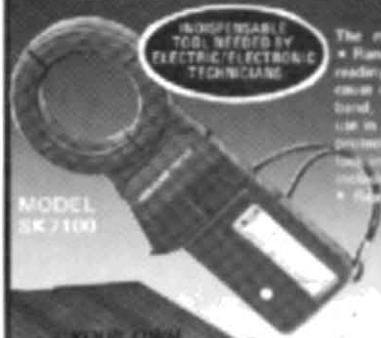

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gram control either directly (if followed by a valid hex address) or indirectly (if followed by an address in square brackets).

The Go option, G, permits processing to continue following a breakpoint trap. Control is restored to the address of the last restored breakpoint. The Register Dump, R, reprints the values of the registers preserved at the last breakpoint trap. Finally, X returns you to Color Basic.

Once again, the JPC documentation leaves little to be desired. Besides a detailed description of each JBUG command, the manual contains a thick appendix on 6809 programming. This material is taken directly from the *Motorola Programming Manual* for the microprocessor, and is attractively presented: for example, each instruction gets its own page.

"JBUG doesn't do it all... However, I have found the program to be a simple, compact, and friendly tool."

JBUG doesn't do it all; instructions for examining and immediately changing register contents come to mind. However, I have found the program to be a simple, compact, and friendly tool. The assembly and disassembly options don't hurt a bit, either. Hardcore Assembly-language enthusiasts will probably need other tools, including a higher-powered assembler, but JBUG still represents a very reasonable value.■

* * * *

Cyberchess Chess Improvement System
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by Terry Kepner

Cyberchess is a teaching tool for people serious about learning to improve their chess skills, both amateur and professional. The games are divided into two categories: unrated to 1,650 tournament strength, and 1,600–2,250 tournament strength. Unlike some other microcomputer chess programs, Cyberchess doesn't challenge you to play a game that depends on the programmer's chess skills to beat you, nor does it take one or two games to teach you preprogrammed gambits or moves. Instead, Cyberchess lets you participate in games that have been played in bona fide tournaments.

More than a demonstration of various moves that can be used to your advantage, Cyberchess makes it possible for you to play the grand masters of chess at your level, your speed and your convenience. And the grand masters teach you by analyzing and correcting your moves and telling you what's wrong and what's right about each move you make.

The software package consists of a master system disk and over 55 four-game disks available in each of two categories—amateur and professional. You begin with the master system disk containing the main programs, instructions and four games (two amateur and two professional). Once you've mastered the games on this disk, you can buy the next disk in your rating field. There are several hundred games, gambits and techniques to learn.

For example, in the amateur rating, disk AMT-001 teaches the Center Counter opening, the French Defense (how to exploit a weak opening play by your opponent), the Sicilian Defense (how to storm a fianchettoed King's wing), and the Queen's Gambit Declined (how to sacrifice a rook and bishop to pursue the opponent's exposed king).

The professional disk, PRO-001, analyzes Philidor's Defense (how sound development ends in a strong attack), Ruy Lopez (how sound play exploits an inferior opening play by the opponent), Larson (how white, after a sacrifice, can avoid rushing to the kill and deliberately foil each trap as it appears), and Evan's Gambit (how to exploit an attempt to attack with insufficient force and counterattack forcefully).

The system is simple to use: first, set up a chess board beside your computer. You'll play most games with real boards and pieces. There isn't enough room on the video for the game board, your move choices, their comments and analyses, and other information.

Next put your DOS disk in drive 0,

```
AMT-SYS/GAME 1      LOSING   DRAW   WINNING     MOVE #: 1
LEVEL:BEGINNER                                  DFCLTY: +1
1. QN-Q2
2. P×P
3. Q-Q3
4. B-Q2
5. B-N5+
6. 0-0

PRESS THE MOVE # OF YOUR CHOICE
```

Figure 1

```
AMT-SYS/GAME 1      LOSING   DRAW   WINNING     MOVE #: 1
LEVEL:BEGINNER                                  DFCLTY: +1
1. -1               NOT QUITE AS GOOD AS TEXT
2. P×P
3. Q-Q3
4. B-Q2
5. B-N5+
6. 0-0

PRESS THE MOVE # OF YOUR CHOICE
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Figure 2

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the Cyber System disk in drive 1, and type CYBER at the DOS Ready prompt.

The software, a compiled Basic program using Simutek's ZBASIC, automatically checks to determine which games are on your disk. If you want to use one of the data disks, copy the Cyber program to your DOS disk and put the data disk in drive 1 before typing CYBER at the DOS Ready prompt.

Cyberchess lists the four games on the disk, the color you'll be playing, the United States Chess Federation (USCF) rating, and the opening move for each game. It then asks which game you wish to play. After making your choice, the program gives you a brief summary.

I chose the first beginner's game on the system disk and it told me:

```
PROGRAM AMT-SYS  GAME#: 1
  CLASS: AMATEUR
IN THIS GAME YOU PLAY THE WHITE
  PIECES.
THE OPENING USED IS THE QUEEN'S
  GAMBIT ACCEPTED.
THE GAME SOURCE IS 500 MASTER
  GAMES PAGE 455.
YOUR PLAYING PARTNER IS INTERNA-
  TIONAL GRANDMASTER ALEKHINE.
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GAME PLAN:
THIS GAME ILLUSTRATES THE DEPTH OF
A MASTER'S THOUGHT PROCESS BY FOL-
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SCHEME. WHITE SETS UP AN INTRICATE
AND WELL-HIDDEN ROOK SACRIFICE
COMBINATION WHICH AFTER EXE-
CUTED REQUIRES THE UTMOST OF PRE-
CISE FOLLOW-THROUGH TO SUCCEED
INTO A WINNING ENDGAME.
```

After this, you select the conditions under which you want to play. Your choices are:

- Instruction—an untimed game with a move-analysis option.
- Tournament Mode 1—a timed game without analysis. Forty moves are required in the first two hours of play, followed by 20 moves per hour thereafter.
- Speed Chess Mode 1—a timed game lasting from one minute to 60 minutes, without analysis.
- Speed Chess Mode 2—a timed game lasting from 10 to 60 seconds, without analysis.

Next select the USCF tournament level at which you want to play: beginner (below 1,200); intermediate (1,200–1,350); advanced (1,350–1,500); and top (1,500–1,600). Professional disks use a similar four-level rating, with tournament strength from 1,600 to 2,200.

After selecting the game, game conditions and game level, you're ready to begin. If necessary, you'll be told to make several initial moves to get the board set up to the gambit you're interested in. To make sure you haven't made a mistake, a graphics presentation of the board layout is placed on the screen (this is also done every ten moves during the game).

Now you're ready to play. The screen clears and five possible moves are displayed (see Fig. 1). The game number and level are at the upper left of the screen, while the move number and difficulty factor are displayed at the top right. Between these displays are the words Losing, Draw and Winning. Underneath these words is a graphic line, with a dot under one of the words.

The dot indicates your success or failure. If you make a wrong move the dot appears to the left under the word Losing; when you make a good move the dot appears right under the word Winning. To win a game the dot must be under the word Winning.

The exact ratio of winning moves to

```
AMT-SYS/GAME 1          LOSING   DRAW   WINNING     MOVE #: 1
LEVEL:BEGINNER                                      DFCLTY: +1
1. -1                NOT QUITE AS GOOD AS TEXT
2. -1                YOU MIGHT DO BETTER THAN
                           THAT TERRY
3. -1                ALMOST AS GOOD AS TEXT
4. -1                NOT QUITE AS GOOD AS TEXT
5. -1                YOU MIGHT DO BETTER THAN
                           THAT TERRY
6. 0-0
          PRESS THE MOVE # OF YOUR CHOICE
```

Figure 3

```
AMT-SYS/GAME 1          LOSING   DRAW   WINNING     MOVE #: 1
LEVEL:BEGINNER                                      DFCLTY: +1
1. QN-Q2             -1
2. P×P               -1
3. Q-Q3              -1
4. B-Q2              -1
5. B-N5+             -1
6. 0-0               N-B3   <=CORRECT. PLAY
                            YOUR MOVE AND THE
                            REPLY ON THE
                            CHESSBOARD
PRESS MOVE # TO DISPLAY ANALYSIS OR PRESS SPACE TO GO ON
```

Figure 4

```
AMT-SYS/GAME 1          LOSING   DRAW   WINNING     MOVE #: 1
LEVEL:BEGINNER                                      DFCLTY: +1
1. QN-Q2             THE N IS BETTER LOCATED AT
                           B3
2. P×P               ALLOWS A Q EXCHANGE LOSING
                     CASTLING RIGHT AFTER Q×Q+
3. Q-Q3              BRINGS Q OUT TOO EARLY AND
                     Q IS MORE IN THE WAY THAN
                     ANYTHING
4. B-Q2              A VERY PASSIVE AND POOR
                     LOCATION FOR THIS B
5. B-N5+             ONLY HELPS BLACK TO
                     DEVELOP WITH B-Q2
6. 0-0               GETS K INTO SAFETY OUT OF
                     THE CENTER
PRESS MOVE # TO DISPLAY ANALYSIS OR PRESS SPACE TO GO ON
```

Figure 5

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losing moves determines whether you win, lose or draw. One disastrous move immediately sacrifices the game.

When you choose a move Cyberchess lets you know whether or not it is appropriate (see Figs. 2, 3 and 4). In Fig. 4 all possible moves are displayed along with the points you lost.

Now for the analysis. Press the number of the move you want analyzed and the grand master's thought on that move is displayed (see Fig. 5).

Now you're ready for the second move, repeating the above procedure.

Once you've finished a game, you're by no means through with it. As the authors state in the documentation, "Most people with ratings below 2,200 won't memorize a specific game in one or two plays, and in a few days it can be replayed at any level."

In Conclusion

Cyberchess is a unique, interactive system for practicing and improving your chess skills. It is designed for both professional and amateur players, and although beginners can use it to learn the details of playing chess, you have to be familiar with the game pieces, their moves and board directions (all these details can be acquired from a beginner's text on chess).

This system noticeably improved my game-playing ability. Several companies have introduced packages to teach the finer points of chess, but most end up teaching only one or two gambits. If you wanted to improve your game, you had to resort to chess books, magazines and clubs. Cyberchess has changed that picture considerably. ■

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by Wynne Keller

For over a year I've seen small ads in *80 Micro* for a data base called Super by ISA. The ads never grew bigger, but they never disappeared either. Curious, I decided to review it, and I am happy to announce that Super far exceeded my expectations.

While the package lacks sophistication in some senses, its overall data-handling capabilities are impressive. Because Super is able to post transactions, it can stand alone in most business environments, without auxiliary programs to access the data file.

I reviewed the Model III TRSDOS version, which is provided on a formatted disk: you supply the DOS. Super cannot be moved from one operating system to another, because DOS commands are used within the program. So be sure to specify your DOS when ordering. DOSPLUS, NEWDOS, and LDOS are all supported.

I found the instructions for merging the program disk with TRSDOS confusing, but I was assured that new instructions are being written and will appear with the next release of the program.

On the whole, the manual is clearly written, although its organization seems odd at first because getting started is not discussed until the middle of the booklet. The author intends to familiarize you with program operation and data-base layout before covering the specifics of initializing a data base.

This means that it is sometimes necessary to look in several locations for information you need. Fortunately the manual features a complete table of contents and an index to make this task easier. The documentation is contained within a hardcover three-ring binder and is daisy-wheel printed on one side of the page.

Initializing a new Super data file is different from most data bases because there are so many field types. These field types allow for data compression and potentially significant saving of disk space. Three types of alphanumeric fields are available: alphabetic—capital letters with a few special characters such as a comma; printable—capital letters with all other keys; and literal—all keys, including lowercase. Both alphabetic and printable fields are compressed. Every three characters of alphabetic field entries are compressed to two, and every four characters of printable field entries are compressed to three. Both fields are slower than literal, which is not compressed.

There are 14 types of numeric fields, and with careful selection you can achieve significant disk-storage economy. Three special-purpose fields are Telephone, Date, and Code. Telephone numbers are packed into four bytes, Dates into two. In each case, the number entered is checked to see if it is reasonable. The Code field stores up to eight one-digit code numbers in one byte, and the presence or absence of each of the eight digits has a special meaning.

During initialization, you have an opportunity to correct errors after each section. The data file spans from one to four drives. It is also possible to have several initialized data files on one disk.

You can design data-viewing screens within limits, although this capability is less sophisticated than with some other data bases on the market. There is only one screen per data file, but it is easy to change the screen at any time. You never have full use of the screen because a corrections menu is displayed along the screen's bottom during all edit operations.

Another drawback is the size limit imposed on mailing labels. A mark on the screen indicates how much information fits on a mailing label; all fields that appear on a label must be placed within these boundaries.

Super provides several types of reports. A horizontal report is available that prints each field in the order in which it was initialized. This report can span two lines, but wraparound occurs at the end of the first line, which may look messy. It is also possible to specify the fields used in the report, in which case the printing order is the order in which the fields are selected.

A screen-format report is also available; it prints each record as it appears on the screen display, with one space between each. Screen-format reports cannot exceed 64 characters across, but may be more than two lines, and they will not suffer from wraparound. If you design the screen with this printout in mind, the report section is easier to use.

Many of the disadvantages of this report system could be overcome if report designs could be saved on disk for later use, but this is not possible. On the positive side, you can obtain reports very

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quickly with this program. You don't need to set up formats and read through the manual just to get a printout. According to ISA, the next program release lets you store report formats.

The report option's last drawback is that page lengths are fixed and you cannot control them. Therefore, it's impossible to do special printing jobs, like printing 3-by-5-inch cards.

In all reports, you can select which records you want printed. Subtotals and totals are available with the horizontal report. Also, you can display reports on the screen instead of on the printer, a nice feature.

Super's Add mode has an unusual feature called production input. This lets you transfer data to each record from as many fields as you wish without keystrokes. Many data bases allow transfer of the contents of only one field at a time from the previous record during the Add mode.

Production input takes the concept further. Suppose you enter a mailing list that sorts by zip code. The zip code, state, and town fields are all established with the first entry. With Super you enter the production input and relax while the zip code, state, and town are automatically placed in the fields. Entering a new town name and zip code stops the process. The new information is then entered automatically until you make another change. This is an excellent time-saving feature.

The add and edit screens are not as sophisticated as they could be. The Add mode displays field prompts one at a time, so you cannot see all the fields when you begin. At the end of each record, you must use two unnecessary keystrokes, one to confirm there are no corrections and another if you want to add more records. It is preferable to have special keys with these functions, such as Clear, to return to the menu.

The edit screen displays field numbers and names below a line drawn on the screen; you must match the field you wish to edit with its number. It would be easier if field numbers were adjacent to their respective fields.

Manipulating the Data

The select function is excellent. In addition to the select options available in most data bases, Super can select by comparing one field's contents to another for all numeric, calculated, and date fields. This is useful in an inventory. You could compare the Quantity on Hand field with the Reorder Point field and select items whose stock quantity is lower than the reorder point.

A fast binary search is available for sorted records. Other searches include substring, range, and searches on a code field. All searches on more than one field use the logical AND; that is, records are selected only if they meet search criteria in every field.

You can calculate the four basic math functions using any number of fields and store the results in another field. Equations entered from the keyboard or stored in a disk file are applied to fields of your choice. An important feature is that you can change a calculation at any time, even calculations entered during initialization.

Easily the most important function for a business is the ability to post transactions. Super is the only data base I know of with this feature. To use it, you need two data files, and at least one key field must be identical in both. Monthly transactions are stored in one and the balance posted (in this case, added) to the other at month's end for customer billing. The monthly file is then purged and the process is repeated. Normally the customer account number links the two files. It is also possible to post transactions without adding, so that one field simply replaces the value in a field in the second file.

Super has other features for manipulating data on a large scale. One of them, mass update, lets you select any field, type in the new data, and then select records. All of the records meeting the search criteria are automatically changed.

Another mass operation is copying one data base into another. The fields to be copied must match in length and type. In this way, a smaller data file can be extracted from a large one. You can use this function to restructure a data base. It is rare for anyone to initialize a new data base perfectly on the first try. This feature also helps salvage data in a poorly structured data file. Although you cannot change the length of a field, a lot can be accomplished by dropping fields and adding new ones.

Super allows you to sort data files that do not fit in memory by sorting the file in sections and then merging them. To avoid large sorts, you can also specify the starting record for a sort. In this way, new records added to the file can be sorted without resorting the whole file.

In Summary

Super is a very powerful data base designed for business needs. Its capacity to move and change data on a large scale is very impressive. ISA is working on a new version that promises to have a better input/change screen. In addition, a sophisticated report generator will soon be available (at extra cost) that combines two data files in a single report. A program to merge files with Super Scripsit (Scripsit on Model II), Newscript, and WordStar is also under development. ■

★★★★★

Super Duper
WittSoft
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Model I and III
$29.95 disk

by Terry Kepner

Super Utility Plus owners, you can now make back-up copies of your favorite disk utility with WittSoft's Super Duper.

Super Utility Plus V2.2z, the utility that repairs or copies software on any TRS-80 program disk, is a must-have program for every TRS-80 Model I or III owner. But many users are upset to discover that Super Utility Plus won't duplicate itself. And nothing makes computer people nervous like having an important piece of software without a security back-up (Murphy's Law will get you every time).

WittSoft alleviated the back-up problem with a program that lets you make as many copies of Super Utility Plus as you need. You must have version 2.2z for Super Duper to work properly.

Using Super Duper is straightforward. First load your copy of Super Utility Plus V2.2z into your computer's memory. Then remove the disk and put the Super Duper disk in drive zero. Use

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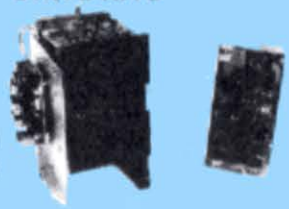

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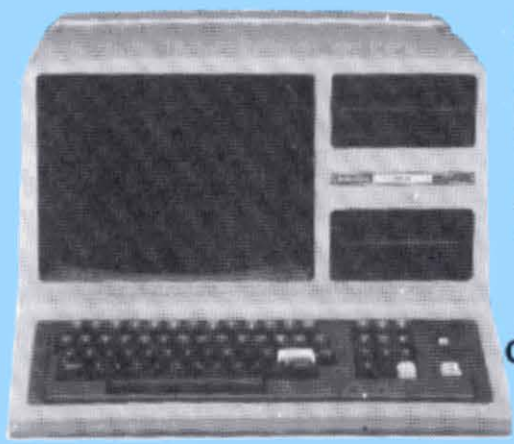

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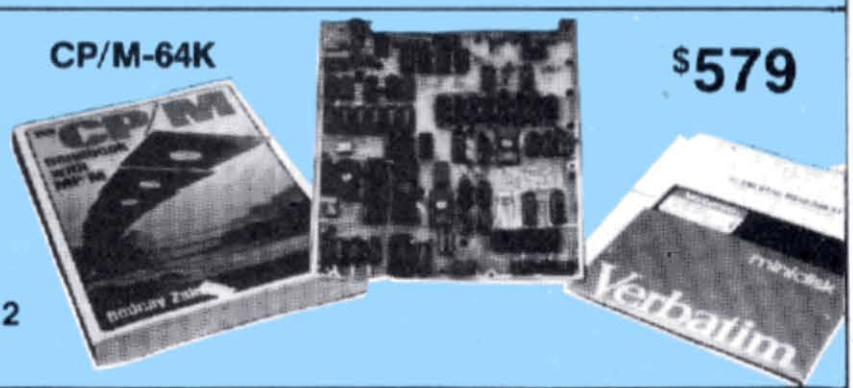

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Super Utility to load the Super Duper program into memory, then remove the disk from the drive. Go to the disk-repair section of Super Utility Plus and select the directory display option. (Leave the drive doors open to make sure that Super Utility Plus has the correct current track number.) Put a DOS disk in drive zero and use Super Utility Plus and your DOS Debug to activate Super Duper. Save the two programs to your disk.

Make sure you have at least 29 free grans on your disk or you'll get a Disk Full error message and you'll probably have to start over.

This procedure seems complicated at first reading, but if you follow the instructions faithfully and have sufficient room on your disk, you'll be able to make a back-up copy of Super Utility Plus the first time you try.

Now that you have an unprotected copy of Super Utility Plus on disk, making additional back-ups is simple. Load the modified Super Utility Plus and use Super Utility Plus to get a disk directory (again, keep all drive doors open). Invoke Super Duper and save another back-up copy of Super Utility Plus to disk. Trying to use the DOS Copy command to make duplicates won't work; you must use the Super Duper Save function.

"As a final note, the Super Duper disk itself can't be backed up."

The chance to make a back-up copy of your Super Utility program makes Super Duper more than worth its price, but that's not all it does. You can use Super Duper to return to the DOS Ready prompt, load command files (those ending in /CMD) from disk into memory, and load and run a command file from disk (that is, transfer control from the modified Super Utility Plus to another machine-language program).

The load and load-and-run commands are especially useful in analyzing the operation of Super Utility Plus. Patch Super Utility Plus to use a high-memory RS-232 driver instead of the standard parallel driver it currently uses, for example.

You can improve your proficiency at writing tight machine-language code by using a monitor program to watch Super Utility Plus work. If you've ever wanted to write your own DOS I/O routines, Super Utility Plus code is a marvel to behold.

The documentation with Super Duper is clear and concise. Memory maps of execution and loading for Super Utility Plus and Super Duper are included, as are notes for NEWDOS80 and Macro-Mon owners.

As a final note, the Super Duper disk itself can't be backed up. I find this amusing in light of the program's purpose especially when you consider that you only need to use the disk once. ■

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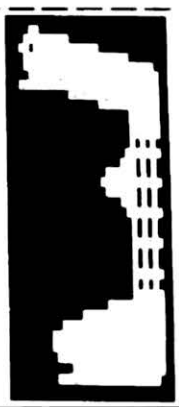

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REVIEW DIGEST

Solo Pool, Tom Mix Software, 3424 College N.E., Grand Rapids, MI 49505; Color Computer, $17.95.

"In Solo Pool, one ball at a time is in play. It's placed randomly and point values are assigned to the six pockets, depending on their distance from, and angle to, the ball. You adjust your cue stick position and take aim by placing a small cross hair behind the ball, and then hit the fire button on your joystick to shoot. . . . Remember, this is a respectable pool hall. In fact, for an extra touch of class, Solo Pool treats you to a short rendition of 'The Entertainer' from the movie 'The Sting' "...
The Rainbow, January, p. 162.

Doodle Bug, Computerware, Dept. C, Box 668, Encinitas, CA 92024; Color Computer, $17.95.

"Doodle Bug has it all: great color, great sound, great action. It has created a sensation here at *The Rainbow* and will probably have to be banned from the premises just to maintain production schedules."
The Rainbow, January, p. 163.

Maxi CRAS, Adventure International, P.O. Box 3455, Longwood, FL 32750; Models I/III, $99.95.

"Maxi CRAS is not only a check register system, but an excellent double-entry accounting system, as well. . . . It is so user-oriented that even the newest computer tyro can use it without difficulty, yet it provides a sophisticated set of reports. . . . If you are a VisiCalc devotee as I am, you will agree that [Maxi CRAS's VisiCalc interface] alone is worth the price of the program."
Creative Computing, February 1983, p. 48.

Microcomputers in Education, Christopher Smith, ed., Halstead Press, New York, NY; $29.95 Softcover.

"The value of this book lies in the broad range of interest of its contributors, all experienced educators and fully authoritative in their field of microcomputing. . . . It contains detailed techniques, including working programs, and offers much insight into the skills required by those who embark on the use of microcomputers for educational purposes."
T.H.E. Journal, February, p. 51.

Polaris, Tandy/Radio Shack, Fort Worth, TX 76102; Color Computer cartridge, $29.95.

"Polaris has to be one of the better game program packs available to date. . . . You have three submarines protecting six islands from raining waves of destructive missiles. . . . In the effort to make this game compatible with both Color Basic as well as Extended Basic, high-resolution graphics were left by the wayside. . . (but) I found Polaris to be challenging as well as entertaining."
Color Computer News, December, p. 66.

MULTIDOS, Cosmopolitan Electronics Corp., P.O. Box 324, Plymouth, MI 48170; Model I or III, $79.95.

"MULTIDOS provides a lot of value for the money. It gives you the opportunity to enjoy a full-feature DOS at a bargain price. Although some aspects of MULTIDOS have a flavor of a 'basement enterprise' production, such as occasional misspellings in system messages, the system as a whole seems to stand up under heavy use."
Byte, December, p. 397.

Business Mailing List, Tandy/Radio Shack, 1400 One Tandy Center, Fort Worth, TX 76102; Model I and III, $99.95.

"Business Mailing List performs as its producers claim it will. As a Basic program, however, it has all the disadvantages of sloth-like speed. Moreover, although it can print labels, it can't do anything else. Other Tandy programs like Micro-Files and Profile, which sell for the same price, can do everything that this can do and more."
InfoWorld, December 13, p. 34.

Wired, Harry Hellerstein, St. Martin's Press, New York, NY; 1982, Hardcover, 249 pp., $12.95.

"*Wired* is a computerized 'what if?' of a special kind. What if you took Harry Hellerstein, a writer with a wildly outrageous vision of computers in the future, let him create a world in which anything goes, and then publish his fantasy? You'd get this novel—a fiction of intrigue, espionage, humor, and lighthearted fun."
Popular Computing, March, p. 202.

The Last One, D.J. 'Al' Systems Ltd., Two Century Plaza, Suite 480, 2049 Century Park E., Los Angeles, CA 90067; Model II, $600.

"In action, The Last One is somewhat like a simple-minded assistant with a good memory. Before you use it, you need a clear idea of the work you want your proposed applications program to do and how you want that work accomplished."
Popular Computing, March, p. 146.

Versa-File, Analytic Management Systems, 247 High St., Palo Alto, CA 94301; Model II with CP/M, $69.

"Versa-File is a low-cost, indexed, file-management system. When used with a mail-list system, this software becomes a powerful tool. It has selection and sorting features as well as a convenient interface with WordStar, and it could replace several more expensive packages that provide similar interfaces. You must know how to use a text editor to create files for this program."
InfoWorld, February 21, p. 48.

CGP-115 Printer, Tandy/Radio Shack, Fort Worth, TX 76102; $249.95.

"The CGP-115 Color Graphic Printer is well worth the money if you need a light-duty plotter with graphics capabilities. At its price, it offers features no other machine has. For home or office it is a good buy. Its chief limitation is the size of the paper..."
80 U.S. Journal, February, p. 64.

The Qume Sprint 9/45-55, Qume Corporation, 2350 Qume Drive, San Jose, CA 95031; $2,660 and $2,795.

"The Qume Sprint 9 series of printers set a new standard for letter-quality printers. Performance is equal to or better than last year's top-of-the-line and the price is lower than any other domestic manufacturer and most of the imports. A close inspection of the construction indicates a heavy commitment to high-quality tooling and first class workmanship." *Interface Age*, March, p. 88.

tFORTH, Talbot Microsystems, 1927 Curtis Ave., Redondo Beach, CA 90278; Color Computer, tFORTH $100, tFORTH + $250.

"Ray Talbot, who wrote the fig implementation for the 6809, sells an implementation of Forth... tFORTH offers features that make it easier to use with FLEX. The disk containing the Forth compiler has several tracks that are initialized in the standard FLEX format. This allows the user to have the Forth compiler on those tracks and to call it with a standard FLEX call...The remainder of the disk is used by Forth directly as screen storage." *Micro*, February, p. 62.

TRS-80 Graphics for the Model I and III, David A. Kater and Susan Thomas, Tandy/Radio Shack, Fort Worth, TX 76102; $10.95, 287 pp.

"I was pleased with this text. Some of the books I previously obtained from Radio Shack have been rather ordinary reprints of older computer-science texts for Basic programming. Many of the past publications have been disappointing because of their lack of many inside secrets on the TRS-80 that can be used effectively. This one reached a new level of competence."
Interface Age, February, p. 164.

TaxPro, Contract Services Associates, Anaheim, CA; Model I, II, and III, $940–$1,230.

"There have been several attempts to write programs to prepare income tax returns using desktop computers. Most of these attempts have fallen far short of meeting the needs of those individuals who have income from several sources. Only a very few have even approached meeting the needs of a small tax office. The programmer who attempts the task of writing a tax program is soon frustrated by the limited capacity of microcomputers, the frequent and massive changes in report requirements, and the small market for such programs. TaxPro is one of the few to face these restrictions and to offer practical solutions."
Interface Age, February, p. 76.

Scriptr and **Crayon**, Pioneer Software, 1746 N. W. 55th St., Apt. 204, Lauderhill, FL 33313; Model I or III, $40 and $45.

"Scriptr is an invaluable tool, and certainly worth the modest price. It is a program I will use for some time, and I recommend it to anyone who wants more power from Scripsit. Crayon is a counterpart to Scriptr, but still an independent program in itself...as the name suggests, it allows the TRS-80 user to draw pictures directly on the screen using simple commands. This multi-faceted program has many other features, though. The three modes are graphics mode, letter mode, and command mode." *Softside*, February, p. 74.

Colortext, Micro-School Programs (Bertamax), 101 Nickerson St., Suite 202, Seattle, WA 98109; Color Computer, $79.80.

"Colortext by Micro-School Programs is a high-resolution text generator for the 32K Radio Shack Color Computer. ...Colortext is a useful utility for teachers or programmers. ...With it, high-resolution graphics and upper/lowercase multi-colored text can be mixed on the screen yielding highly creative and motivating programs." *The Computing Teacher*, January, p. 73.

ZGRAPH 4.0, Misosys, P.O. Box 4848, Alexandria, VA 22303; Model I or III, LDOS, $40.

"This program is sort of a 'word processor' for graphics. It is screen oriented, but instead of enabling you to manipulate text, ZGRAPH allows you to manipulate screen graphics. This gives you a special way to create special graphics designs, company logos, drawings and so on, using the TRS-80's graphics character set. ...This is a fine product and well worth its modest price." *InfoWorld*, February 28, p. 55.

The General Automation Expansion Interface, 9600 Roosevelt Blvd., Suite 100-LL, Philadelphia, PA 19115; Color Computer, $199.95.

"...there are some serious drawbacks to running heavy software on the Color Computer. One of the worst is the lack of expansion capability...The General Automation Expansion Interface helps to solve this important shortcoming...

"The system sent us for review consisted of the two-shelf CX-1001A Aluminum Chassis and the CX-2001A Expander Card. These items, along with your 32K or 64K Color Computer, Tandy Disk Controller and one or two (or three or four) disk drives, transform the system into a very powerful and versatile computer." *'68' Micro Journal*, February, p. 14.

CALENDAR

May

3-5 Hewlett-Packard, Palo Alto, CA. **Productivity '83** Sheraton O'Hare, Chicago, IL.

4-6 **Rocky Mountain Data Processing Expo** Currigan Hall, Denver, CO.

5-7 National Council of Teachers of Mathematics, Reston, VA. **Teaching Math With Microcomputers** La Guardia Marriott Hotel, E. Elmhurst, NY.

10-12 **Northcon/83** and **Mini/Micro-NorthWest/83** Portland, OR.

16-19 American Federation of Information Processing Societies, Arlington, VA. **1983 National Computer Conference** Anaheim and Disneyland Hotel Convention Centers, Anaheim, CA.

18-19 Hewlett-Packard, Palo Alto, CA. **Productivity '83** Breckenridge Concourse Hotel, St. Louis, MO.

18-19 International Information/Word Processing Association, Buffalo, NY. **Office/Computer Expo** Center of Progress Building, State Fairgrounds, Syracuse, NY.

18-20 Illinois Institute for Continuing Legal Education, Springfield, IL. **Computer High-Technology Businesses** IICLE Conference Center, Chicago, IL.

19-22 Computer Expositions Inc., Annapolis, MD. **Maryland Computer Show and Office Equipment Exposition** Convention Center, Baltimore, MD.

23-26 **ATE East Conference** Hynes Auditorium and Sheraton-Boston Hotel, Boston, MA.

24-25 Hewlett-Packard, Palo Alto, CA. **Productivity '83** Radisson South Hotel, Minneapolis, MN.

24-26 University of California Extension, Berkeley, CA. **Microprocessor Background for Management Personnel** Palo Alto, CA.

June

1-2 Hewlett-Packard, Palo Alto, CA. **Productivity '83** Grand Hyatt Hotel, New York, NY.

1-4 **Sunbelt Educational Computing Conference** Texas Tech University, Lubbock, TX.

4 North Area Repeater Association, Hopkins, MN. **Computers/Software Swapfest and Exposition** Minnesota State Fairgrounds.

6-8 IEEE Computer Society, Silver Spring, MD. **National Educational Computing Conference** Convention Center, Baltimore, MD.

9-11 Technical Education Research Centers, Cambridge, MA. **Microcomputers in Education** Watertown, CT.

13-16 **PC '83/International Printed Circuits Conference** New York Hilton, New York, NY.

14-15 Hewlett-Packard, Palo Alto, CA. **Productivity '83** Constellation Hotel, Toronto, Canada.

14-16 Electronic Conventions Inc., El Segundo, CA. **Ohmcon/83 Electronic Show and Convention** Detroit, MI.

19-23 IEEE Computer Society, Silver Spring, MD. **Conference on Computer Vision and Pattern Recognition** Crystal City Hyatt, Arlington, VA.

24-26 **EastCon Games Convention** Glassboro State College, Glassboro, NJ.

26-29 IEEE Computer Society, Silver Spring, MD. **Design Automation Conference** Fontainebleau Hotel, Miami, FL.

26-30 National Computer Graphics Association, Fairfax, VA. **NCGA '83** McCormick Place, Chicago, IL.

27-28 Hewlett-Packard, Palo Alto, CA. **Productivity '83** Sheraton-Boston Hotel, Boston, MA.

July

10-11 **Microcomputers in Music Education** Triton College, River Grove, IL.

18-19 Hewlett-Packard, Palo Alto, CA. **Productivity '83** Westin Hotel, Seattle, WA.

20-22 University of Oregon, Eugene, OR. **Computers in Education Conference** Hilton Hotel and Convention Center, Eugene, OR.

25-28 IEEE Computer Society, Silver Spring, MD. **Softfair Software Development Conference** Hyatt Regency, Crystal City, Arlington, VA.

26-29 University of Illinois at Urbana-Champaign, Urbana, IL. **Computer-Based Music Instruction Workshop** UIUC campus.

Coming Next Month

From the first flowchart to the last patch or debug, writing programs is serious business. Our June issue is devoted to programming techniques, and offers advice for beginners and veterans.

To get you started, there's a Model I/III flowchart generator and a tutorial on TRS-80 error-trapping routines. John Corbani discusses Basic, while Dan Keen and Dave Dischert explain Assembly language. There's also coverage of advanced Assembly techniques and shortcuts, and a disassembler for Z80 instructions. Richard Metzler adds a Forth assembler, and, if that array of languages isn't enough, Thomas Fiske teaches programming with arrays.

There's a Model II file transfer utility, and graphics and backgammon programs for the Color Computer. James Cole completes this month's Model I/III color modification, and Mike Keller puts the finishing touches on his article about using your printer as a paintbrush.

Finally, our regular columns continue; June's Buyer's Guides examine drives, disks, and utilities.

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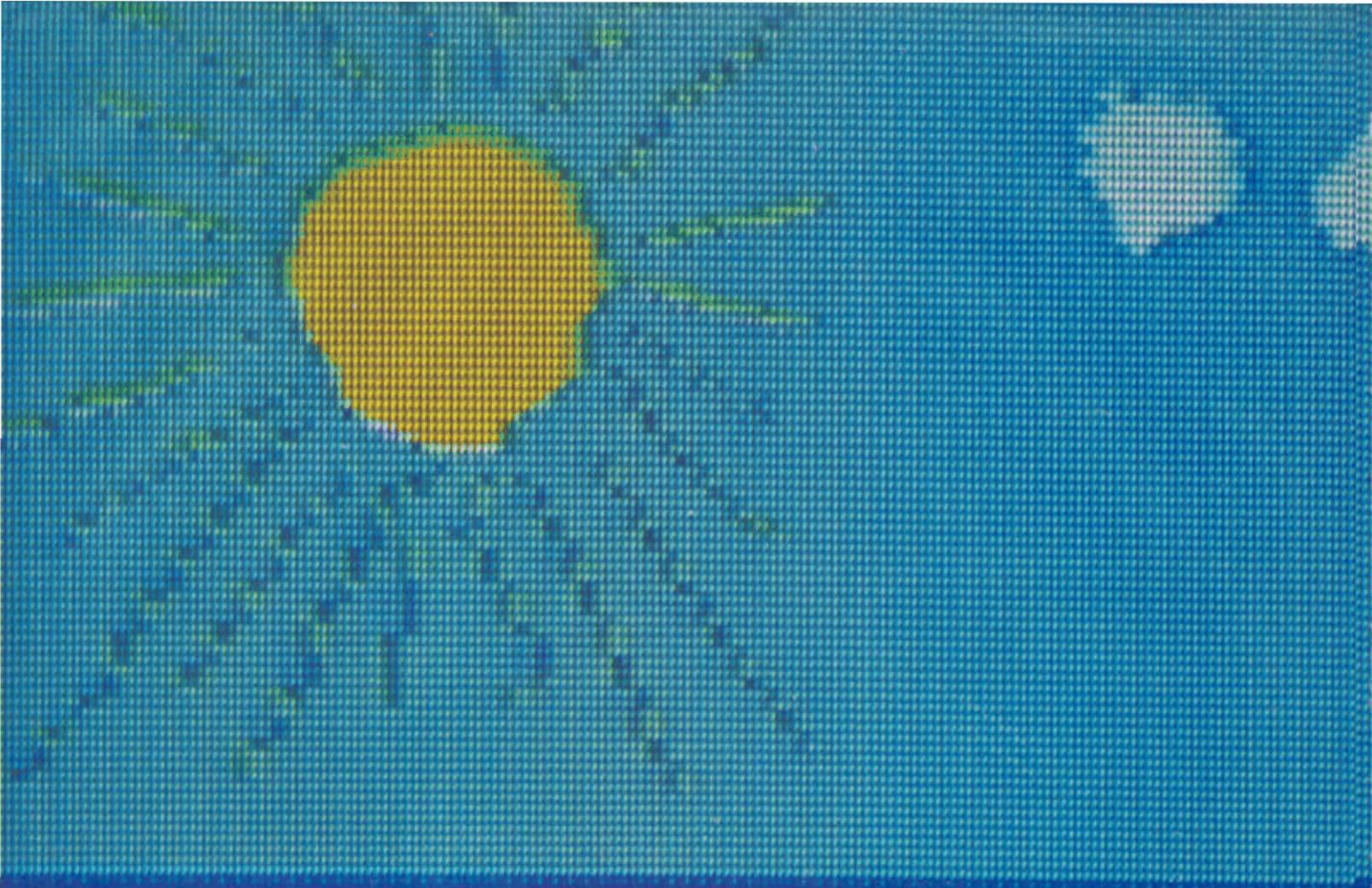


by James W. Cole

How would you like to add color graphics to your Model I/III? Now you can, with a hardware modification you build yourself.

The Mikrokolor interface will give you high-resolution graphics for about $150. Since Mikrokolor uses signals already on the TRS-80's expansion bus, you don't even have to open your computer's case.

The interface is based on Texas Instruments' TMS 9918A Video Display Processor (VDP). The VDP offers 15 colors plus four modes of operation: text, 64-by-48 color graphics similar to the TRS-80 block graphics, and two 256-by-192 graphics modes with two and 16 colors per character. See Table 1 for a more detailed description of the chip's features.

The VDP's secret is its handling of 34 graphics planes. The front 32 planes of the stack are devoted to sprites. A sprite is a small (8-by-8, 16-by-16, or 32-by-32) pattern of dots. Only one sprite is allowed on each plane, and all sprites must be the same size.

The planes in the stack can be

The 80 Goes Color

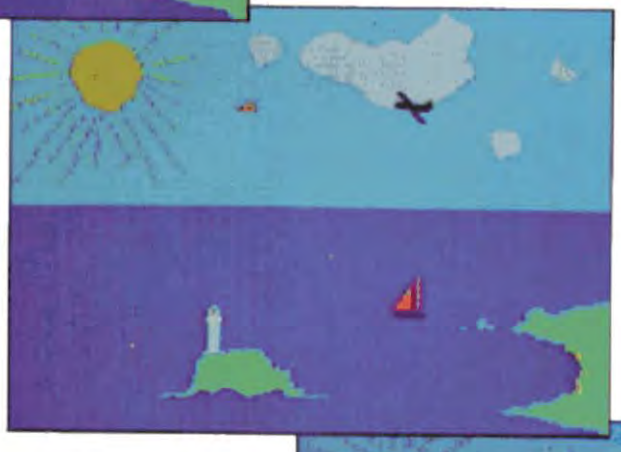
compared to plastic transparencies. If the image of an airplane is formed on the front plane (#0) in a 16-by-16 area and the image of a cloud is formed on the second plane (#1), they appear to have a three-dimensional relationship. The image on plane zero has a higher priority than that on plane 1, so the airplane appears to be in front of the cloud. The VDP can create up to 32 different sprites, all having this 3-D relationship.

The 33rd plane, beneath the sprites, is called the pattern plane. Text and graphics exist only on the pattern plane. Last is the backdrop plane, a solid color that forms a border around your image. If all the planes in front of it are transparent, the backdrop shows through.

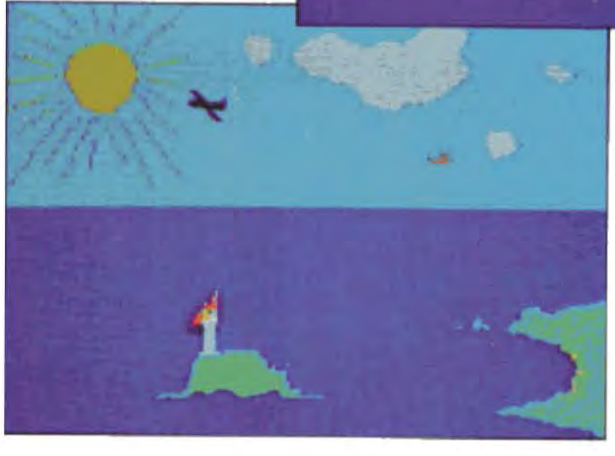
Mikrokolor consists of four main parts (see Fig. 1). The input/output port decoding circuits controls communication between the Z80 and the VDP. The TMS 9918A VDP converts the 1's and zeros into a color picture. A

The test program takes about 2½ minutes to finish loading 16K of VRAM tables (Basic is slow, but I will show you how to speed it up next month). The backdrop plane in this test pattern is 13 (magenta). The airplane appears as a 32 × 32 pixel pattern. It will move across the screen and change colors at set points.

A sailboat, airplane and helicopter cross the screen. Several sprites are defined in this scene: the three small clouds, the airplane, the helicopter, the lighthouse, and the sailboat. The lighthouse and the boat are composed of two sprites each. The rest of the image is on the pattern plane.



In the first photo, the airplane passes behind the small cloud in the upper right corner. The cloud is on sprite plane 2 and the airplane is on plane 8. The image of the cloud has priority over the airplane image. In the last photo, the sailboat passes behind the lighthouse. The lighthouse is on sprite planes 4 and 5; the sailboat is on sprite planes 6 and 7. This gives the lighthouse image priority over the sailboat.



The graphic on the cover is from Part II of this article, which will appear next month.

16K VRAM stores the image in external memory. The video interface drives the connection to the display.

I/O Port Decoding

The Z80 microprocessor has 256 I/O ports that you can decode to provide communication with external devices. To prevent conflicts with items such as the cassette tape and RS-232 interfaces, I decoded I/O ports 1 and 2 to connect the VDP to the computer.

Three TTL ICs perform the decoding (Figs. 2a and 2b). The two 74LS32s watch the address bus for all zeros on address lines A2–A7. If all these address lines are zero and IN or OUT is active, then the appropriate half of the 74LS139 is enabled and it decodes A0 and A1 as I/O ports 0–3. The 74LS08 combines the two IN and OUT signals to form chip select read (CSR) and chip select write (CSW). This completes the generation of the control signals needed for the VDP.

The TMS 9918A VDP

The TMS 9918A VDP is connected to the two signals from the I/O port decoder and to address line A1. The IN signals enable the CSR, and the OUT signals enable the CSW pins on the VDP. The mode pin is connected to address line A1. These three pins control the reading and writing actions on the data bus.

Connect VDP pins 17–24 (D0–D7) to D0–D7 from your expansion bus. This provides an 8-bit parallel communications path between the Z80 microprocessor and the VDP. You can connect the reset pin to a separate switch or to the reset signal on the TRS-80 bus. If you connect it to the bus, the computer and VDP are reset at the same time.

Clock signals are provided by a 10.7 MHz crystal (three times the color burst frequency) and an internal oscillator. You need two capacitors to complete the clock circuit; one is variable to provide fine tuning of the color signals.

Memory (VRAM)

The VDP controls the 16K dynamic memory chips. All address and data lines are routed from the VDP to VRAM. So it can keep up with the VDP, VRAM's access time cannot exceed 200 nanoseconds. Also, VRAM does not use any of your computer's valuable program memory.

Video Interface

Pin 36 of the VDP is the composite video output. I attached a small isolation amplifier to protect the VDP from loading and static charges. The composite video is then fed directly into a color monitor or into an RF modulator for input to your TV antenna terminals.

256-by-192 color graphics
15 colors plus transparent
Three-dimensional sprite planes
Four modes of operation:

- Text
  - 24 lines of 40 characters
  - 6-by-8 dots per character
  - 256 user-defined characters
- Multicolor
  - 64-by-48 color graphics
  - (similar to the TRS-80 block graphics but in color)
- Graphics I
  - 256-by-192 color graphics
  - 24 lines of 32 characters
  - 8-by-8 dots per character
  - two colors per character
- Graphics II
  - same as Graphics I but with 16 colors per character

Sprites
- active in all but the text mode
- 32 prioritized three-dimensional planes
- 15 colors plus transparent
- easily provides animated graphics

Table 1. Features of the TMS 9918A

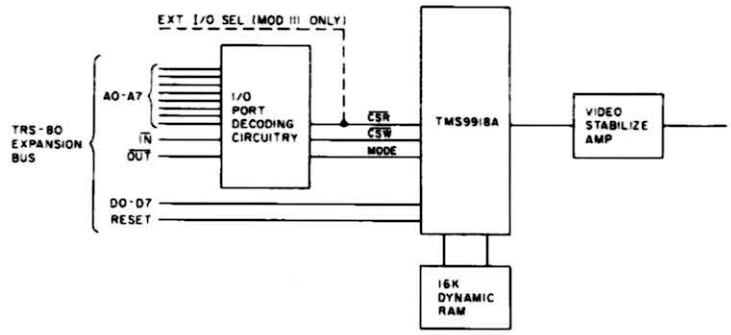


Fig. 1. Mikrokolor Block Diagram

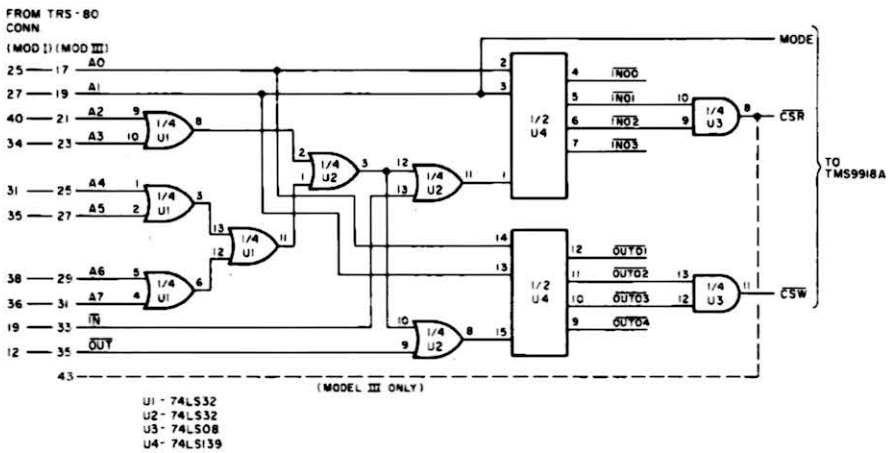


Fig. 2a. Mikrokolor Interface Circuit

Assembling the Hardware

The color interface can be assembled on a printed circuit card or by wire-wrapping (see Table 2). I recommend that you use sockets with the MOS circuits. Make the connection to the computer at its expansion bus. The Model I requires a 40-pin connector, and the Model III needs a 50-pin connector.

Model III users must connect EXTIOSEL to CSR. The rest of the circuit

is identical for both models. You need signals D0–D7, A0–A7, IN, OUT, ground and reset. Reset is needed only if you want the computer and VDP reset at the same time. The connecting cable should not be longer than 18 inches.

You can develop your own power supply or use the design presented here (see Fig. 3). The power supply must have +5, -5 and +12 volts for the circuits. Test it for proper operation before connecting it to any circuit. To prevent noise on the bus, install bypass capacitors (0.1 μF) on the VDP and each of the memory chips. These are connected between the +5 V power pins and ground.

Install the chips after double-checking the wiring. Turn on the machine and run the test program, Program Listing 1, which runs for about 2½ minutes. Finally, adjust the variable capacitor next to the crystal until the colors are correct. You are now ready to start writing your own color programs.

Quantity	Description
8	4116-2 200ns 16K dynamic RAMs
1	TMS 9918A Video Display Processor
1	74LS139
1	74LS08
2	74LS32
1	10.7 MHz crystal
1	ECG 123A transistor
1	33 pF capacitor
1	5-60 pF variable capacitor
13	0.1 μF capacitors
1	33 ohm ¼ W resistor
1	300 ohm ¼ W resistor
1	12k ohm ¼ W resistor
1	25.2 V 1.2 A transformer
1	4 A 100 V bridge rectifier
1	7812 +12 V regulator
1	7805 +5 V regulator
2	heat sinks for voltage regulators
1	ECG 5116A 5.1 V 5 W zener diode
3	1000 μF electrolytic capacitors

Misc: circuit card; RF modulator; 40-pin connector for the Model I; 50-pin connector for the Model III; ribbon cable; IC sockets; RCA connectors; power switch; AC power cord; fuse and holder.

Contact your local TI distributor for the closest source of the TMS 9918A. The 10.7 MHz crystal can be purchased from one of two sources in the TMS 9918A VDP manual.

Printed circuit boards are available from the author.

Table 2. Parts List for Mikrokolor

Controlling the Hardware

The VDP is controlled by a set of eight registers that determine the mode of operation and point to tables of information in the VDP RAM. You must perform four operations to control the VDP, write to VDP registers and VRAM, and read from the VDP status register and VRAM. You can perform these operations from Basic routines or from Z80 Assembly language (the Model III enables the I/O bus with OUT 236,16).

Let D represent the data to be transferred, let A represent the address in memory to write to or read from, and let R represent the register number. Here's how to perform these operations in Basic:

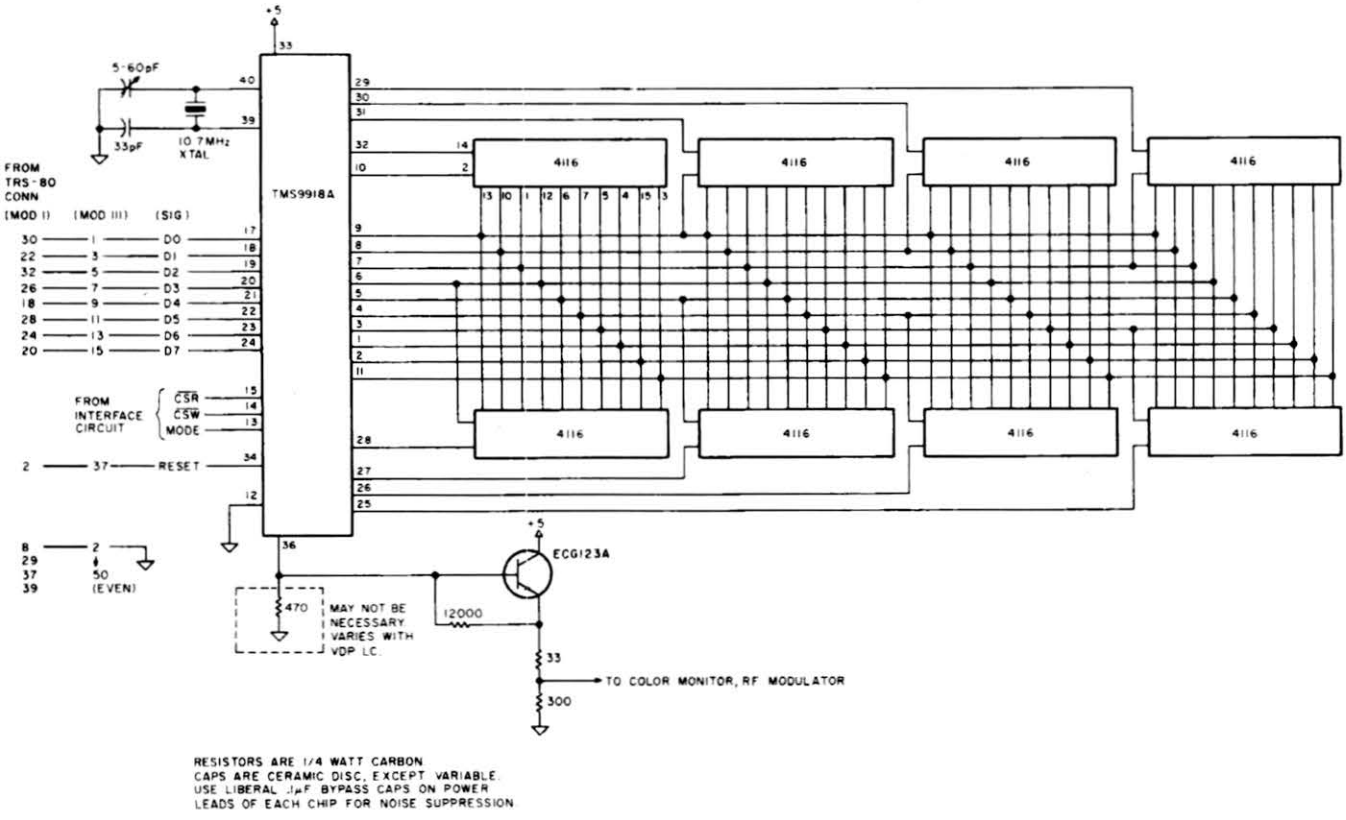


Fig. 2b. Mikrokolor Color VDP and Memory Circuit

Shape your TRS-80 to communicate with any computer you want.

Omniterm is the most flexible, powerful terminal program you can buy. Omniterm lets you adapt your TRS-80 to communicate with 99.9% of the world's computers. Your company's mainframe, for example. Or any other personal computer, time-sharing computer, or communications service.

Omniterm overcomes incompatibilities in screen formats, baud rates, character sets, control codes and file transfer protocols. Seven complete translation tables let you change any character, for complete compatibility of all input and output devices. Omniterm is so flexible, users have even set up their ASCII-coded systems to communicate with EBCDIC-coded systems.

You can send all ASCII characters, even those that aren't on your keyboard. Reformat your screen to neatly accommodate any line length. Run your printer while you're sending or receiving data. And even review data that's scrolled off the top of the screen.

Omniterm's well-thought-out design makes it easy to use. You can get a status display of all functions while on line to tell you what's going on, and make any changes at the same time. You can create a special file of your settings to make it easier next time. You also get X/Y cursor control, single keystroke sign-on and auto-dialing. Even a phone directory. And lots more.

You don't have to be a computer expert to use Omniterm. Just spend a day with what the reviewers call "the best manual in the business." Then if you need help, just call, write, or contact us via CompuServe, Delphi, or Source.

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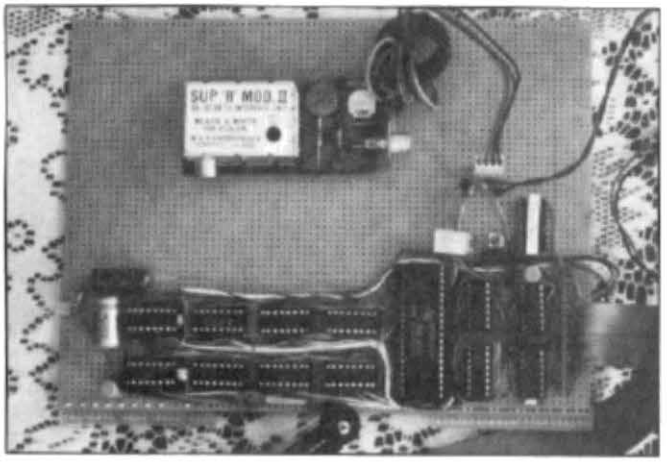

Photo 1. Handwired prototype. The large IC is the TMS 9918A. The readily available RF modulator allows connection to a color TV.

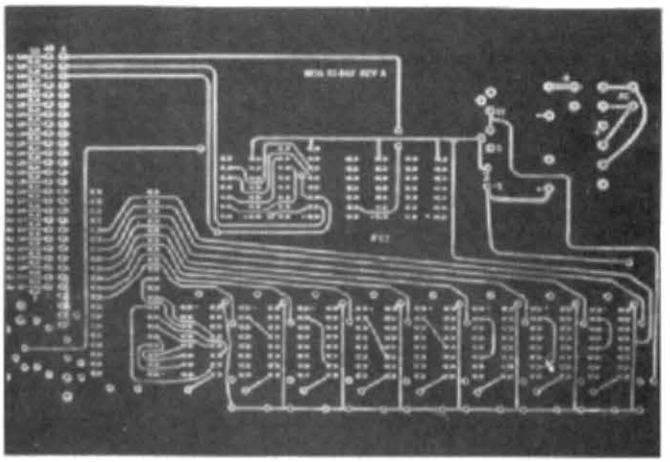

Photo 2. The printed circuit board, for all those who don't enjoy wire wrap.

```
Write to VDP Register R
  OUT 2,D
  OUT 2,128 + R
Write to VRAM Address A
  OUT 2,A - (INT ( A / 256 ) ) * 256
  OUT 2,64 + A / 256
  OUT 1,D
Read VDP Status Register
  D = INP(2)
Read from VRAM Address A
  OUT 2,A - ( INT ( A / 256 ) ) * 256
  OUT 2,A / 256
  D = INP(1)
```

The expressions for reading and writing to the VRAM appear complex because the 16-bit address must be broken up into 2 bytes of 8 bits and 6 bits (only 14 bits are used to address 16K of memory; the other 2 bits signal to the VDP which operation is being performed). The least significant byte (LSB) is sent to the VDP first, followed by the most significant byte (MSB).

For writing to RAM, D6 must be set in the MSB, so add 64 to the MSB. Reading VRAM is performed similarly, but D6 must be a zero so nothing is added to the MSB.

With these four simple operations, you now control one of the best video display processors on the market.

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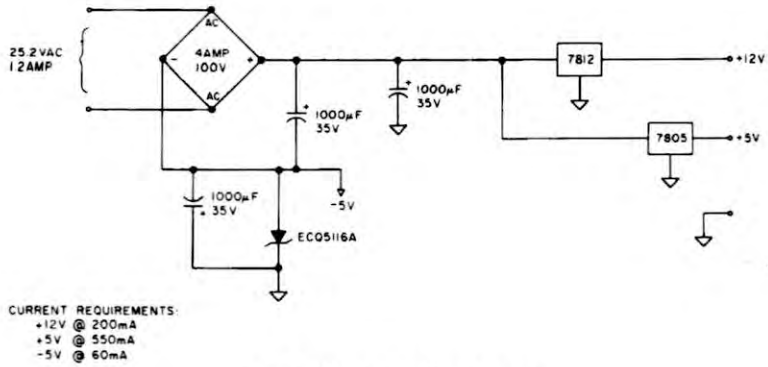

Fig. 3. Mikrokolor Power Supply

isters control the mode of operation and hold pointers to the tables.

Figure 4 contains a universal set of tables. By defining the tables at these addresses, all modes of operation are fully supported, but optimum use of the VDP RAM for each mode is not provided. You can operate the TMS 9918A in any mode without changing the table addresses.

The Text mode uses two tables, the pattern generator table and the pattern name table. The pattern generator table contains the definition of your character set. Each character pattern takes 8 bytes. The 6-by-8 pattern of the character is defined by the six most significant bits of the 8 bytes. You can define up to 256 different patterns or characters.

The pattern name table is a block of 960 VRAM memory locations representing the 960 locations displayed on the screen. Each VRAM location contains a pointer or name of the character to be displayed in that respective screen location. For example, if the pattern name table contained all zeros, the first pattern in the pattern generator table would be displayed in all 960 locations on the screen.

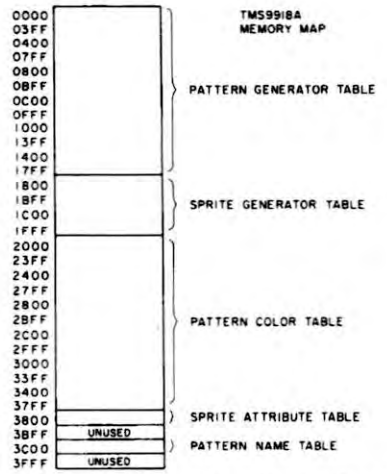

Fig. 4. Universal Tables for VRAM to Support All Four Modes of the TMS 9918A

The Text mode uses only 4K of VRAM. If you redefine the tables, you can store four or more pages of text in VRAM at once. By changing the register values, you can switch between these pages of text.

In the Multicolor mode, the pattern generator table contains the pattern definitions and also the color information

Continues on p. 101

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Continued from p. 98

of each pattern. The pattern name table functions as the pointer to the patterns to be displayed.

In the Graphics I mode, the pattern generator table describes the state of each pixel (the smallest dot that can be controlled) in an 8-by-8 pattern. Up to 256 patterns can be defined.

The pattern name table points to the pattern in the pattern generator table that is to be displayed in each of the 768 locations on the screen (these patterns

```
10 REM************************************************************
20 REM****                                                    ****
30 REM****              display test image                    ****
40 REM****                                                    ****
50 REM************************************************************
60 CLS:PRINT"Display test image for TMS 9918A interface"
70 PRINT"loading registers"
80  OUT 2,2   : OUT 2,128+0 : REM Reg 0
90  OUT 2,194 : OUT 2,128+1 : REM Reg 1
100 OUT 2,15  : OUT 2,128+2 : REM Reg 2
110 OUT 2,255 : OUT 2,128+3 : REM Reg 3
120 OUT 2,3   : OUT 2,128+4 : REM Reg 4
130 OUT 2,112 : OUT 2,128+5 : REM Reg 5
140 OUT 2,3   : OUT 2,128+6 : REM Reg 6
150 OUT 2,15  : OUT 2,128+7 : REM Reg 7
160 PRINT"Registers are loaded"
170 PRINT"loading pattern generator table"
180 REM start address for sequential memory load
190 OUT2,0: REM low byte of address
200 OUT2,64: REM high byte of address + 64
210 REM output the data into the table
220 REM all 0's into ALL patterns
230 FOR N = 0 TO 767 : FOR M = 0 TO 7 : OUT 1,0 : NEXT M,N
240 PRINT"pattern generator table is loaded"
250 PRINT"loading sprite generator table"
260 REM form airplane pattern in first sprite
270 REM the rest are zeros
280 FOR N = 0 TO 31 : READ X : OUT 1,X : NEXT
290 FOR N = 32 TO 2047 : OUT 1,0 : NEXT
300 PRINT"sprite generator table is loaded"
310 PRINT"loading pattern color table"
320 REM 16 lines of different colors
330 REM 32 patterns per line
340 FOR N = 0 TO 15 : FOR M = 0 TO 31 : FOR P = 0 TO 7
350 OUT 1,N
360 NEXT P,M,N
370 REM FINE LINES  for the bottom 1/3 of the screen
380 FOR N = 0 TO 7 : FOR M = 0 TO 31 : FOR P = 0 TO 7
390 OUT 1,P + ( N - INT( N/2 ) * 2 ) * 8
400 NEXT P,M,N
410 PRINT"pattern color table loaded"
420 PRINT"loading sprite attribute table"
430 REM place airplane image on screen
440 REM vertical position
450 OUT 1,50
460 REM horizontal position
470 OUT 1,100
480 REM pattern name
490 OUT 1,0
500 REM pattern color
510 OUT 1,1 : REM black
520 REM put nul values in remaining sprites
530 FOR N = 4 TO 127 : OUT 1,208 : NEXT N
540 PRINT"sprite attribute table is loaded"
550 REM fill unused area in memory map with zeros
560 FOR N = 0 TO 895 : OUT 1,0 : NEXT N
570 PRINT"loading pattern name table"
580 FOR N = 0 TO 3 : FOR M = 0 TO 255
590 OUT 1,M
600 NEXT M,N
610 PRINT"pattern name table is loaded"
620 PRINT"image is complete"
630 REM MOVE AIRPLANE ACROSS SCREEN
640 AD=14337 : REM ADDRESS OF AIRPLANE HORIZONTAL POSITION
650 FOR X = 255 TO 0 STEP -1 : REM MAKE IT GO FROM RIGHT TO LEFT

660 OUT 2,AD - (INT(AD/256)*256) : OUT 2,AD/256 + 64 :REM SEND A
DDRESS TO VDP
670 OUT 1,X : REM UPDATE X POSITION
680 OUT 1,0 : REM DON'T CHANGE NAME OF SPRITE
690 OUT 1,(X/18) : REM CHANGE COLOR OF AIRPLANE
700 NEXT X
710 GOTO650
720 DATA 0,0,112,56,28,14,7,127,255,127,1,0,0,0,0,0
730 DATA 0,0,0,0,0,1,3,255,255,254,192,224,112,56,28,0
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2	medium green	A	dark yellow
3	light green	B	light yellow
4	dark blue	C	dark green
5	light blue	D	magenta
6	dark red	E	gray
7	cyan	F	white

values are given in hexadecimal

Table 3. TMS 9918A VDP Color Table

are 8-by-8, and the text patterns are 6-by-8, so more text patterns are on each line).

The pattern color table defines the colors of each pattern. The pixel colors of the first eight patterns in the pattern generator table are defined by the first entry or byte in the Pattern Color Table (see Table 3). The 1's are defined by the most significant nibble (4 bits) and the zeros are defined by the least significant nibble. The second entry in the pattern color table determines the colors for the second set of eight patterns.

In the Graphics II mode, the tables are similar to the Graphics I mode, but the color and pattern generator tables are expanded. The pattern table is expanded by three times. A full set of 768 unique patterns can be defined in this mode, and a single pattern can be mapped to each position on the screen.

The color table is expanded 24 times, letting you define two colors for each byte or row in each pattern in the pattern generator table.

The tables also define and control the sprites. The sprite pattern generator table defines the patterns that can be displayed. The patterns can be 8-by-8 or 16-by-16 bits; the registers define the sprite size. In the sprite pattern generator table, the 1's are displayed as the color of the sprite, and the zeros are always transparent.

The sprite attribute table contains four values for each sprite. The first value is the vertical position, and the second is the horizontal position. By changing these two values you can move a sprite to any location on the screen without redrawing and erasing the image. This is handled by the TMS 9918A, independent of Z80 operation.

The third byte in the table is the sprite name, or a pointer to the sprite pattern generator table. It tells the TMS 9918A which sprite pattern to display. The fourth byte defines the color of the 1's in the sprite pattern; again, the zeros are transparent.

The eight registers of the VDP can be broken up into three groups. Registers zero and 1 select the different modes of the TMS 9918A. Registers 2-6 act as pointers to the tables in memory. Register 7 controls the text colors and the color of the backdrop plane (see Table 4).

By writing values to the registers, you can determine the mode of operation, location of the tables, and the text/backdrop color. By reading the Status register, you can determine if five sprites are on the same horizontal line or if two or more sprites are at the same screen location. By writing to the VRAM, you can print text, create color images, and move sprites across the screen in three dimensions.

Register 0
- bit 0: 1 enables the external video input (this project doesn't use it)
  0 disables the external video input
- bit 1: M3 one of the mode control bits (see Register 1)

Register 1
- bit 7: 0 selects 4027 RAM operation
  1 selects 4108/4116 RAM operation
- bit 6: blank enable/disable
  0 causes the display to blank
  1 enables the active display
  blanking will display the border color only
- bit 5: 0 disable VDP interrupt (this project doesn't use interrupts)
  1 enable VDP interrupt
- bits 4,3: M1, M2 (mode bits 1 and 2)
  M1, M2 and M3 determine the mode of the TMS 9918A

M1	M2	M3	
0	0	0	Graphics I mode
0	0	1	Graphics II mode
0	1	0	Multicolor Mode
1	0	0	Text mode

- bit 2: reserved (put a 0 here)
- bit 1: sprite size
  0 is the 8-by-8 pattern
  1 is the 16-by-16 pattern
- bit 0: magnification factor for sprites
  0 will make the sprites the normal size
  1 will double their size

Register 2
Four Most Significant Bits of the Name Table Address

Register 3
Eight MSB of the Color Table Address

Register 4
Three MSB of the Pattern Generator Table Address

Register 5
Seven MSB of the Sprite Attribute Table Address

Register 6
Three MSB of the Sprite Pattern Generator Address

Register 7
The 4 MSB define the text color of the 1's in the pattern
The 4 LSB define the text color of the zeros in the patterns or, if not in text mode, the backdrop color.

Table 4. TMS 9918A VDP Registers

Information

To get all the details about the TMS 9918A, read the TMS 9918A Video Display Processor data manual from Texas Instruments. It contains tips on programming, complete information on the registers and tables, and additional information on the sprites.

TI has numbered their data and address buses differently than is conventional with the Z80. The numbering is reversed with the MSB being A0 on the address bus and D0 on the data bus. The LSBs are A15 and D7. Keep this in mind as you read the manual.

In next month's installment, I'll discuss some USR routines for full, high-speed control of Mikrokolor from Basic. You will be able to define patterns and colors from Basic strings. I'll present the complete source listings with comments. ■

James W. Cole (515 Aspen St., Vandenberg, CA 93437) works for the 6595th Space Shuttle Test Group, U.S. Air Force.

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Symmetrical Graphics

by John D. Fowler, Jr.

Intrigued by graphics? Consider these rotations in a plane and reflections across a line.

Symmetrical visual patterns have a special appeal to the human imagination. Symmetry implies a high degree of organization, and seems to satisfy an aesthetic need for order.

This article will deal with the visual symmetry of rotations in a plane and of reflections across a line.

An object is symmetrical if certain operations can be performed on it which leave it unchanged in appearance. For instance, a ferris wheel with 16 seats has 16-fold rotational symmetry when viewed from the side. Each rotation of 360°/16 brings the ferris wheel back to an identical appearance. If one seat is removed, the rotational symmetry is reduced to single-fold (i.e., it takes a whole rotation to restore it to its original appearance). If another seat is removed halfway around, the ferris wheel assumes two-fold rotational symmetry. In general, a body has n-fold rotational symmetry if each successive rotation of 360°/n returns it to its original configuration.

In addition to rotation, another symmetry operation is reflection. If a body is symmetrical with respect to a plane passing through it, then it exhibits reflection or mirror symmetry about that plane. (Two-dimensional objects have reflection lines instead of planes.)

Symmetry of the Rectangle

Graphics display surfaces are most likely to be flat rectangles. Figure 1 has one-fold rotation and no mirror symmetry. Anything you put on the screen meets these minimum requirements.

The next step up the symmetry scale is single-fold rotation accompanied by a mirror reflection. This, illustrated in Fig. 2, is known as lm symmetry. The mirror is shown along the x-axis for convenience; it could just as well be along the y-axis, but not both. Consider the origin of the coordinate axes to be in the center of the screen. The lm symmetry may be obtained by *mapping* each display element in the upper half upside-down into the lower half of the display.

Mapping implies that there exists some simple relationship between display elements in different parts of the screen. For lm symmetry, this relationship, written as $x \rightarrow x$, $y \rightarrow -y$, means that for every point (x,y) in the upper half of the display we set the corresponding point (x, −y) in the bottom half to the same color. Thus, in this case, the x (horizontal) variable maps into itself, while the y (vertical) variable maps into its negative. This makes the bottom half of the display a mirror image of the top half.

The simplest two-fold symmetry is shown in Fig. 3. The mapping for this, 2 symmetry, is written as $x \rightarrow -x$ and $y \rightarrow -y$.

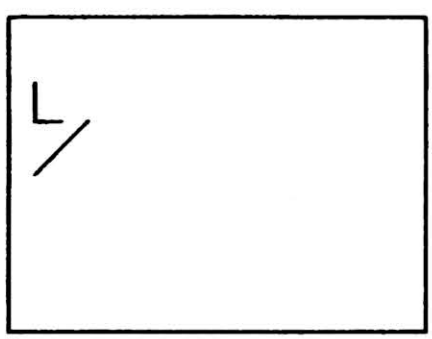

Fig. 1. Symmetry pattern in the plane for a rectangle with one-fold rotation.

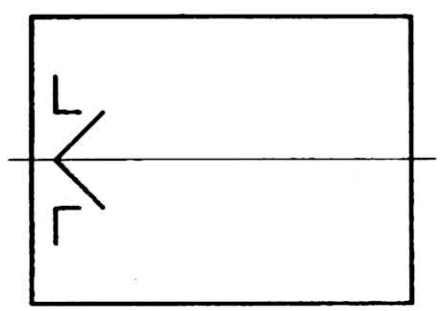

Fig. 2. Symmetry pattern in the plane for a rectangle with 1m, one-fold rotation and mirror reflection.

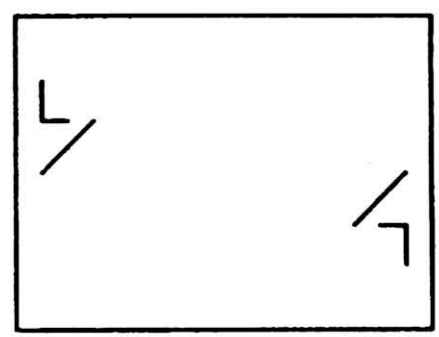

Fig. 3. Symmetry patterns in the plane for a rectangle with 2, two-fold rotation.

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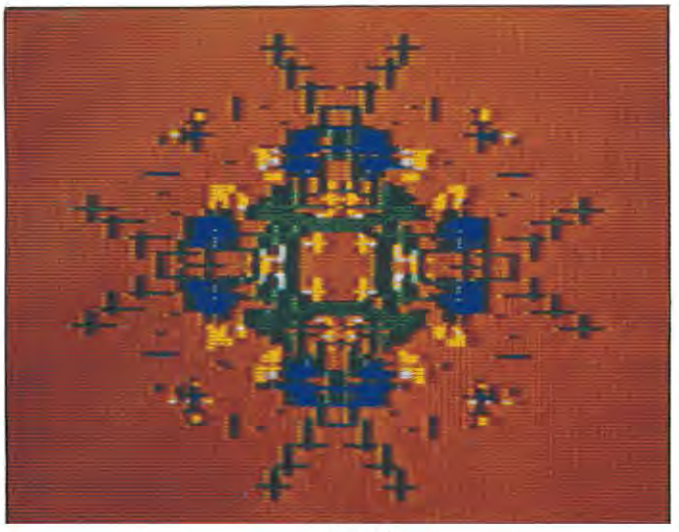

Photo 1

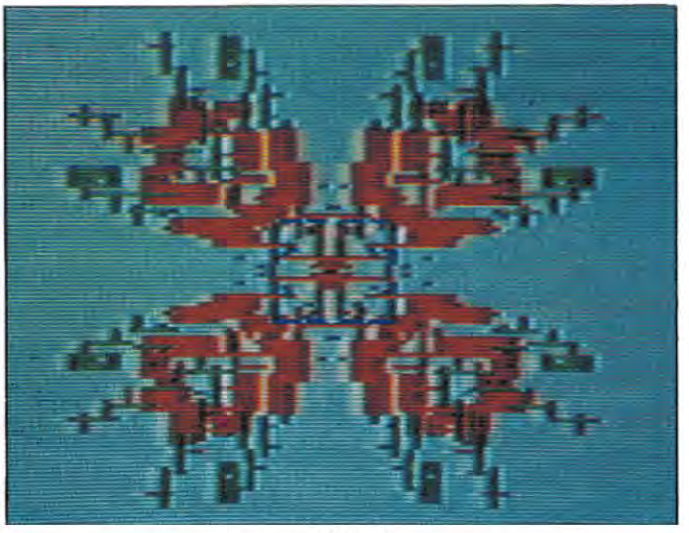

Photo 2

You might think that the next two-fold symmetry would be 2m, but with two-fold symmetry, one mirror line implies another, so the next symmetry is 2mm as in Fig. 4. Here there are four images, with additional mappings:

$x \rightarrow -x,\ y \rightarrow y;$
$x \rightarrow x,\ y \rightarrow -y;$ and
$x \rightarrow -x,\ y \rightarrow -y.$

The 2mm symmetry is the highest exhibited by the rectangle; however, by being a bit devious it is possible to squeeze out a pseudo-symmetry by scaling a square into a rectangle.

The square in Fig. 5 has four-fold rotational symmetry and two mirror axes. Actually, this implies two more mirrors along the diagonals, but the symmetry is traditionally called 4mm. The mappings for the eight images are those shown for 2mm plus these:

$x \rightarrow y,\ y \rightarrow x;$
$x \rightarrow -y,\ y \rightarrow x;$
$x \rightarrow y,\ y \rightarrow -x;$ and
$x \rightarrow -y,\ y \rightarrow -x.$

Here, for the first time, we are mapping one variable, not into itself or its negative, but into the other variable or its negative. It is precisely because of this, and the fact that the rectangle scales differently along the two directions, that these symmetries do not apply to the rectangle.

Stretching the square into a rectangle destroys the four-fold rotational symmetry, but a pseudo-symmetry may be obtained by scaling the four extra mappings of the square by the width-to-height ratio of the rectangle. This scaling makes things come out right at the boundaries and along the axes and diagonals. An example of 4mm stretched to fit the rectangle is shown in Fig. 6. This pseudo-symmetry will be called p4mm.

The scaling factor may be defined as the ratio of M, the number of graphics elements along the x axis, to N, the number along the y axis, as in the formula $S = M/N$.

Under the scaling operation, the four mappings of one variable into the other that constitute the extra mappings for 4mm symmetry become, in addition to the unchanged 2mm mappings:

$x/S \rightarrow y,\ Sy \rightarrow x;$
$x/S \rightarrow -y,\ Sy \rightarrow x;$
$x/S \rightarrow y,\ Sy \rightarrow -x;$ and
$x/S \rightarrow -y,\ Sy \rightarrow -x.$

Writing a Program

You can write a program to generate symmetrical patterns simply by setting the appropriate picture elements on the display. Photos 1, 2, and 3 show some examples of patterns with p4mm symmetry drawn with the Radio Shack Color Computer.

The Program Listing uses the RND (random) function to control the color, shape, size, and location of the pattern elements. The coordinate origin the Color Computer uses is in the upper left corner of the screen, so the eight mappings (lines 380–490) appear in a somewhat different form than before. For example, the mapping $x \rightarrow -x,\ y \rightarrow -y$ becomes $x \rightarrow M - x,\ y \rightarrow N - y$, where

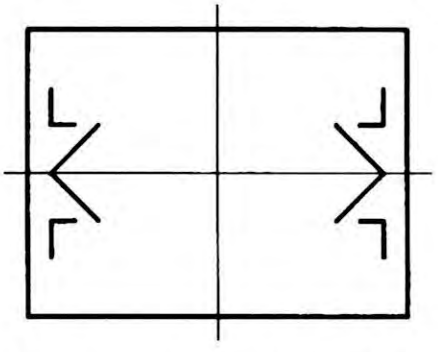

Fig. 4. Symmetry pattern in the plane for rectangle with 2mm, two-fold rotation and double-mirrored reflection.

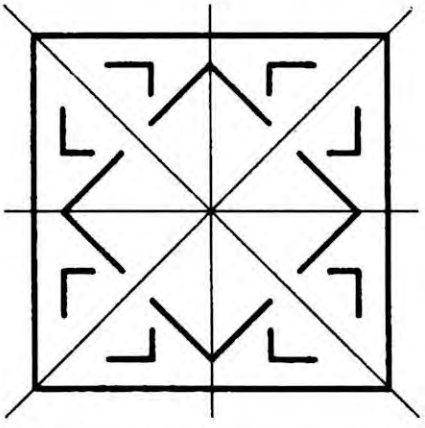

Fig. 5. Symmetry pattern in the plane for a square with 4mm, four-fold rotation and double-mirrored reflection.

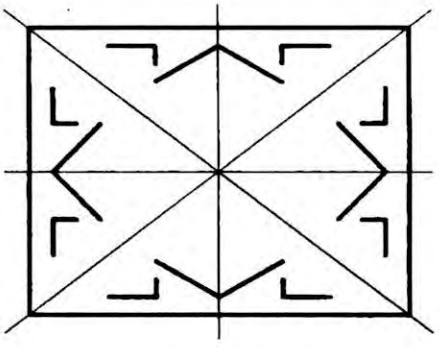

Fig. 6. Pseudo symmetry, p4mm, pattern in the plane for a square stretched into a rectangle.

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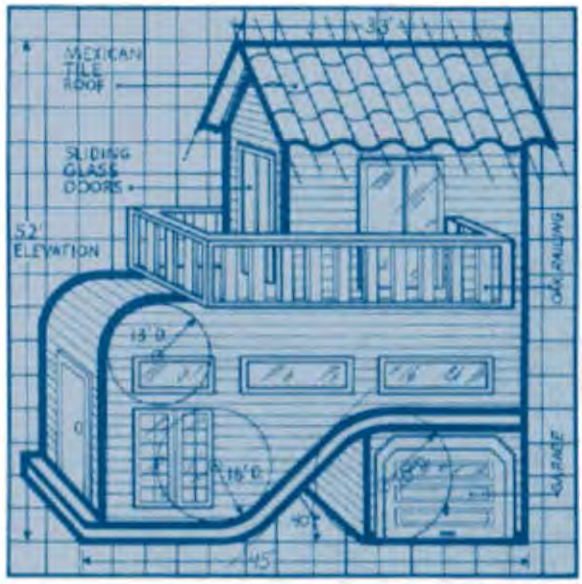

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M = 256 and N = 192 for the Color Computer. The scale factor, necessary for the p4mm symmetry, is defined in line 130.

The character of the patterns drawn can be altered in a number of ways. Different families of patterns can be created by changing the arguments of the RND functions which control the color variable, C, and the horizontal and vertical increments, DH and DV, or by altering the probabilities for changing these (lines 170 and 570). Changing the equations for H and V in lines 520 and 530 will also make a big difference. The program restarts when the value of TIMER becomes sufficiently large. This keeps the display from getting too cluttered.

Special effects can also be created by adjusting the color, tint, and brightness controls on your monitor. To photograph patterns from the screen, use a tripod and a slow shutter speed (approximately ¼ second).

Line 5 should be used cautiously. This doubles the clock speed for fetches from the Basic ROM and thus makes the program run somewhat faster. The drawback is that I/O functions such as CSAVE and CLOAD will no longer work unless the computer is first reset. If you choose to omit line 5, the only effect will be that it takes longer for patterns to be drawn. ■

John Fowler can be reached at 946 Caplin, Los Alamos, NM 87544.

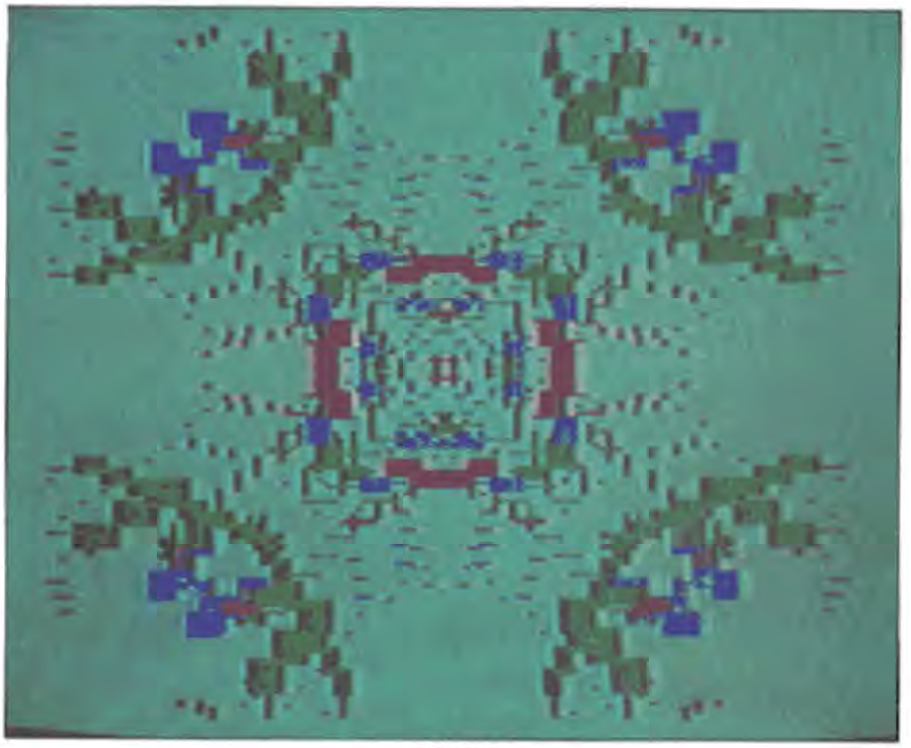

Photo 3

```
5 POKE 65495,0
10 PMODE 3,1
20 TIMER=0
30 PCLS
40 SCREEN 1,1
50 INC=RND(4)+4
60 IMC=RND(4)+4
70 C=RND(9)-1
80 H=127
90 V=95
100 DH=1
110 DV=-1
120 DC=1
130 S1=3/4
140 S2=1/S1
150 RA=RND(100)
160 IF TIMER>12000 THEN 10
170 IF RA>65 THEN GOSUB 550
180 H=H+DH
190 V=V+DV
200 IF H>=0 THEN 230
210 DH=-DH
220 H=1
230 IF H<=254 THEN 260
240 DH=-DH
250 H=255-INC
260 IF V>=0 THEN GOTO 290
270 DV=-DV
280 V=1
290 IF V<95 THEN 320
300 DV=-DV
310 V=95-INC
320 FOR HH=H-1 TO H+IMC STEP DH
330 FOR VV=V-1 TO V+INC STEP DV
340 IF HH>255 THEN GOTO 520
350 IF VV>95 THEN GOTO 520
360 IF HH<0 THEN 520
370 IF VV<0 THEN 520
380 PSET(HH,VV,C)
390 JQ=HH*S1
400 JW=(256-HH)*S1
410 JE=VV*S2
420 JR=(192-VV)*S2
430 PSET(JE,JQ,C)
440 PSET(256-HH,VV,C)
450 PSET(JE,JW,C)
460 PSET(HH,192-VV,C)
470 PSET(JR,JQ,C)
480 PSET(256-HH,192-VV,C)
490 PSET(JR,JW,C)
500 NEXT VV
510 NEXT HH
520 H=HH-2
530 V=VV-2
540 GOTO 150
550 C=RND(9)-1
560 DD=RND(100)
570 IF DD<80 THEN 600
580 INC=2*RND(4)
590 IMC=2*RND(4)
600 DV=3-2*RND(2)
610 DH=3-2*RND(2)
620 RETURN
```

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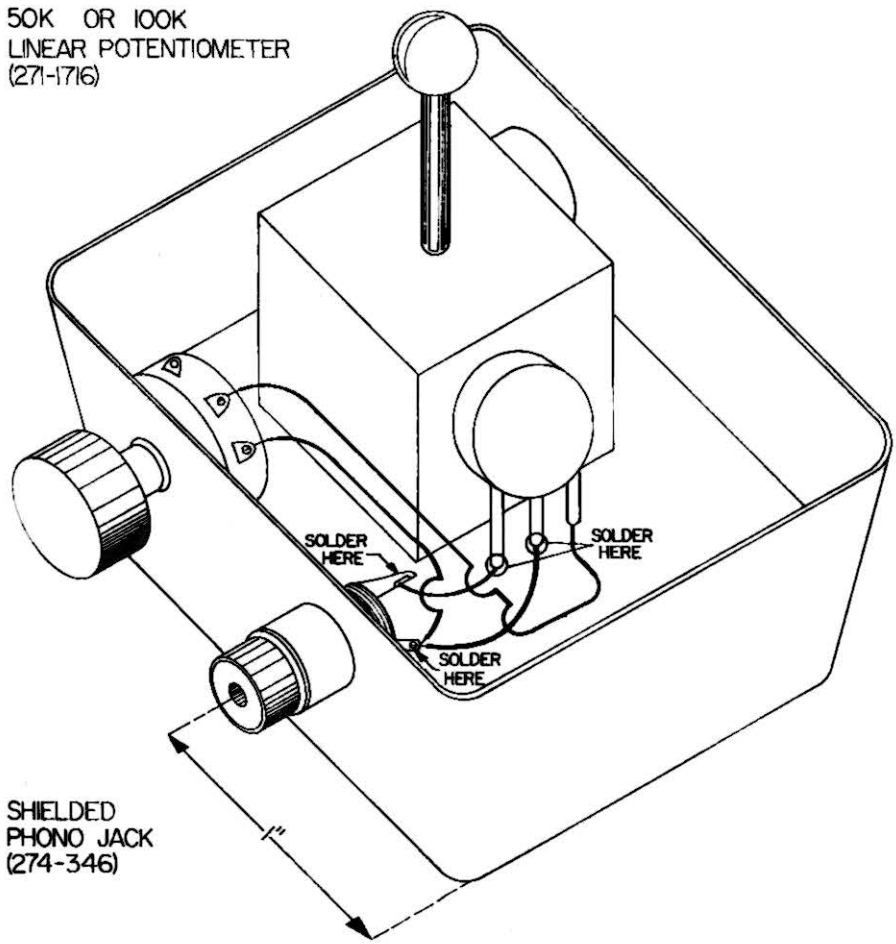

Fig. 1. Joystick and Potentiometer

I have constructed a simple, inexpensive light pen for the Color Computer. It senses position and color in the same manner as an expensive commercial light pen.

All light pens are photocells—simple light sensors. Since no photo detectors can sense position or color, commercial light pens use separate hardware to perform these tasks. My light pen uses the computer's existing hardware and software. The computer performs the analyses, not the pen or an associated circuit board.

The output from the photocell must be input into the computer. This requires an analog-to-digital conversion performed at the Color Computer's joystick port. Using the joystick potentiometer as the point of connection (see Fig. 1), the light pen can detect 64 light levels.

Construction

You need a Radio Shack 276-116 photocell and an Eveready penlight case. Your first step is to knock the red tip out of the back of the light pen. Slide the red tip about 6 inches down the cord. Then slide the plastic cover from inside the penlight on the cord.

The Key Box

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Next, solder the 276-116 photocell to the end of the cord. Tape over the wires from the photocell to the cover. The cover and photocell will be about ½ inch longer than the interior of the pen. Now screw the pen onto the base. Slide the red tip up and apply a drop of super glue.

Assemble the modified joystick as shown in Fig. 1. Unscrew the base from the right joystick (joystick zero). Take off the top. At a point 1 inch from the left corner farthest from the trigger, drill a hole for the shielded phono jack (274-346).

Run wires from the central post on the potentiometer and from the left post on the potentiometer to the shielded

Continues on p. 116

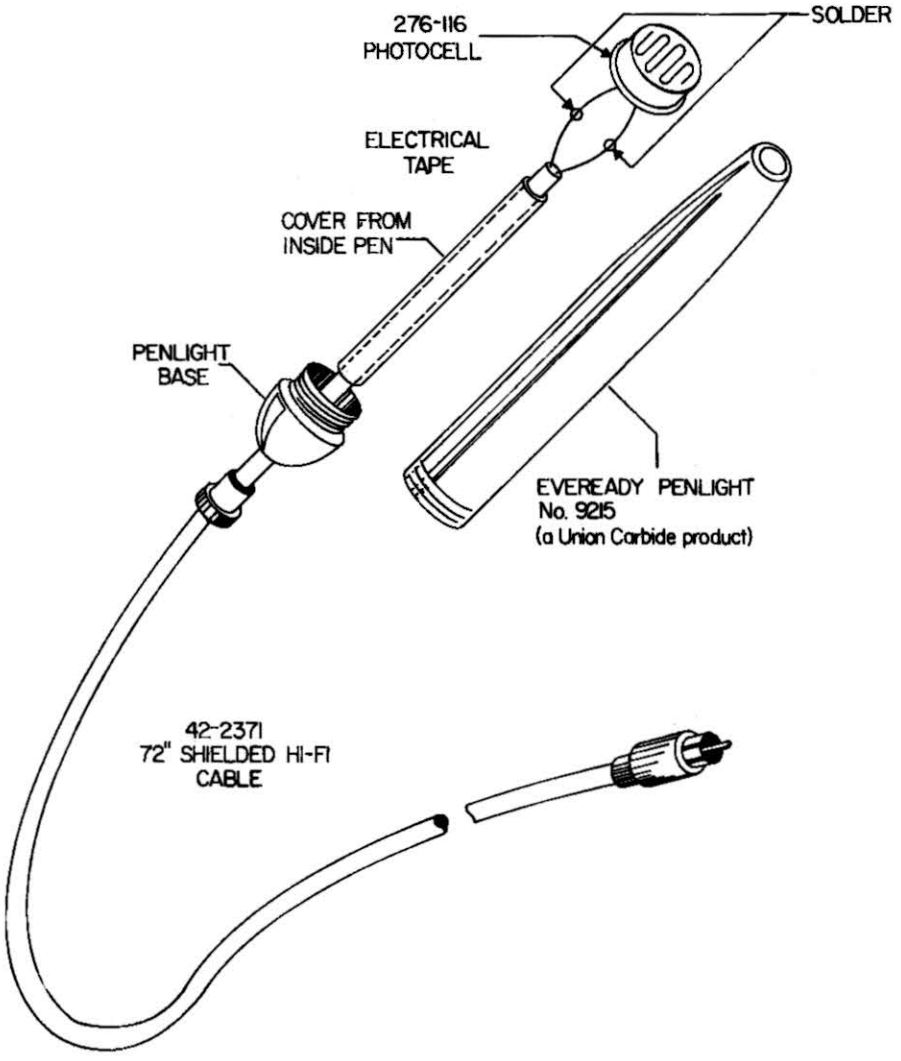

Fig. 2. Light Pen

Program Listing 1

```
10 Z=1
20 CLS(3)
30 PRINT@168,"          FIND                    THIS PROGRAM SETS
A POINT AT    THE PEN'S LOCATION AND SOUNDS   A TONE. IT THEN PR
INTS THE      X,Y COORDINATES."
40 PRINT"TO PROPERLY ADJUST THE PEN       POINT IT JUST ABOVE THE
 WORD     PEN AND ADJUST THE NUMBER AT     THE TOP OF THE SCREEN T
O 800."
50 PRINT"PRESS C TO STOP TEST AND         CONTINUE."
60 PRINT"THE PEN WILL NORMALLY TAKE       ABOUT 4 SECONDS."
70 M=0 :FOR T=1 TO 100:A=JOYSTK(0):M=M+A:NEXT T:PRINT@0,M
80 IF I$="C" THEN  110
90 I$=INKEY$:GOTO 70
100 FOR T=1 TO  3000 :NEXT T
```

Listing 1 continues

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John Roy
Review in Buss Newsletter December 1982

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Listing 1 continued

```
110 CLS(4)
120 SET(30,15,3)
130 INPUT"ENTER P";P$
140 CLS(0)
150 FOR Y=0 TO 31 STEP 16
160 FOR X=0 TO 63 STEP 4
170 IF X=60 THEN SET(X+3,Y,1):SET(X+3,Y+8,1):SET(X+3,Y+14,1):SET
(X+3,Y+15,1)
180 IF X=60 THEN SET(X+3,Y+4,1):SET(X+3,Y+12,1)
190 J=JOYSTK(0)
200 SET(X,Y,1)
210 SET(X+2,Y,1)
220 SET(X,Y+2,1)
230 SET(X+2,Y+2,1)
240 SET(X,Y+4,1)
250 SET(X+2,Y+4,1)
260 SET(X,Y+6,1)
270 SET(X+2,Y+6,1)
280 SET(X,Y+8,1)
290 SET(X+2,Y+8,1)
310 SET(X,Y+10,1)
320 SET(X+2,Y+10,1)
330 SET(X,Y+12,1)
340 SET(X+2,Y+12,1)
350 SET(X,Y+14,1)
360 SET(X+2,Y+14,1)
370 IF Y>15 AND X>1 THEN ZU=0
380 ZR=X
390 IF ZR<ZU THEN ZR=ZU:GOTO 430
400 IF Y<15 THEN ZU=0
410 IF Y<16 THEN ZU=X ELSE ZU=0
420 IF J<25 THEN ZR=1
430 IF V=2 THEN GOTO 440
440 IF J<25 THEN GOTO 480
450 NEXT X
460 NEXT Y
470 GOTO 10
480 CLS(0)
490 A=X
500 IF A>61 THEN A=61
510 IF A<8 THEN A=8
520 R=0
530 B=Y
540 IF B<15 THEN GOTO 560
550 IF Z=2 AND A=8 THEN A=61:B=0:Z=1
560 IF B>16 THEN B=16
570 FOR N=B TO B+15
575 FOR M=A-8 TO A+2 STEP 2
620 SET(M,N,1)
630 IF M>62 THEN M=62
640 J=JOYSTK(0)
650 IF J<30 THEN 710
660 R=R+1:IF R>80 AND A<60 THEN A=M:B=N:GOTO 710
670 IF R>80 AND A>60 THEN A=1:B=22:GOTO 930
700 NEXT M
705 NEXT N
707 M=0:N=0:GOTO 570
710 FOR A=M TO M+1
720 IF A>63 THEN A=63
730 FOR B=N TO N+1
740 IF B>31 THEN B=31
750 CLS(0)
760 IF B>30 THEN B=30
770 IF A<63 THEN SET(A+1,B,1):SET(A+1,B+1,1)
780 IF B>1 AND A+1>63 THEN SET(2,22,1)
790 SET(A,B,1)
800 SET(A,B+1,1)
810 J=JOYSTK(0)
820 IF J<35 THEN GOTO 930
830 IF Z=3 THEN  GOTO 140
840 Z=Z+1
```

Listing 1 continues

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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.

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Listing 1 continued

```
850 FOR T=1 TO 20
860 J=JOYSTK(0)
870 IF J<35 THEN GOTO 930
880 IF T>18 AND B>4 THEN B=B-1
890 NEXT T
900 GOTO 490
910 NEXT B
920 NEXT A
930 CLS(3)
932 IF B=0 THEN B=1
934 IF B<6 THEN B=B+1
936 IF B<20 AND ZU=0 THEN B=B+1
940 IF A>20 THEN 990
950 IF B<16 THEN 990
960 IF ZU<45 THEN 990
970 A=59:B=8
980 IF Y<16 THEN A=(A+ZU)/2
990 IF A>ZU AND Y<16 THEN A=ZU:B=B+3
998 SET(A,B,4)
1000 PRINT A;B;ZU
1010 SOUND A+1,B+1
1020 Z=1
1030 FOR T=1 TO 3000:NEXT T
1040 INPUT"ENTER P TO SET ANOTHER POINT.";P$
1050 CLS(0)
1060 ZU=0
1070 IF P$="P" THEN 140
7705 NEXT N
```

Program Listing 2

```
10 REM
20 CLS(4)
30 PRINT@160,"       COLOR TEST                YOUR COMPUTER LIGH
T PEN CAN      DISTINGUISH  BETWEEN GREEN,     YELLOW, BLUE, AND
RED.  TO       USE THE PEN TO DETECT COLOR     HOLD IT  OVER A RE
GION FOR       AT LEAST TEN SECONDS."
40 PRINT"WHEN THE TONE SOUNDS PLACE THE  LIGHT PEN OVER A COLOR
AND LET  IT REMAIN THERE UNTIL THE TONE  SOUNDS  AGAIN."
50 FOR  T=1 TO 4000:NEXT T
60 CLS(3)
70 PRINT@160,"TO CALIBRATE THE SYSTEM ADJUST  THE JOYSTICK FOR G
REEN=18,       YELLOW=4, BLUE=36.5, AND        RED=27-OR AS CLOSE
 AS POSSIBLE."
80 FOR  T=1 TO 3000:NEXT T
90 FOR X=0 TO 62
100 FOR Y=0 TO 31
110 IF A<10 THEN S=2
120 IF 10<A<25  THEN S=1
130 IF 25<A THEN S=3
140 SET(X,Y,X/14)
150 SET(10,10,S)
160 NEXT Y
170 NEXT X
175 PRINT@320, "TO END CALIBRATION TAP C": C$=INKEY$
180 FOR T=1 TO 100
185 FOR A=1 TO 40
190 J=JOYSTK(0)
191 C$=INKEY$
192 IF C$="C"THEN 220
195 M=M+J
197 NEXT A
198 J=M/40
200 PRINT@0,J
201 M=0
210 NEXT T
220 INPUT"TO TEST COLOR ENTER A KEY";S$
230 REM
240 Z=0
250 FOR N=1 TO 120
260 A=JOYSTK(0)
270 A=(A+(N-1)*Z)/N
280 IF N=119 THEN PRINT@320,A
290 IF 14<A<19 THEN S=1
300 IF A<7 THEN S=2
310 IF 19<A THEN S=4
320 IF  31<A THEN S=3
330 SET(10,10,S)
340 Z=A
350 IF N=119 THEN SOUND 160,8
360 IF N=119 THEN  PRINT@352,"THE COLORS ARE 1 GREEN,2 YELLOW,3
BLUE, 4 RED.  THE PEN  WAS    OVER",S
370 NEXT N
380 GOTO 230
```


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Continued from p. 111

phono jack as shown. Solder the wires to the phono jack. Put the top cover back on the joystick. Plug your pen into the phono jack and load one of the programs in this article.

Finally, plug the cable into the modified joystick. You can now adjust the joystick or potentiometer to the light level of your TV. Be sure not to use the pen in brightly lit or back-lit rooms, which will create highlights on the TV screen.

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Continues on p. 119

Program Listing 3

```
10 REM- CANNONP A LIGHT CONRTOLLED CANNON
20 U=0
30 Z=0
40 CLS(3)
50 M=0
60 PRINT@64,"       PEN SENSITIVITY SET       PLACE THE PEN IN TH
E MIDDLE OF  THE BLUE AND ADJUST THE          NUMBER TO NEAR 3000
."
70 PRINT"WHEN THE PEN IS PROPERLY         ADJUSTED THE PROGRAM WI
LL       AUTOMATICLY CONTINUE."
80 FOR T=1 TO 1500:NEXT T
90 FOR T=1 TO 100
100 A=JOYSTK(0)
110 M=M+A
120 NEXT T
130 PRINT M
140 FOR T=1 TO 500:NEXT T
150 IF 2500<M GOTO 170
160 GOTO 40
170 IF 4000>M THEN GOTO 172 ELSE GOTO 40
172 PRINT"IF THE PEN DOESN'T FIRE THE     FIRST TIME YOU PLACE I
T OVER    THE CANNON BARREL GENTLY NUDGE  THE JOYSTICK TILL IT F
IRES."
174 FOR T=1 TO 4000:NEXT T
180 REM-MAIN PROGRAM
190 N=1
200 CLS(4)
210 PRINT@160,"          CANNON                    TO FIRE THE CANNO
N PLACE YOUR   LIGHT PEN AGAINST THE SCOPE      FACE. WHEN YOU WI
SH THE CANNON  TO FIRE MOVE THE PEN OVER THE    BRIGHT SPOT AT TH
E END OF THE   BARREL."
220 FOR T=1 TO 2000:NEXT T
230 PRINT"WATCH FOR THE PLANE TO MOVE.    FIRE AS SOON AS POSSIB
```

Listing 3 continues

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ZBASIC 2.2 DOES NOT SUPPORT THESE BASIC COMMANDS:

1. ATN, EXP, COS, SIN, LOG, TAN, and exponentiation. (However, subroutines are included in the manual for these functions.)
2. ERROR, ON ERROR GOTO, ERL, ERR RESUME.
3. No direct commands like AUTO, EDIT, LIST, LLIST ETC, although these commands may be used when writing programs.
4. Others NOT supported: CDBL, CINT, CSNG, DEFFN, FIX, FRE.
5. Normal CASSETTE I/O. (ZBASIC supports it's own SPECIAL CASSETTE I/O statements.)
6. SOME BASIC COMMANDS MAY DIFFER IN ZBASIC. For instance, END jumps to DOS READY, STOP jumps to BASIC READY etc.
7. MEMORY REQUIREMENTS: to approximate the largest BASIC program that can be compiled in your machine (at one time), enter BASIC and type: PRINT (MEM-6500)/2. Remember, you can merge compiled programs together to fill memory.

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.**
ZBASIC 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 subroutine package.) Program shown exactly as compiled and run in BASIC and ZBASIC.

```
10 '========= ZBASIC 2.2 EXAMPLE PROGRAM AND TIME TEST========
20 CLS:CLEAR100: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=1TO127STEP2 :FOR J=47TO1STEP-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$,"9"):XX=SQR(I*J)
90 BA$=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 IFPOS(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:GOTO210
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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Listing 3 continued

```
LE AFTER  IT DOES. GOOD SHOOTING."
240 PRINT"TO USE THIS PROGRAM WITHOUT A   LIGHT PEN SIMPLY SWING
         JOYSTICK(0) FROM RIGHT TO LEFT  AND BACK. IN THIS MODE
 START    WITH THE JOYSTICK TO THE RIGHT."
250 FOR T=1 TO 2200:NEXT T
260 F=1
270 CLS(0)
280 M=0
290 X=40:Y=20
300 FOR C=20 TO 25
310 SET(20+C,C,3)
320 NEXT C
330 SET(X,Y,2)
340 F=F+1
350 IF F>12 THEN F=1
360 PRINT@F,CHR$(62)
370 E$=INKEY$:IF E$="E" THEN PRINT@160,"YOUR SCORE WAS".9* S/U
380 FOR T=1 TO 100
390 A=JOYSTK(0)
400 M=M+A
410 NEXT T
420 IF M<4000 THEN M=0:GOTO 450
430 FOR T=1 TO 300:NEXT T
440 GOTO 270
450 FOR H=X-2 TO X+2
460 FOR V=Y-2 TO Y+2
470 IF V<1 THEN GOTO 270
480 SET(H,V,2)
490 A=JOYSTK(0)
500 M=M+A
510 RESET(H,V)
520 IF M<4000 GOTO 560
530 NEXT V
540 NEXT H
550 GOTO 450
560 X=H:Y=V
570 M=0
580 IF F>12 THEN F=1
590 F=F+1
600 PRINT@F,CHR$(62)
610 Z=Z+1
620 U=Z/10
630 IF F=.5*X THEN CLS(3):SOUND 30,15:S=S+1:PRINT@160,"YOU GOT H
IM.":FOR T=1 TO 200:NEXT T
640 GOTO 450
```

Program Listing 4

```
5 CLS(3)
7 PRINT@160,"       KAMIKAZE                    YOUR MISSILES TRAVE
L ON THE     BEAM OF YOUR LIGHT  PEN"
8 FOR T=1 TO 3000:NEXT T
10 U=0
11 K=0
12 PRINT"TO CALIBRATE YOUR PEN HOLD IT    OVER A LARGE GREEN ARE
A."
13 PRINT"ADJUST THE JOYSTICK UNTIL IT    READS ABOUT 2000. LOWER
 NUMBERS ARE EASIER, HIGHER ARE HARDER."
16 FOR T=1 TO 1500: NEXT T
17 FOR N=1 TO 50:J=JOYSTK(0):K=K+J:NEXT N :PRINT K
18 FOR T=1 TO 500:NEXT T
20 K=0
30 T=0
35 W=1
36 INPUT"TO END TEST ENTER E. TO TEST    AGAIN ENTER A";E$
37 IF E$="E" THEN  GOTO 40
38 GOTO 16
40 REM-KAMIKAZE
50 PCLEAR8
60 PCLS
70 Z=50+RND(50)
80 U=U+1
90 FOR N=1 TO 4
100 FOR P=1 TO 8
110 PMODE 0,P
120 Z=Z+3*N
130 PCLS
140 CIRCLE(Z,90),(P+7*(N-1))/1.5
145 IF RND(10)>9 THEN SOUND 205,4:LINE(Z,90)-(128,180),PSET:IF A
>40 AND Z>160 THEN GOTO 370
150 PAINT(Z,90),3,1
160 LINE(Z-3*(P+7*((N-1))),90)-(Z+3*(P+7*(N-1)),90),PSET
```

Listing 4 continues

Continued from p. 116

Listing 4 continued

```
170 LINE(Z,90)-(Z,90-2*( P+7*(N-1))),PSET
180 LINE(Z-1.5*(P+7*(N-1)),90-P-7*(N-1))-(Z+1.5*(P+7*(N-1)),90-P
-7*(N-1)),PSET
190 SCREEN1,0
200 A=JOYSTK(0)
210 IF A<3 THEN A=3
220 LINE(4*A-10,90)-(4*A+10,90),PSET
230 LINE(4*A,80)-(4*A,100),PSET
240 A=JOYSTK(0)
250 IF A<40 THEN GOTO 290
260 IF N=4 AND P=5 THEN GOTO 370
270 NEXT P
280 NEXT N
290 FOR L=1 TO 30
300 LINE(4*A,90)-(4*A-RND(80)+40,90+RND(80)-40),PSET
310 NEXT L
320 SCREEN1,0
325 SOUND 10,30
330 CLS(4)
340 PRINT@160,"CONGRATULATIONS                    YOUR SCORE WAS"30
-(P+7*N)
350 S=30-(P+7*N)
360 GOTO 420
370 CLS(8)
380 PRINT@160,"CONDOLENCES WILL BE SENT TO      NEXT OF KIN"
390 K=30
400 S=0
410 GOTO 420
420 T=T+S-K
425 S$=INKEY$
427 IF S$="S" THEN GOTO 490
428 W=W+1:IF W=10 THEN GOTO 490
480 GOTO 70
490 CLS(1)
491 FOR X=0 TO 63
492 FOR Y=0 TO 31
493 SET(X,Y,Y/4)
494 NEXT Y
495 NEXT X
500 PRINT@160,"YOUR TOTAL WAS"T,"IN "U,"TRIES"
```

that demonstrate use of this light pen. Program Listing 1 finds the pen and gives the location and brightness of the light point.

Program Listing 2 determines color. Each of the eight colors and black corresponds to a different brightness. Three colors—green, yellow, and red—are sufficiently different in brightness that the pen can ordinarily distinguish them. Another way to distinguish colors is to use a high-speed reset with a delay, different for each color.

Program Listing 3 fires a light-controlled cannon. Program Listing 4 is a light-pen game called Kamikaze. Program Listing 5 lets you write on the screen.

For those of you unable or unwilling to build this light pen, I will provide an assembled unit for $36. I will also provide the complete kit for $18. ■

Contact Ray Moses at P.O. Box 11038, Huntsville, AL 35805.

Listing 5 on p. 120

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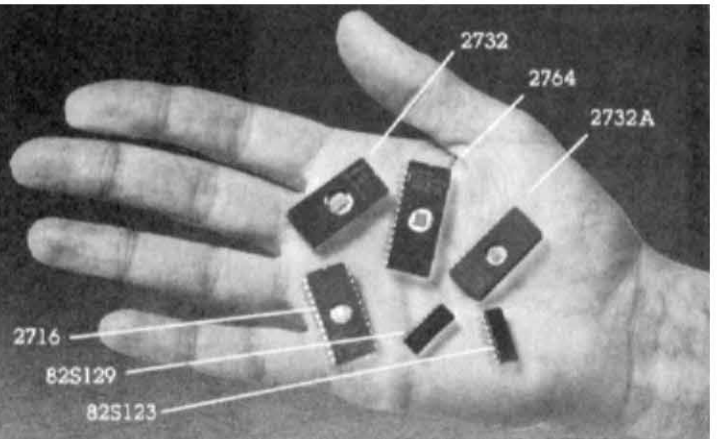

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```
3 CLS(7)
5 PRINT"NOTE- TO USE THIS PROGRAM MAKE  SURE THERE ARE NO BRIGHT
        REFLECTIONS ON THE SCREEN SUCH  AS THOSE FROM A SUNLIT W
INDOW.  YOUR PEN IS A LIGHT SENSOR AND  SUCH REFLECTIONS MAY CAU
SE      INCORRECT RESPONSES."
7 FOR T=1 TO 2500:NEXT T
10 K=N-1
20 Q=0
30 DIM X(150):DIM Y(150)
40 REM- PENPAL
50 REM-THIS PROGRAM ALLOWS YOU TO WRITE ON THE SCREEN.
60 CLS(0)
70 PRINT"TO SET PEN PLACE IT OVER THE    SPOT. ADJUST THE NUMBER
S TO     READ ABOUT 1500. WHEN THE PEN   IS ADJUSTED THE PROGRAM
 WILL    AUTOMATICLY CONTINUE."
80 FOR T=1 TO 2000:NEXT T
90 SET(10,20,2)
100 FOR S=1 TO 50
110 A=JOYSTK(0)
120 M=M+A
130 NEXT S
140 PRINT@192,M
150 IF 500<M AND M<1500 THEN GOTO 160 ELSE M=0: GOTO 100
160 CLS(0)
170 SET(5,25,2)
180 PRINT"TO WRITE PLACE THE PEN OVER THE POINT PRESS P. WHEN TH
E TONE    OCCURS MOVE THE PEN SLOWLY."
190 INPUT P$
200 M=0
210 FOR S=1 TO 10
220 A=JOYSTK(0)
230 M=M+A
240 NEXT S
250 IF M<300 THEN SOUND 140,4:M=0:GOTO 270
260 GOTO 200
270 CLS(0)
280 X=5:Y=25
290 FOR H=X+2 TO X-1 STEP-1
300 FOR V=Y-2 TO Y+2
310 SET(H,V,2)
320 FOR S=1 TO 5
330 A=JOYSTK(0)
340 M=M+A
350 NEXT S
360 RESET(H,V)
365 IF M<100 THEN GOTO 380
370 IF M<250 THEN GOTO 420 ELSE M=0:GOTO 380
380 NEXT V
390 NEXT H
400 M=0
410 GOTO 290
420 X(N)=H:Y(N)=V
430 M=0
440 SET(H,V,2)
450 FOR T=1 TO 5
460 A=JOYSTK(0)
470 M=M+A
480 NEXT T
485 RESET(H,V)
490 IF M<130 THEN M=0:GOTO 380
500 IF M>200 THEN M=0:GOTO 380
520 RESET(H,V)
530 M=0
540 FOR S=1 TO 5
550 A=JOYSTK(0)
560 M=M+A
570 NEXT S
580 IF M<250 THEN GOTO 290
590 X=H:Y=V
600 N=N+1
610 IF N>4 THEN SET(X(N-4),Y(N-4),2)
620 IF N<4 THEN GOTO 640
630 IF X=X(N-4) AND Y=Y(N-4) THEN RESET(X,Y)
640 SOUND 140,1
645 C$=INKEY$
647 IF C$="C" THEN GOTO 1000
650 GOTO 290
1000 REM-WRITES ON COLORED BACKGROUND
1010 FOR C=2 TO 8
1020 FOR S=1 TO N
1030 SET(X(S),Y(S),C-1)
1040 RESET(X(S),Y(S))
1045 A=C+1
1047 IF A=9 THEN A=1
1050 SET(X(S),Y(S),A)
1060 NEXT S
1070 NEXT C
1080 GOTO 1000
1100 END
```

Program Listing 5

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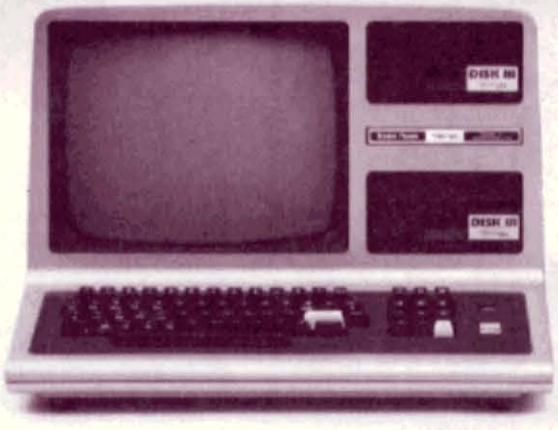

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MX-80 Driver

by Dan Robinson

While Radio Shack's new SuperScripsit is a terrific word processor, it is difficult to convert Tandy's sample driver for use on such popular printers as the MX-80.

SuperScripsit offers two means of sending codes to the printer. One way involves customizing the number keys as control keys. The other method, contained in the printer driver itself, toggles underscore, double-strike, backslash, sub- and superscripts on and off. These last features, except for the backslash, which uses internal code, can also be programmed on the user keys.

If you've been unable to use your printer with SuperScripsit, you should try this program.

The source code in the Program Listing is a SuperScripsit printer driver for the MX-80 with Graftrax Plus. It begins with some suggestions for programming the user keys for emphasized, italic, compressed, and double-width fonts.

You must adjust the line length when you change type widths. Remember that the presentation of the format on the bottom of the screen will then be inaccurate since the driver's type width is set at 10 characters per inch.

The driver will use SuperScripsit's – or = with the clear key to toggle underscore on or off, and a + will toggle double-strike. A . will turn subscript on and superscript off, while a * will initiate superscript or turn subscript off. Since I haven't needed the backslash to overstrike text, I have converted the / into a toggle to turn slashed-zero on and off.

SuperScripsit uses a half line feed for subscripting, and 1½ for line spacing at 1½. So, if you specify 1½ line spacing, expect to see your print shrink to a tiny size after the first line. If you already have some files with unusual line spacing, put a RET instruction in the remarks where indicated, and program user keys for sub- and superscripts.

Remember that the MX-80 command that turns off sub- and superscripts will also take you out of the double-strike mode, so be prepared to reinstate it if it was used.

The Program Listing is in Model I format with Model III differences contained in the remarks. Other printer configurations may require some minor changes. The program has been compressed enough from the DW2 driver that you should be able to understand it. ■

Program Listing

```
                00100 ; ***************************************************
                00110 ; *                                                 *
                00120 ; *     SUPERSCRIPSIT PRINTER DRIVER FOR            *
                00130 ; *       THE MX-80 WITH GRAFTRAX PLUS              *
                00140 ; *                                                 *
                00150 ; ***************************************************
                00160 ; *                                                 *
                00170 ; *  PROGRAM USER PRINT KEYS WITH UNIT VALUE OF 000  *
                00180 ; *                                                 *
                00190 ; *  0 = 015            COMPRESSED FONT ON           *
                00200 ; *  1 = 018                            OFF          *
                00210 ; *  2 = 027,087,001    DOUBLE-WIDTH    ON           *
                00220 ; *  3 = 027,087,000                    OFF          *
                00230 ; *  4 = 027,069        EMPHASIZED FONT ON           *
                00240 ; *  5 = 027,070                        OFF          *
                00250 ; *  6 = 027,052        ITALIC FONT     ON           *
                00260 ; *  7 = 027,053                        OFF          *
                00270 ; *                                                 *
                00280 ; ***************************************************
                00290 ; *                                                 *
                00300 ; *  SUPERSCRIPSIT PRINT CODES FOR MX-80:           *
                00310 ; *                                                 *
                00320 ; *  "-" OR "="      UNDERSCORE ON/OFF              *
                00330 ; *  "+"             DOUBLE-STRIKE ON/OFF           *
                00340 ; *  "/"             SLASH ZERO ON/OFF              *
                00350 ; *  "."             SUBSCRIPT ON/SUPERSCRIPT OFF   *
                00360 ; *  "*"             SUPERSCRIPT ON/SUBSCRIPT OFF   *
                00370 ; *                                                 *
                00380 ; ***************************************************
                00390 ;
BAD3            00400           ORG     0BAD3H
BAD3 3C         00410 INCSIZ    DEFB    3CH     ;0 UNITS/INCH
BAD4 0A         00420 PITCH0    DEFB    0AH     ;PITCH VALUE
BAD5            00430 WIDTBL    EQU     $       ;CHARACTER WIDTH TABLE
BAD5            00440 WIDSPC    EQU     $       ;SPACE WIDTH
BB35            00450           ORG     0BB35H
```

Listing continues

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Listing continued

```
BB35 01          00460          DEFB    01H     ; 00 SUPRESES LINEFEED AFTER CR
BB36 01          00470          DEFB    01H     ; NULLS AFTER CR
BB37 C376BB      00480          JP      PRINIT  ; JUMP TABLE
BB3A C389BB      00490          JP      SETPCH
BB3D C38ABB      00500          JP      PRTCHR
BB40 C397BB      00510          JP      PRTSPC
BB43 C3BABB      00520          JP      BACKSP
BB46 C3C0BB      00530          JP      TOGFEA
BB49 C321BC      00540          JP      EXFEA
BB4C C33CBC      00550          JP      HAFFOR          ; INSERT RET AT THESE
BB4F C377BC      00560          JP      HAFREV          ; LOCATIONS TO SUPPRESS
BB52 C395BC      00570          JP      RDYTST
BB55 C3A2BC      00580          JP      SETTBL
                 00590 ;
BB73             00600          ORG     0BB73H
BB73 BCBC        00610          DEFW    LAST    ; NEXT AVAILABLE ADDRESS
BB75 0A          00620 MODSTO   DEFB    0AH     ; CURRENT PITCH
BB76 CD95BC      00630 PRINIT   CALL    RDYTST  ; CHECK IF PRINTER READY
BB79 AF          00640          XOR     A
BB7A 32F7BB      00650          LD      (EX1),A ; ZERO EXTRA FEATURE FLAGS
BB7D 3201BC      00660          LD      (EX2),A
BB80 3220BC      00670          LD      (EX3),A
BB83 3276BC      00680          LD      (SUPR),A
BB86 C3B3BC      00690          JP      PRINT   ; INITIALIZE PRINTER
BB89 C9          00700 SETPCH   RET             ; NOT NEEDED FOR MX-80
BB8A CDBBBA      00710 PRTCHR   CALL    PRSTOP  ; CHECK FOR <BREAK> KEY
BB8D D8          00720          RET     C
BB8E CD95BC      00730 PC1      CALL    RDYTST  ; CHECK IF PRINTER READY
BB91 20FB        00740          JR      NZ,PC1  ; AND LOOP UNTIL IT IS
                 00750 ; ********************************************************
                 00760                          ; MODEL III USE
BB93 32E837      00770          LD      (PRPORT),A      ; OUT (PRPORT),A
                 00780                          ; INSTEAD
                 00790 ; ********************************************************
BB96 C9          00800          RET
BB97 C5          00810 PRTSPC   PUSH    BC      ; OUTPUT EXTRA SPACES FOR
BB98 E5          00820          PUSH    HL      ; MONO-SPACED JUSTIFICATION
BB99 D5          00830          PUSH    DE
BB9A 60          00840          LD      H,B
BB9B 69          00850          LD      L,C
BB9C 3AD5BA      00860          LD      A,(WIDSPC)
BB9F 4F          00870          LD      C,A
BBA0 0600        00880          LD      B,00H
BBA2 7C          00890 LOOP0    LD      A,H
BBA3 B5          00900          OR      L
BBA4 280F        00910          JR      Z,SPDONE
BBA6 ED42        00920          SBC     HL,BC
BBA8 3004        00930          JR      NC,JUMP0
BBAA 09          00940          ADD     HL,BC
BBAB 55          00950          LD      D,L
BBAC 2E00        00960          LD      L,00H
BBAE 3E20        00970 JUMP0    LD      A,20H
BBB0 CD8ABB      00980          CALL    PRTCHR
BBB3 30ED        00990          JR      NC,LOOP0
BBB5 D1          01000 SPDONE   POP     DE
BBB6 E1          01010          POP     HL
BBB7 C1          01020          POP     BC
BBB8 AF          01030          XOR     A
BBB9 C9          01040          RET
BBBA 3E08        01050 BACKSP   LD      A,08H   ; BACKSPACE ROUTINE CALLED FROM
BBBC CD8ABB      01060          CALL    PRTCHR  ; SUPERSCRIPSIT
BBBF C9          01070          RET
BBC0             01080 TOGFEA   EQU     $       ; TOGGLE FEATURE ON/OFF
BBC0 FE2D        01090          CP      2DH     ; UNDERSCORE WITH "-"
BBC2 280E        01100          JR      Z,EXTRA1
BBC4 FE3D        01110          CP      3DH     ; UNDERSCORE WITH "="
BBC6 280A        01120          JR      Z,EXTRA1
BBC8 FE2F        01130          CP      2FH     ; SLASHED-ZERO
BBCA 282C        01140          JR      Z,EXTRA2
BBCC FE2B        01150          CP      2BH     ; DOUBLE-STRIKE
BBCE 2832        01160          JR      Z,EXTRA3
BBD0 AF          01170          XOR     A
BBD1 C9          01180          RET
BBD2 3E1B        01190 EXTRA1   LD      A,1BH   ; UNDERSCORE
BBD4 CD8ABB      01200          CALL    PRTCHR
BBD7 D8          01210          RET     C
BBD8 3E2D        01220          LD      A,2DH
BBDA CD8ABB      01230          CALL    PRTCHR
BBDD D8          01240          RET     C
BBDE 3AF7BB      01250          LD      A,(EX1) ; SET ON/OFF FLAG
BBE1 2F          01260          CPL
BBE2 32F7BB      01270          LD      (EX1),A
BBE5 FE00        01280          CP      00H
BBE7 2807        01290          JR      Z,EXT1
BBE9 3E31        01300          LD      A,31H
BBEB CD8ABB      01310          CALL    PRTCHR
BBEE AF          01320          XOR     A
BBEF C9          01330          RET
BBF0 3E00        01340 EXT1     LD      A,00H
BBF2 CD8ABB      01350          CALL    PRTCHR
BBF5 AF          01360          XOR     A
BBF6 C9          01370          RET
BBF7 00          01380 EX1      DEFB    00H     ; FLAG
BBF8 3A01BC      01390 EXTRA2   LD      A,(EX2) ; SLASHED-ZERO
BBFB 2F          01400          CPL
BBFC 3201BC      01410          LD      (EX2),A
BBFF AF          01420          XOR     A
BC00 C9          01430          RET
BC01 00          01440 EX2      DEFB    00H     ; FLAG
BC02 3E1B        01450 EXTRA3   LD      A,1BH   ; DOUBLE-STRIKE
BC04 CD8ABB      01460          CALL    PRTCHR
BC07 3A20BC      01470          LD      A,(EX3)
BC0A 2F          01480          CPL
BC0B 3220BC      01490          LD      (EX3),A
BC0E FE00        01500          CP      00H
BC10 2807        01510          JR      Z,EXT3
```

Listing continues

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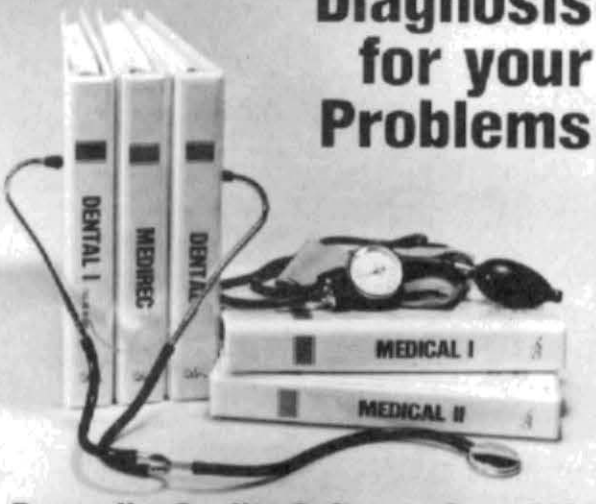

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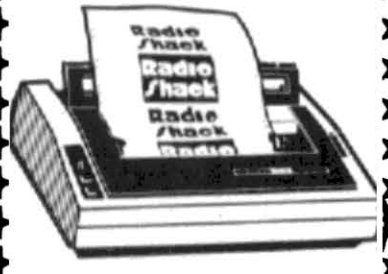

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```
BC12 3E47     01520          LD      A,47H
BC14 CD8ABB   01530          CALL    PRTCHR
BC17 AF       01540          XOR     A
BC18 C9       01550          RET
BC19 3E48     01560 EXT3     LD      A,48H
BC1B CD8ABB   01570          CALL    PRTCHR
BC1E AF       01580          XOR     A
BC1F C9       01590          RET
BC20 00       01600 EX3      DEFB    00H     ; FLAG
BC21          01610 EXPEA    EQU     $
BC21 FE2F     01620          CP      2FH     ; SLASHED-ZERO
BC23 2015     01630          JR      NZ,EXIT0
BC25 3A01BC   01640          LD      A,(EX2)
BC28 B7       01650          OR      A
BC29 280F     01660          JR      Z,EXIT0
BC2B 7A       01670          LD      A,D     ; GET LAST CHARACTER PRINTED
BC2C FE30     01680          CP      30H     ; CHECK FOR ZERO
BC2E 200A     01690          JR      NZ,EXIT0
BC30 3E08     01700          LD      A,08H   ; BACKSPACE
BC32 CD8ABB   01710          CALL    PRTCHR
BC35 3E2F     01720          LD      A,2FH   ; PRINT SLASH
BC37 CD8ABB   01730          CALL    PRTCHR
BC3A AF       01740 EXIT0    XOR     A
BC3B C9       01750          RET
BC3C 3A76BC   01760 HAFFOR   LD      A,(SUPR)        ; SUBSCRIPT
BC3F 2F       01770          CPL
BC40 3276BC   01780          LD      (SUPR),A
BC43 FE00     01790          CP      00H
BC45 2813     01800          JR      Z,SUP1
BC47 3E1B     01810          LD      A,1BH
BC49 CD8ABB   01820          CALL    PRTCHR
BC4C D8       01830          RET     C
BC4D 3E53     01840          LD      A,53H
BC4F CD8ABB   01850          CALL    PRTCHR
BC52 D8       01860          RET     C
BC53 3E01     01870          LD      A,01H
BC55 CD8ABB   01880          CALL    PRTCHR
BC58 AF       01890          XOR     A
BC59 C9       01900          RET
BC5A 3E1B     01910 SUP1     LD      A,1BH   ; RESETS SUPER- AND SUB-SCRIPTS
BC5C CD8ABB   01920          CALL    PRTCHR  ; & RESETS DOUBLE-STRIKE
BC5F D8       01930          RET     C
BC60 3E48     01940          LD      A,48H
BC62 CD8ABB   01950          CALL    PRTCHR
BC65 3E1B     01960          LD      A,1BH   ; ENDS UNI-DIRECTIONAL PRINTING
BC67 CD8ABB   01970          CALL    PRTCHR
BC6A 3E55     01980          LD      A,55H
BC6C CD8ABB   01990          CALL    PRTCHR
BC6F 3E00     02000          LD      A,00H
BC71 CD8ABB   02010          CALL    PRTCHR
BC74 AF       02020          XOR     A
BC75 C9       02030          RET
BC76 00       02040 SUPR     DEFB    00H             ; SUB/SUPER FLAG
BC77 3A76BC   02050 HAFREV   LD      A,(SUPR)        ; SUPERSCRIPT
BC7A 2F       02060          CPL
BC7B 3276BC   02070          LD      (SUPR),A
BC7E FE00     02080          CP      00H
BC80 28D8     02090          JR      Z,SUP1
BC82 3E1B     02100          LD      A,1BH
BC84 CD8ABB   02110          CALL    PRTCHR
BC87 D8       02120          RET     C
BC88 3E53     02130          LD      A,53H
BC8A CD8ABB   02140          CALL    PRTCHR
BC8D D8       02150          RET     C
BC8E 3E00     02160          LD      A,00H
BC90 CD8ABB   02170          CALL    PRTCHR
BC93 AF       02180          XOR     A
BC94 C9       02190          RET
BC95 C5       02200 RDYTST   PUSH    BC              ; CHECK IF PRINTER
BC96 47       02210          LD      B,A             ; READY
              02220 ; ********************************************************
              02230 ;                                ; MODEL III USE
BC97 3AE837   02240          LD      A,(PRPORT)      ; IN  A,(PRPORT)
              02250                                  ; INSTEAD
              02260 ; ********************************************************
BC9A 00       02270          NOP
BC9B E6F0     02280          AND     0F0H
BC9D FE30     02290          CP      30H
BC9F 78       02300          LD      A,B
BCA0 C1       02310          POP     BC
BCA1 C9       02320          RET
BCA2 E5       02330 SETTBL   PUSH    HL              ; SET WIDTH TABLE FOR
BCA3 C5       02340          PUSH    BC              ; VIDEO TAB LINE DRIVER
BCA4 21D5BA   02350          LD      HL,WIDTBL       ; ALL CHARACTERS SET AT
BCA7 065F     02360          LD      B,95            ; 10 CHAR PER INCH
BCA9 3E06     02370          LD      A,6
BCAB 77       02380 SETLP    LD      (HL),A
BCAC 23       02390          INC     HL
BCAD 10FC     02400          DJNZ    SETLP
BCAF C1       02410          POP     BC
BCB0 E1       02420          POP     HL
BCB1 AF       02430          XOR     A
BCB2 C9       02440          RET
BCB3 C2B5BA   02450 PRINT    JP      NZ,PRTERR       ; DISPLAY ERROR MESSAGE
BCB6 3E14     02460          LD      A,14H           ; INITIALIZE PRINTER
BCB8 CD8ABB   02470          CALL    PRTCHR
BCBB C9       02480          RET
BCBC          02490 LAST     EQU     $               ; NEXT AVAILABLE ADDRESS
BAB5          02500 PRTERR   EQU     0BAB5H
BABB          02510 PRSTOP   EQU     0BABBH
              02520 ; ********************************************************
              02530                                  ; FOR MODEL III USE
37E8          02540 PRPORT   EQU     37E8H           ; EQU     0F8h
              02550                                  ; INSTEAD
              02560 ; ********************************************************
0000          02570          END     0000H
```

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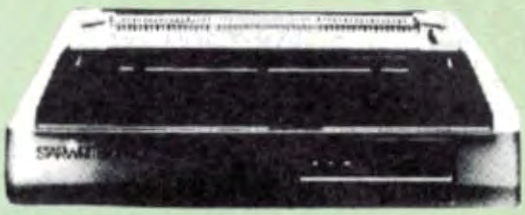

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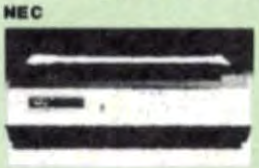

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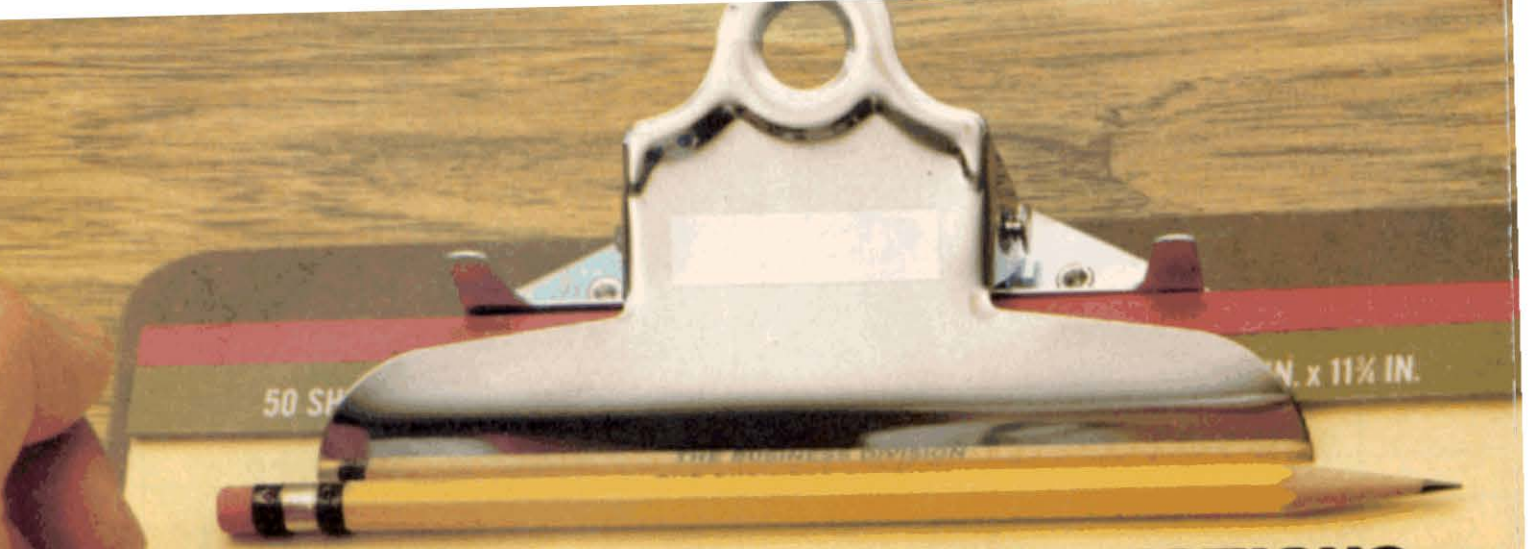

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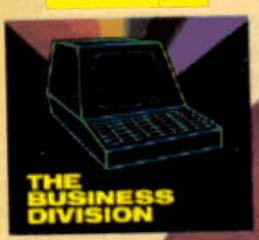

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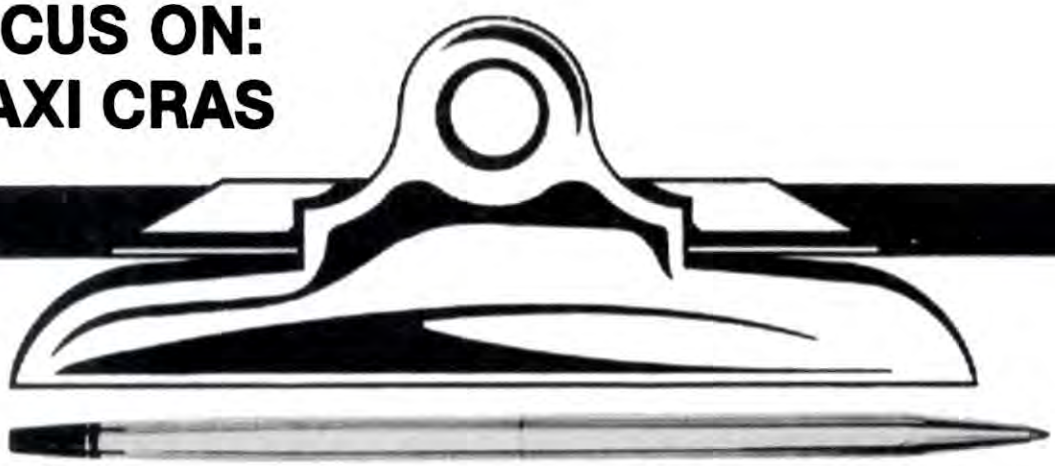

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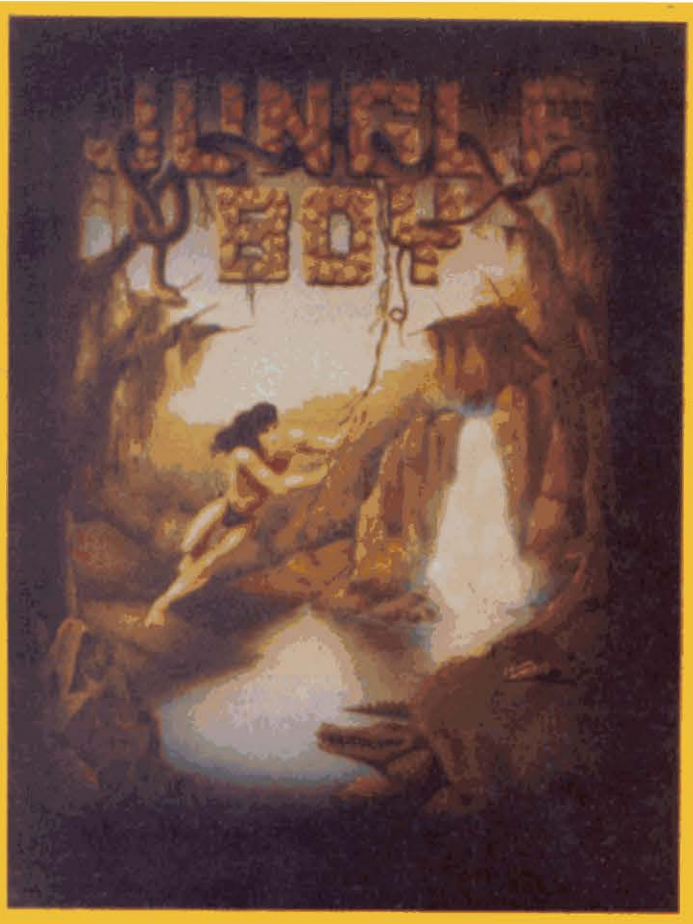

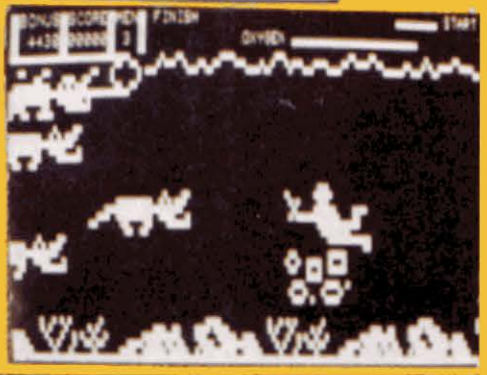

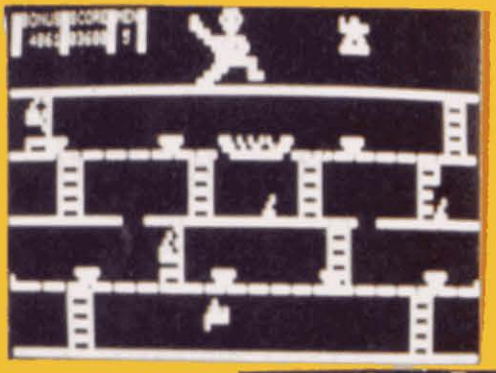

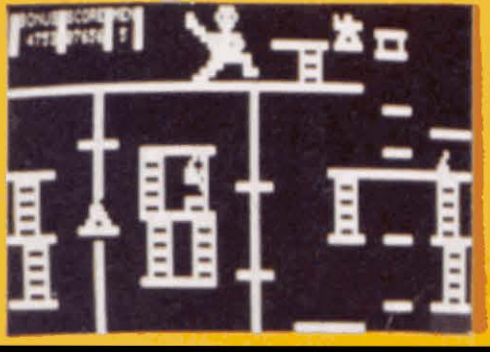

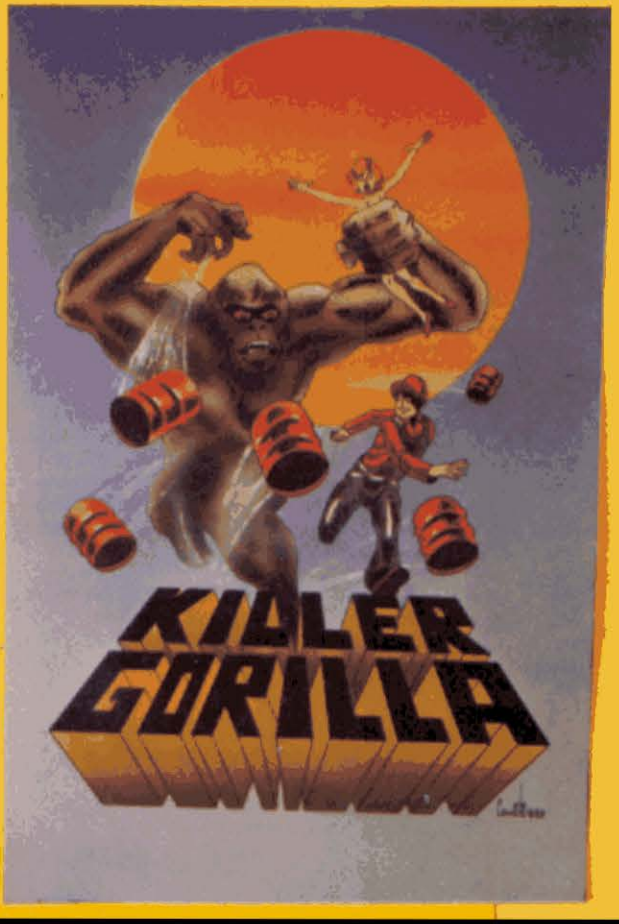

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The Model 12

by Jim Hawkes

Tandy refines the Model II and introduces a strong contender with the Model 12. This expandable machine is competition for the Model 16.

★★★★

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Since 12 is between 2 and 16, it seems reasonable to conclude that Tandy's new TRS-80 Model 12 is more powerful than the venerable Model II, but not quite as powerful as the Model 16. Moreover, since 12 is closer to 16 than it is to 2, the Model 12 must resemble the Model 16 more than the Model II. Though somewhat facetious, this analysis is accurate in many respects.

The Model 12 is a redesigned Model II. It has greater disk capacity, a larger expansion bus, a new keyboard, a different color case, and a new video screen.

Many of these improvements are incorporated from the Model 16. Hence, the Model 12 is not a major innovation, but an evolutionary product designed, like its predecessors the Model II and 16, principally as a business computer. Since many of the undesirable features of its predecessors have been eliminated, it will supplant the Model II in the Radio Shack product line.

Memory

One of the more interesting features of the Model 12 is the amount of memory provided, 80K. This memory is proportioned into 64K of RAM and 16K for use by the double-sided disk operating system. Although the extra memory holds part of the operating system, no additional memory is available for Basic programs. A 64K board can also be purchased and used with VisiCalc and some non-Radio Shack operating systems.

The Z80A CPU

The CPU is the aged Z80A, which has been used in both the Model II and 16. By using the same CPU as the Model II, the Model 12 immediately has access to a large volume of ready-to-run software and maintains compatibility with the Mod 16 upgrade.

The Z80 family of microprocessors has been around for quite a few years and the Z80A represents only the second generation. The third generation, the Z80B, operates at six megahertz while the fourth generation, the Z80H, operates at 10 megahertz.

Eventually, Radio Shack has to provide systems with greater performance; if they plan to maintain software compatibility with the Z80 family, they need yet another generation.

Zilog has recently announced a new

CPU, the Z800, that is compatible with the Z80 family but has awesome computational capabilities. This CPU executes all Z80 instructions as well as hardware multiply and divide. Furthermore, the microprocessor addresses one-half megabyte of memory.

But the most intriguing aspect of the device is its clock speed—reportedly, as high as 25 megahertz—more than six times the speed of the Z80A.

The Display

Like the CPU, the display is similar to previous machines, especially the Model 16. The 12-inch screen produces an 80-character by 24-line display. It is capable of high-resolution graphics when the hi-res graphics board is installed. Unlike the Model II, the screen is green phosphorus to prevent eye strain and increase character legibility.

The Keyboard

In designing the keyboard, Radio Shack engineers improved on what was already a good idea. The new board is one of the best design features of the new machine. The keys have more contour—that is, they fit your fingertips a little better. In addition, the keyboard features eight special function keys around the numeric pad instead of the two available on the Models II and 16. Another new feature of the Model 12 is an audible keystroke response. The duration of the tone is variable, but the pitch is not. This note not only provides a typing rhythm but, more important, reinforces the action of striking the key. I've missed this reinforcement in the previous Radio Shack computers.

The Model 12's keyboard is detachable and connects to the front of the console in a slightly different manner than in the Model II/16 series. The cable is permanently attached to the keyboard, rather than the console.

The only point I don't like about the new keyboard is one small but not insignificant change, the enter key. By examining Photo 1 carefully you will notice that in the middle of what used to be the enter bar there is a sculpted key of the same height and shape as the rest of the keys. Unhappily, your little finger must strike the sculpted portion of the enter bar to easily depress the key. This is not difficult when the index finger on your right hand is in the normal (j) position, but it is cumbersome from other positions.

Size and Dimension

Steven Jobs, co-founder of Apple Computer, is reputed to have said, "Never trust a computer you cannot pick up—and throw out the window." By these standards the 12 possesses at least one of the necessary conditions of a trustworthy microcomputer. It has about the same physical characteristics as the Models II and 16.

In most respects the Model 12 looks like the Model 16. It is the same color, slightly off white, and has the same type of video display. One noticeable difference is the on/off switch. I found the Model II switch too long and the Model 16 switch too short. The Model 12 switch is just right. In fact, the Model 12 on/off switch is not on the front panel of the display console. Rather, it has a big red button that glows to let you know the machine is on.

System Noise

One thing is for sure. Unless you are deaf or in the middle of an active war zone, you don't need the red light to tell you the system is on.

Tandy has certainly improved most of the machine's undesirable hardware features, but excessive noise still holds many owners in acoustical purgatory. I

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have heard more than one operator discuss the debilitating effects of system noise—especially after eight or nine hours of steady operation. And, I can testify that on occasion I have been reluctant to use the Model II, or 16 because of the omnipresent noise.

Certainly the system's electronic components require cooling, but isn't there a quieter fan or a better design that would eliminate the noisy internal fan?

Disk Storage

The Model 12 has the same disk drives as the Model 16, namely thinline double-sided, double-density (DS/DD). These drives provide not only twice the capacity per drive of the old Model II drives, but take up one-half the space. Consequently, a two-drive system, the minimum configuration for most business needs, is contained completely within the display console, eliminating the need for an expansion bay unless you need more than two drives (almost 2.5 million bytes of storage).

As in the Model 16, the drives turn off after 20 seconds without a disk I/O. This helps reduce system noise and drive wear and tear.

Double-sided disk drives are more finicky than the single-sided variety—especially about being moved. That is why I recommend saving the shipping cardboard that was initially present in your drives. Reinsert these strips when you move the system to assure the disk heads don't collide.

In addition to floppy disks Radio Shack recently announced a 12-megabyte version of their hard disk. Up to four of these disks used with the 12 provide a hard-disk capacity of almost 50 megabytes. However, can you imagine backing up 50 megabytes onto floppy disks—the only way to back up your data? Radio Shack should quickly address this problem.

Expansion

Since the introduction of the Model II, Radio Shack introduced a host of peripheral boards, including additional memory, disk controllers, communication upgrades, monochrome high-resolution graphics, and 16–32 bit processors. They have also claimed that they will soon release Arcnet—a communication network based on an integrated circuit developed by Datapoint. In addition to these peripherals, other manufacturers have developed disk emulators, hi-res graphics upgrades, and serial I/O boards for the Model II family.

Unfortunately, the Models II and 16 cannot fully utilize available peripherals. For example, a standard Model 16 has only two slots on its bus for additional expansion. However, for a mere $200 and a $30 fee, Radio Shack can install an expansion box (bus) within the Model 12 enclosure. This bus, located in the rear of the computer, provides six additional card slots. By removing the rear panel, you can install additional cards yourself without paying any installation fees.

The expansion bus accepts all of the peripheral cards distributed by Radio Shack, including the Model 16 upgrade. One of the implications of the expansion bus is that in the Model 16 mode, the Model 12 supports 768K, 50 percent more memory than the Model 16 and three times more than the Model II. You can also configure a Model 12 as a Model 16 and have four empty slots available for extra peripherals (as I recall a Mod 16 only has two) at the identical price of a 16. Why then would

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anyone want to buy the Model 16?

Software

All of the software available for the Model II is compatible with the Model 12. In addition, Radio Shack recently announced two software packages, CPM+ and TRS-XENIX, that further expand the models' application software.

CP/M+ is the latest lineal release of Digital Research's CP/M (Control Program/Microcomputer) operating system, the de facto standard of microcomputer operating systems. Few software standards exist in the microcomputer marketplace, yet CP/M has emerged as the common denominator, having been installed on more than 600 different systems. Because of its prevalence, it seems likely that any new significant software packages must—out of economic imperative—be adopted for CP/M. Furthermore, new software products may use bank select memory, one of the many advantages of CP/M+.

TRS-XENIX is the long awaited multi-user, multi-tasking operating system for the Model 16. The new operating system was developed by Microsoft under license from Bell Labs and is an enhanced version of the much heralded UNIX. The initial release requires a hard disk and at least 256K of memory. However, single-user systems have been promised.

All Model 16 owners receive the core system, which lets them execute applications software; it contains no development tools. However, you can buy a development system including the full set of UNIX utilities and the C programming language for $700.

Model II Epitaph

"...the Model 12 does replace the Model II." The previous quote, which appeared in a recent Radio Shack newsletter, is the only formal announcement I've seen acknowledging the Model II's demise.

This is not a fitting epitaph for a machine that fathered the Model 12 and 16, and was for some time the pride and joy of the Radio Shack product line. But evolution must take its course.

After examining the pricing structure of the 12, anyone who has studied "micro" biology could have predicted the extinction of the Model II. Since a two-drive Model II costs the same as a two-drive Model 12, why would anyone buy a Model II?

This pricing policy raises another interesting question. Does Tandy plan to eliminate or drastically change the Model 16? Since a Model 12 can be configured as a Model 16 at the same price, why would anyone want a Model 16, especially as the Model 12 is a more expandable machine?

Fortunately for Model II and 16 owners, the 12 is a very close relative. Spare parts and new software should benefit owners of both machines for some time.

Conclusion

The Model 12 affirms the old adage that anyone can learn from their mistakes, even large organizations. Radio Shack has finally engineered just about every serious flaw out of their Model II/16 design.

With the micro marketing wars heating up, no company, even one with enormous influence, can afford to become stagnant. So, congratulations, Radio Shack, on a good computer. It may be just in time. ■

Jim Hawkes can be reached at The College of Charleston, Charleston, SC 29401.

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Apply matrix logic to business applications.

MiniCalc

John Corbani
2455 Calle Linares
Santa Barbara, CA 93109

VisiCalc and the many other spread-sheet programs have turned the microcomputer into a professional tool. It is surprising that it took so long for someone to recognize the possibility of applying matrix logic to business applications. Now that everybody is offering newer and better programs at higher and higher prices, I thought it would be interesting to see what could be done in Basic on the TRS-80. The following program turned out to be quite powerful and a time saver when figuring expense accounts and small department budgets. The editing technique might spark some interest among advancing programmers.

I sized the program to a 16K tape system. Many improvements are possible if you have a large disk system. This user-friendly, electronic spread-sheet program features independently user-selectable rows and columns. It allows 2-14 columns of data and one column of totals and 2-25 rows of data and one row of totals. The data can be string or numeric. The field size is 14 characters. All are usable for strings. A maximum of eight characters are allowed for numeric data, which can have positive or negative values. Decimal places are allowed. The program performs addition only; it totals rows and columns and ignores string fields. Precision is to eight digits with two decimal places.

When you choose the create-sheet option, you can enter a title up to 240 characters long, the number of columns (2-14), and the number of data rows (2-25). The rerun-sheet option allows you to enter or change data fields. The print-sheet option prints the title and the sheet in groups of five columns across an 8½-inch sheet. The save-sheet option saves the data and totals on cassette and the load-sheet option loads data and totals from cassette.

The program handles all data as an array of strings. There is one string for each of the rows plus one for the total. Each row string is divided into 15-character segments with a maximum of 15 segments or 225 characters per string. This is comfortably below the 240-character limit of the PRINT#-n function. The field size is compatible with the 64-character screen width and the 80-character printer width. There is enough room for the row number and four columns on the screen and the row number and five columns on the printer. One character in each field is used as a field separator so there are 14 usable characters of data.

Letters printed above each column identify the columns on the screen and printer. Rows are identified by number; the number agrees with the array element (see Fig. 1).

A screen-oriented editor makes interaction with the program as natural as possible. The spread-sheet data fields are displayed on alternate lines of the screen starting with the second line. This allows the display of seven rows and four columns of the string array. A 14-character field cursor centered on a data field can occupy one of four positions on the free line below each data line. The four arrow keys control this cursor. The arrow keys repeat and move the cursor from side to side and up and down the screen to underline selected fields in the data base. When the cursor reaches the edge of the screen, the program checks to see if the cursor is at the edge of the spread sheet. If it is not, the display scrolls left, right, up or down as required to give the effect of the cursor moving across the surface of a large sheet of paper.

Once the cursor is positioned under the field of interest, editing consists of simply typing in the desired data. Pressing an alphanumeric key erases the field cursor and prints the typed character at the left edge of the prior cursor position. The program now appears to be in a normal TRS-80 character entry mode with an underline prompting for new characters. If the first character typed is a minus sign or one of the numerals (0-9), the program limits data input to eight digits. Any other first character identifies the field as a string field and allows 14 characters. A mark identifies the end of the field and the

A	= Temporary variable/column count
AA	= Row count
A5	= Temporary row variable
A6	= Substring length
B	= Temporary variable
B1	= Temporary variable
C	= Column count
CC	= Character count
CL	= Column limit
CN	= Character number
CT(N)	= Column total array
I	= Input variable
LI	= Last arrow variable
LN	= Line number
LT	= Len(T$)
MC	= Maximum character count
MH	= Maximum horizontal rows
MV	= Maximum vertical columns
MX	= Maximum X count
R	= Row/column number
RL	= Row limit
RT	= Row total
S	= Column scroll flag
SP	= Cursor position
V	= Flag/value of MID$
X	= Horizontal position of cursor
Y	= Vertical position of cursor

Table 1. Numeric variables

The Key Box

Models I and III
16K RAM
Cassette and Disk Basic
Printer

Scanned by Ira Goldklang - www.trs-80.com

backspace key (left arrow) allows correcting mistakes. The backspace repeats and automatically stops at the beginning of the field.

Pressing enter formats the operator's entry and inserts it into the appropriate string array element. String data is centered in each field. Numeric data is right-justified at the eighth character position of the field. The new data is printed on the screen in place of the old field data, the raw input is erased and the field cursor reappears. Data is usually entered into this kind of a program by row or by column. The cursor automatically steps to the next column by going the same direction as it went the last time it was moved.

Scrolling and Character Entry

The scrolling of the display and the character entry part of the program are the most complex. A number of key pointers are maintained for the display. AA defines the row that will be displayed as the first line on the screen. RL defines the last row to be displayed. RL is either the maximum row count + 1 or AA + 5. A is the starting character of each row to be displayed. A6 is the number of characters to be displayed starting at A. A6 is either 60 or (the number of columns + 1)*15. Line 170 clears the screen, prints the column letters and the first six lines of data with a space between each line. The seventh line is printed separately without the extra line that would cause the display to scroll up.

Line 180 gives a new user some security. It is written over during editing but always comes back. The editing cursor position is specified by the variable SP which is the total of the X character count and the Y line count times 64. The old cursor is erased in line 190, a new SP is calculated and a new cursor is drawn using the PRINT@ function. The arrow key buffer is cleared as the final part of a screen update. This clearing allows the arrows to repeat.

The program then goes into a keyboard polling mode. The biggest drawback to using the string functions in Basic is the uncontrollable garbage collection routine that is triggered when the program runs out of string space. Keyboard polling routines can fill the string area very quickly so the INKEY$ character is converted to the numeric variable I for all preliminary tests. Numeric comparisons are faster, too. If I is a printable character, the program jumps to line 310. If I equals 25 it indicates that a shift, right arrow has been pressed and the program does its calculations at line 400. If I equals 31 the clear key has been pressed and indicates that editing is complete. If the input character is not one of the above and not one of the arrow keys, the program ignores the character and looks for another one.

Lines 210-250 update the various pointers. Lines 270-280 calculate the limits of the displayable data. If any data pointer is changed, S is set to 1 indicating that the whole screen must be replotted. If the cur-

A$(N)	=	Data row array
B$	=	Back one character space
I$	=	Input character/temporary variable
IN$	=	Input string
L$	=	Left string
N$(N)	=	Row number array
P$	=	Prompt character plus backspace
R$	=	Right string
SP$	=	Field cursor
T$	=	Temporary string
TY$	=	Title string

Table 2. String variables

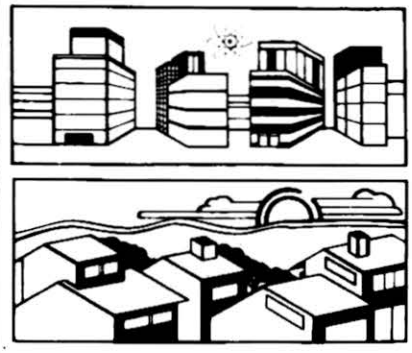
FIELD TRIP NOV 3-10 JOHN CORBANI

	A	B	C	D	E
1	ACCOUNT/DAY	TUE 11/3	WED 11/4	THU 11/5	FRI 11/6
2	CITY	S.B./N. YORK	KINGSTON	BURLINGTON	DENVER
3	AIR/TRAIN/BUS	495.70	55.83	60.24	370.35
4	AUTO	-	27.42	34.90	-
5	TAXI/LIMO	7.50	-	-	-
6	LODGING	55.97	39.60	46.93	-
7	BREAKFAST	3.50	6.23	-	3.89
8	LUNCH	4.50	-	-	10.38
9	DINNER	14.89	SEE BELOW	SEE BELOW	17.27
10	CLEANING/MISC	-	-	-	14.65
11	ENTERTAINMENT	.....	.....	.....	.....
12	CLIENT	-	GREEN	JONES/FRY	-
13	CHARGES	-	34.91	57.84	-
14	CLIENT	-	-	JONES/LONG	-
15	CHARGES	-	-	18.32	-
16		582.06	163.99	218.23	416.54

	F	G	H	I	J
1	SAT 11/7	SUN 11/8	MON 11/9	TUES 11/10	
2	DENVER	DENVER	DENVER/PHEONIX	PHECNIX/S.B.	
3	-	-	65.00	120.90	1168.02
4	-	-	72.21	22.15	156.68
5	-	-	4.75	7.50	19.75
6	-	-	172.45		314.95
7	4.76	5.74	2.45	7.20	33.77
8	8.15	-	14.50	-	37.53
9	12.45	SEE BELOW	10.13	-	54.74
10	-	22.32	-	-	36.97
11	.....	.....	.....	.....	
12	-	GRANGER	-	-	
13	-	26.86	-	-	119.61
14	-	-	-	-	
15	-	-	-	-	18.32
16	25.36	54.92	341.49	157.75	1960.34

Figure 1

TECHNOLOGY MEETS REAL ESTATE



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CSi

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```
10 '                    MINI CALC
              11/29/81     TAPE #11  150 "C"
                        BY
                   JOHN CORBANI
                   2455 CALLE LINARES
                   SANTA BARBARA, CA 93109
.
20 CLEAR 8400: DEFINT A,B: SP$=STRING$(14,131): SP=128:
   DIM CT(16), A$(26), N$(26): A6=60:
   P$=CHR$(95)+CHR$(24): B$=CHR$(24)
30 CLS:
   PRINT @ 149, "MINI CALC VS 1.1                11/29/81":
   PRINT: PRINT TAB(20) "BY": PRINT TAB(21) "JOHN CORBANI":
   PRINT TAB(21) "2455 CALLE LINARES":
   PRINT TAB(21) "SANTA BARBARA, CA 93109": PRINT
40 FOR A=1 TO 9: N$(A)=STR$(A)+" ": NEXT:
   FOR A=10 TO 26: N$(A)=MID$(STR$(A),2,3)+" ": NEXT:
   GOTO 60
50 CLS: PRINT @ 347, "MINI CALC"
60 PRINT TAB(25) "COMMAND MENU": PRINT:
   PRINT TAB(17) "P - PRINT          L - LOAD":
   PRINT TAB(17) "R - RERUN          S - SAVE":
   PRINT TAB(21) "C - CREATE NEW FORM"
70 I$=INKEY$: IF I$="P" OR I$="p" THEN GOSUB 470ELSE
   IF I$="L" OR I$="l" THEN GOSUB 540: GOTO 50ELSE
   IF (I$="R" OR I$="r") AND Y>0 THEN 170ELSE
   IF I$="S" OR I$="s" THEN GOSUB 640: GOTO 50ELSE
   IF I$="C" OR I$="c" THEN IF Y>0 THEN 90ELSE 100
80 GOTO 70
90 CLS: GOSUB 610: GOSUB 620: IF V=0 THEN 50
100 CLS: PRINT @ 342, "PAGE TITLE (1 LINE)": PRINT: PRINT TY$:
    INPUT TY$: PRINT @ 448, CHR$(31) TY$;
110 PRINT @ 576, "NUMBER OF COLUMNS ACROSS (2 - 14)" MV
    CHR$(30);: INPUT MV: IF (MV<2 OR MV>14) THEN
    PRINT "TRY AGAIN": GOTO 110ELSE CL=MV*15+1
120 PRINT @ 640, "NUMBER OF LINES DOWN      (2 - 25)" MH
    CHR$(30);: INPUT MH: IF (MH<2 OR MH>25) THEN PRINT
    "TRY AGAIN": GOTO 120ELSE RL=MH: IF RL>6 THEN RL=6
130 PRINT @ 768, CHR$(31) TAB(20) "IS THIS CORRECT ? (Y/N)";:
    GOSUB 620: IF V=0 THEN 100
140 CLS: T$="";
   FOR B=1 TO MV: T$=T$+CHR$(160)+STRING$(14,32): NEXT:
   T$=T$+CHR$(160)+STRING$(225-(MV)*15,191):
   FOR A=1 TO MH: A$(A)=T$: NEXT: A$(MH+1)=STRING$(240,191)
150 A=1: AA=1: X=4: Y=128: MX=MV*15-11: IF MX>34 THEN MX=34
160 '
                    RUN PROGRAM
.
170 CLS: FOR R=0 TO 3: PRINT TAB(R*15+11) CHR$(A/15+R+65);:
    NEXT: PRINT: FOR A5=AA TO RL:
    PRINT N$(A5) MID$(A$(A5),A,A6): PRINT: NEXT:
    PRINT N$(A5) MID$(A$(A5),A,A6);
180 PRINT @ 960,
"(SHIFT RIGHT) TOTAL    (ARROWS) MOVE CURSOR     (CLEAR) MENU";
190 PRINT @ SP,CHR$(30);: SP=X+Y: PRINT @ SP,SP$;: POKE 16444,0
200 I$=INKEY$: IF I$="" THEN 200ELSE I=ASC(I$):
    IF I>31 AND I<91 THEN GOSUB 310ELSE
    IF I=25 THEN 400ELSE
    IF I=31 THEN 50ELSE

    IF I=13 THEN I=LI ELSE
    IF I>10 AND I<>91 THEN 200
210 IF I=91 THEN IF Y>128 THEN Y=Y-128 ELSE
    IF AA>1 THEN AA=AA-1: S=1
220 IF I=10 AND Y<MH*128 THEN IF Y<896 THEN Y=Y+128: ELSE
    IF AA<MH-5 THEN AA=AA+1: S=1
230 IF AA=MH-5 AND Y>768 THEN Y=768
240 IF I=8 THEN IF X>16 THEN X=X-15 ELSE
    IF A>1 THEN A=A-15: S=1
250 IF I=9 THEN IF X<35 THEN X=X+15 ELSE
    IF A<CL-46 THEN A=A+15: S=1
260 IF A>CL-46 AND X>MX THEN X=MX
270 RL=AA+5: IF RL>MH THEN RL=MH
280 A6=CL-A+15: IF A6>60 THEN A6=60
290 LI=I: IF S=1 THEN
    S=0: GOTO 170ELSE GOTO 190
300 '
                    INPUT DATA
.
310 PRINT @ SP, CHR$(30);: CC=0: IN$="":
    IF I$="-" OR (I$>"/" AND I$<":") THEN MC=8 ELSE MC=14
320 GOSUB 350: I$=IN$: IF MC=14 THEN B=INT((MC-CC)/2):
    IN$=STRING$(B,32)+I$+STRING$(MC-CC-B,32) ELSE
    IF LEFT$(IN$,1)="-" THEN CC=CC-1: I$=RIGHT$(IN$,CC):
    IN$="-"+STRING$(MC-CC-1,32)+I$+"      ": ELSE
    I$=IN$: IN$=STRING$(MC-CC,32)+I$+"      "@_%>o>@ou>oec1@@@

1:1
330 I=LI: IF CC=0 THEN RETURN ELSE PRINT @ SP-64, IN$;:
    LN=AA-1+Y/128: CN=A+X-4: L$=LEFT$(A$(LN),CN):
    R$=IN$+MID$(A$(LN),CN+15,240): A$(LN)=L$+R$: RETURN
340 I$=INKEY$: IF I$="" THEN 340
350 IF I$=CHR$(13) THEN RETURN ELSE
    IF I$=CHR$(8) THEN 370ELSE
    IF (CC=MC OR I$<" ")THEN 340ELSE CC=CC+1:
    IF CC<MC THEN PRINT I$ P$; ELSE PRINT I$ CHR$(184)+B$;
360 IN$=IN$+I$: GOTO 340
370 IF CC>0 THEN CC=CC-1: IN$=LEFT$(IN$,CC):
    PRINT CHR$(32) STRING$(2,24) P$;
380 POKE 16444,0: GOTO 340
390 '
                ADD ROWS AND COLUMNS
.
400 FOR C=1 TO MV+1: CT(C)=0: NEXT: FOR R=1 TO MH: RT=0:
    FOR C=1 TO MV: T$=MID$(A$(R),(C-1)*15+2,14)
410 V=VAL(T$): RT=RT+V: CT(C)=CT(C)+V: NEXT:
    CT(MV+1)=CT(MV+1)+RT:
    PRINT @ 960, CHR$(30) "CALCULATING      ROW" R "= " RT;
420 IF RT=0 THEN T$="": LT=0: ELSE I$=STR$(RT): LT=LEN(I$):
    IF RT<0 THEN LT=LT-1:
    T$="-"+STRING$(13-LT,32)+RIGHT$(I$,LT) ELSE
    T$=STRING$(14-LT,32)+I$
430 A$(R)=LEFT$(A$(R),MV*15+1)+T$: NEXT
440 A$(MH+1)="": FOR C=1 TO MV+1:
    IF CT(C)=0 THEN T$=STRING$(14,32) ELSE
    I$=STR$(CT(C)): LT=LEN(I$): IF CT(C)<0 THEN LT=LT-1:
    T$="-"+ STRING$(13-LT,32)+RIGHT$(I$,LT)ELSE
    T$=STRING$(14-LT,32)+I$
450 A$(MH+1)=A$(MH+1)+CHR$(170)+T$: NEXT: GOTO 170
460 '
                    PRINT DATA
.
470 IF PEEK(14312)<>63 THEN PRINT @ 960, "PRINTER NOT READY";:
    RETURN ELSE LPRINT TY$: LPRINT " "
480 FOR R=1 TO MV+1 STEP 5: FOR CN=0 TO 4: LPRINT
    "          "+CHR$(R+CN+64)+"    ";: NEXT:
    LPRINT: FOR A5=1 TO MH+1:
    LPRINT A5 TAB(4);: FOR CN=0 TO 4:
    T$=MID$(A$(A5),(R+CN)*15-13,14): GOSUB 510:
    NEXT: LPRINT
490 IF A5=MH THEN LPRINT "      " STRING$(70,"-")
500 NEXT: LPRINT: LPRINT " ": LPRINT " ": LPRINT " ": NEXT:
    LPRINT " ": LPRINT " ": LPRINT " ": RETURN
510 V=VAL(T$): IF V=0 THEN LPRINT " "+T$;: RETURN
520 LPRINT USING "########.##"; V;: LPRINT "    ";: RETURN
530 '
                    LOAD FROM TAPE
.
540 IF Y=0 THEN 550ELSE GOSUB 610: GOSUB 620:
    IF V=0 THEN RETURN
550 CLS: PRINT @ 340, "CLEARING MEMORY": PRINT TAB(13)
    "POSITION TAPE AT START OF FILE": PRINT TAB(14)
     "AND PRESS (PLAY) ON RECORDER":
    FOR A=1 TO MH+1: A$(A)="": NEXT
560 PRINT: PRINT TAB(17) "PRESS (L) TO LOAD FILE": PRINT:
    PRINT TAB(18) "PRESS (CLEAR) TO RETURN TO COMMAND MENU"
570 I$=INKEY$: IF I$="L" OR I$="l" THEN CLS: PRINT TAB(22)
    "LOADING FILE": ELSE IF I$=CHR$(31) THEN RETURN ELSE 570
580 INPUT#-1, MV,MH: INPUT#-1, TY$: CL=MV*15+1: RL=MH: PRINT:
    PRINT TY$: A=1: AA=1: X=4: Y=128: MX=MV*15-11:
    IF MX>34 THEN MX=34
590 FOR V=1 TO MH+1: PRINT @ 345, "LINE" V: INPUT#-1, A$(V):
    NEXT: IF RL>6 THEN RL=6
600 RETURN
610 CLS: PRINT @ 268, "THIS WILL ERASE THE FILE NOW IN MEMORY";
    PRINT TAB(16) "DO YOU WISH TO CONTINUE ? (Y/N)": RETURN
620 I$=INKEY$: IF I$="Y" OR I$="y" THEN V=1: RETURN ELSE
    IF I$="N" OR I$="n" THEN V=0: RETURN ELSE 620
630 '
                    SAVE ON TAPE
.
640 CLS: PRINT @ 271,
    "POSITION TAPE AT A BLANK AREA": PRINT TAB(9)
    "PRESS (RECORD) AND (PLAY) SIMULTANEOUSLY"
650 PRINT: PRINT TAB(18) "PRESS (S) TO SAVE FILE": PRINT:
    PRINT TAB(18) "PRESS (CLEAR) TO RETURN TO COMMAND MENU"
660 I$=INKEY$: IF I$="S" OR I$="s" THEN CLS: PRINT TAB(23)
    "SAVING FILE": PRINT: PRINT TY$ ELSE IF I$=CHR$(31) THEN
    RETURN ELSE 660
670 PRINT#-1, MV,MH: PRINT #-1, TY$: FOR V=1 TO MH+1:
    PRINT @ 345, "LINE" V: PRINT#-1, A$(V): NEXT
680 RETURN
```

Program Listing. MiniCalc

sor is the only thing that must be moved, S equals zero. Line 290 jumps back to the proper print routine and the keyboard is again polled.

The character entry routine at line 310 handles all numeric and string input and formatting. Line 310 erases the field cursor, clears the input string variable (IN$), zeros the character count (CC) and sets the maximum character count (MC) allowed for input. Control then jumps to the subroutine at line 350 where input is checked for enter (CHR$(13)) or backspace (CHR$(8)). If the input character was neither of the above, is printable, and the character count is less than the maximum count, the character count is incremented and the character is printed. If the character count now equals the maximum count, the end of line character is printed. The new character is added to the input string (IN$) in line 360 and the program goes into a keyboard polling loop at line 340. Lines 370-380 handle the repeating backspace function.

When entry is complete, control returns to line 320. IN$ is reformatted in line 320 depending on the string contents. If IN$ consists of string data, the characters are centered in a 14-character string by padding both sides with blanks. If IN$ is a negative

Model II/16 Conversion

```
DELETE THE FOLLOWING LINES:

0

ADD THE FOLLOWING LINES:

321 IN$=STRING$(MC-CC,32)+I$+'
576 OPEN"I",1,"DATAFIL/DAT"
578 IFEOF(1)THEN600
665 OPEN"O",1,"DATAFIL/DAT"

EDIT THE FOLLOWING LINES:
```

Conversion continues

number, a minus sign is used as the first character in the 14-character wide field. The number is then padded with spaces to the left and to the right to right-justify the digits at position 8. Positive numbers are padded with spaces to right-justify to position 8. The negative sign must be the first character in a negative string when the VAL(n$) function is invoked. Leading spaces are allowed when using VAL(n$) for positive numbers.

Line 330 returns directly to the main display routine if no new information is entered into the field. New information is inserted into the middle of the appropriate array element and control then returns to the main display routine. I is made equal to LI before returning. This steps the cursor from field to field as data is entered.

The row and column totals are right-justified in the 14-character field. Totals of zero are left blank. All numbers are single precision so it is possible to go into scientific notation if you are handling a big budget. You can alter the program to do the totals in double precision if needed. Integer arithmetic can be used and will speed things up a little.

The print routine is set up for a Model I. Change the Printer Ready test address in line 470 to agree with the port you are using on a Model III. Notice that the LPRINT USING function is used on all numeric printing to align the decimal points and to round all numbers to the nearest cent.

If you convert MINICALC to disk I/O, file handling will be much faster. Use LINE INPUT#n and you will be able to use commas and colons in your strings. You can display and save these characters without problem, but they cause loading errors on a tape system. Disk users can also take advantage of MID$ on the left of equations in line 330. If you use cassette I/O under Disk Basic do a CMD"T".

I have used the program for a monthly check register, an automobile mileage and maintenance log, and as a job costing sheet for a small catering business. If you have the memory, clear more string space and increase the row count to 31. You now have a monthly accounting sheet. A row is available for every calendar date and 14 accounts cover a lot of territory.■

John Corbani is a self-employed consultant. His hobbies include flying, skiing, snorkeling and RC models.

Conversion continued

```
10 '                    MINI CALC              11/29/81    TAPE #11  150 "C"
                  BY                    JOHN CORBANI                    2455 CALLE
 LINARES                 SANTA BARBARA, CA 93109.
20 CLEAR 8400:DEFINT A,B:SP$=STRING$(13,150):SP=80:DIM CT(16), A$(26), N$(26): A
6=60:P$=CHR$(95)+CHR$(28):B$=CHR$(28)
30 CLS:    PRINT @ 189, "MINI CALC VS 1.1                11/29/81":   PRINT: PRI
NT TAB(28) "BY": PRINT TAB(21) "JOHN CORBANI":   PRINT TAB(21) "2455 CALLE LINAR
ES":   PRINT TAB(21) "SANTA BARBARA, CA 93109": PRINT
40 FOR A=1 TO 9: N$(A)=STR$(A)+" ": NEXT:   FOR A=10 TO 26: N$(A)=MID$(STR$(A),2
,3)+" ": NEXT:   GOTO 60
60 PRINT TAB(25) "COMMAND MENU": PRINT:   PRINT TAB(17) "P - PRINT          L -
LOAD":   PRINT TAB(17) "R - RERUN          S - SAVE":   PRINT TAB(21) "C - CREAT
E NEW FORM"
70 I$=INKEY$:IFI$="P"ORI$="p"THENGOSUB470:GOTO50:ELSEIFI$="L"ORI$="l"THENGOSUB 5
40:GOTO50ELSEIF(I$="R"ORI$="r")ANDY>0THEN170ELSEIFI$="S"ORI$="s"4THENGOSUB 640:G
OTO50ELSEIFI$="C"ORI$="c"THENIFY>0THEN90ELSE100
100 CLS: PRINT @ 342, "PAGE TITLE (1 LINE)": PRINT: PRINT TY$:    INPUT TY$: PRI
NT @ 448, CHR$(24) TY$;
110 PRINT @ 576, "NUMBER OF COLUMNS ACROSS (2 - 14)"; MV;     CHR$(23);: INPUT M
V: IF (MV<2 OR MV>14) THEN    PRINT "TRY AGAIN": GOTO 110ELSE CL=MV*15+1
120 PRINT @ 656, "NUMBER OF LINES DOWN     (2 - 25)" MH    CHR$(23);: INPUT MH:
IF (MH<2 OR MH>25) THEN PRINT    "TRY AGAIN": GOTO 120ELSE RL=MH: IF RL>6 THEN R
L=6
130 PRINT @ 816, CHR$(24) TAB(20) "IS THIS CORRECT ? (Y/N)";:    GOSUB 620: IF V
=0 THEN 100
140 CLS: T$="":   FOR B=1 TO MV: T$=T$+CHR$(148)+STRING$(14,32): NEXT:   T$=T$+C
HR$(148)+STRING$(225-(MV)*15,158):   FOR A=1 TO MH: A$(A)=T$: NEXT: A$(MH+1)=STR
ING$(240,158)
150 A=1: AA=1: X=4: Y=80: MX=MV*15-11: IF MX>34 THEN MX=34
160 '                    RUN PROGRAM.
170 CLS: FOR R=0 TO 3: PRINT TAB(R*15+11) CHR$(A/15+R+65);:    NEXT:PRINT:PRINT:
  FOR A5=AA TO RL:    PRINT N$(A5) MID$(A$(A5),A,A6):  NEXT:    PRINT N$(A5) MID
$(A$(A5),A,A6)
180 PRINT @ 1600,"(SHIFT RIGHT) TOTAL    (ARROWS) MOVE CURSOR     (C) MENU";
190 SP=X+Y:PRINT@SP,CHR$(23);
200 I$=INKEY$: IF I$="" THEN 200ELSE I=ASC(I$):IF I>31 AND I<91 THEN GOSUB 310EL
SEIFI=29THEN400ELSEIFI=13THENI=LI
210 IF I=30 THEN IF Y>80 THEN Y=Y-80 ELSE    IF AA>1 THEN AA=AA-1: S=1
220 IF I=31 AND Y<MH*80 THEN IF Y<896 THEN Y=Y+80: ELSE    IF AA<MH-5 THEN AA=AA
+1: S=1
240 IF I=8 THEN IF X>16 THEN X=X-15 ELSE    IF A>1 THEN A=A-15: S=1
250 IF I=9 THEN IF X<35 THEN X=X+15 ELSE    IF A<CL-22 THEN A=A+15: S=1
260 IF A>CL-22 AND X>MX THEN X=MX
290 LI=1: IF S=1 THEN    S=0: GOTO 170ELSE GOTO 190
300 '                    INPUT DATA.
310 PRINT @ SP, CHR$(23);: CC=0: IN$="":    IF I$="-" OR (I$>"/" AND I$<":") THE
N MC=8 ELSE MC=14
320 GOSUB 350: I$=IN$: IF MC=14 THEN B=INT((MC-CC)/2):    IN$=STRING$(B,32)+I$+S
TRING$(MC-CC-B,32) ELSEIFLEFT$(IN$,1)="-" THEN CC=CC-1: I$=RIGHT$(IN$,CC):IN$="-
"+STRING$(MC-CC-1,32)+I$+"      ":ELSEI$=IN$
330 I=LI: IF CC=0 THEN RETURN ELSE PRINT @ SP-80, IN$;:    LN=AA-1+Y/80: CN=A+X-
4: LS=LEFT$(A$(LN),CN):    RS=IN$+MID$(A$(LN),CN+15,240): A$(LN)=LS+RS: RETURN
350 IF I$=CHR$(13) THEN RETURNELSEIFI$=CHR$(67)THEN50 ELSEIF I$=CHR$(8) THEN 370
ELSE    IF (CC=MC OR I$<" ")THEN 340ELSE CC=CC+1:    IF CC<MC THEN PRINT I$ P$;
ELSE PRINT I$ CHR$(138)+B$;
370 IF CC>0 THEN CC=CC-1: IN$=LEFT$(IN$,CC):    PRINT CHR$(32) STRING$(2,28) P$;
380 GOTO 340
390 '                    ADD ROWS AND COLUMNS.
400 FOR C=1 TO MV+1: CT(C)=0: NEXT: FOR R=1 TO MH: RT=0:    FOR C=1 TO MV: T$=MI
D$(A$(R),(C-1)*15+2,14)
410 V=VAL(T$): RT=RT+V: CT(C)=CT(C)+V: NEXT:    CT(MV+1)=CT(MV+1)+RT:    PRINT @
 960, CHR$(23) "CALCULATING     ROW" R "= " RT;
420 IF RT=0 THEN T$="": LT=0: ELSE I$=STR$(RT): LT=LEN(I$):    IF RT<0 THEN LT=L
T-1:    T$="-"+STRING$(13-LT,32)+RIGHT$(I$,LT) ELSE    T$=STRING$(14-LT,32)+I$
440 A$(MH+1)="": FOR C=1 TO MV+1:    IF CT(C)=0 THEN T$=STRING$(14,32) ELSE    I
$=STR$(CT(C)): LT=LEN(I$): IF CT(C)<0 THEN LT=LT-1:    T$="-"+ STRING$(13-LT,32)
+RIGHT$(I$,LT)ELSE    T$=STRING$(14-LT,32)+I$
450 A$(MH+1)=A$(MH+1)+CHR$(149)+T$: NEXT: GOTO 170
460 '                    PRINT DATA.
470 SYSTEM"FORMS W=80":LPRINT TY$: LPRINT " "
480 FOR R=1 TO MV+1 STEP 5: FOR CN=0 TO 4: LPRINT    "           "+CHR$(R+CN+80)
+"  ";: NEXT:    LPRINT: FOR A5=1 TO MH+1:    LPRINT A5 TAB(4);: FOR CN=0 TO 4:
   T$=MID$(A$(A5),(R+CN)*15-13,14): GOSUB 510:    NEXT: LPRINT
500 NEXT: LPRINT: LPRINT " ": LPRINT " ": LPRINT " ": NEXT:    LPRINT " ": LPRIN
T " ": LPRINT " ": RETURN
510 '                    LOAD FROM DISK.
540 IF Y=0 THEN 550ELSE GOSUB 610: GOSUB 620:    IF V=0 THEN RETURN
550 CLS: PRINT @ 340, "CLEARING MEMORY":FOR A=1 TO MH+1: A$(A)="": NEXT
560 PRINT: PRINT TAB(17) "PRESS (L) TO LOAD FILE": PRINT:    PRINT TAB(10) "PRES
S (C) TO RETURN TO COMMAND MENU"
570 I$=INKEY$: IF I$="L" OR I$="l" THEN CLS: PRINT TAB(22)    "LOADING FILE": EL
SE IF I$=CHR$(67) THEN RETURN ELSE 570
580 INPUT#1, MV,MH: INPUT#1, TY$: CL=MV*15+1: RL=MH: PRINT:    PRINT TY$: A=1: A
A=1: X=4: Y=80: MX=MV*15-11:    IF MX>34 THEN MX=34:GOTO578
590 FOR V=1 TO MH+1: PRINT @ 345, "LINE" V: INPUT#1, A$(V):    NEXT: IF RL>6 THE
N RL=6
600 CLOSE:RETURN
610 CLS: PRINT @ 268, "THIS WILL ERASE THE FILE NOW IN MEMORY":    PRINT TAB(16)
 "DO YOU WISH TO CONTINUE ? (Y/N)": RETURN
620 I$=INKEY$: IF I$="Y" OR I$="y" THEN V=1: RETURN ELSE    IF I$="N" OR I$="n"
THEN V=0: RETURN ELSE 620
630 '                    SAVE ON DISK.
640 CLS
650 PRINT: PRINT TAB(10) "PRESS (S) TO SAVE FILE": PRINT:    PRINT TAB(10) "PRES
S (C) TO RETURN TO COMMAND MENU"
660 I$=INKEY$: IF I$="S" OR I$="s" THEN CLS: PRINT TAB(23)    "SAVING FILE": PRI
NT: PRINT TY$ ELSE IF I$=CHR$(67) THEN    RETURN ELSE 660
670 PRINT#1, MV,MH: PRINT#1, TY$: FOR V=1 TO MH+1:    PRINT @ 345, "LINE" V: PRI
NT#1, A$(V): NEXT
```


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Statements in Common

by Zvi Barak

You can transfer data from one program to another. This routine makes it quick and easy.

While writing a payroll program recently, I found myself with the problem of having to transfer data from one program to another. There had to be a way to share data without wasting time and disk space.

Some Basic and Fortran compilers solve this problem with the Common statement. This statement specifies the variables and arrays that are to be shared between programs, and the compilers transfer the data between the different programs.

My Basic interpreter does not have the Common statement, so I created one in my programs.

Since Basic lets you protect parts of the RAM, you can move shared data to that area before executing Run, and retrieve it after the program has run.

The reserved area should be large enough to accommodate both the shared data, and the machine-language routine that moves the data to and from the high memory area.

Program Listing 1 shows the Basic statements necessary to share a two-dimensional array of integers. Line 100 defines the variables used, and line 110 defines the address of the machine-language routine (stored under MOVE/CMD).

This routine must be loaded before being called. From TRSDOS, use LOAD MOVE/CMD. From Basic, use SYSTEM"LOAD MOVE/CMD" for the Model II, or CMD"L", "MOVE/CMD" for the Model III.

Line 120 defines an array H(100,1) used in the main program, and a working array WA(1). Remember that each

```
100  DEFINT H,L,AD,WA
110  DEFUSR1 = &HF000
120  DIM H(100,1),WA(1)

                    program lines

200  L = 404:AD = VARPTR(H(0,0)):GOSUB1000

                    program lines

300  L = -404:AD = VARPTR(H(0,0)):GOSUB1000

                    program lines

990  REM SUBROUTINE TO CALL MACHINE LANGUAGE ROUTINE
1000 WA(0) = VARPTR(L)
1010 WA(1) = AD
1020 WA(0) = USR1(VARPTR(WA(0)))
1030 RETURN
```

Program Listing 1

The Key Box

Model I, II, and III
48K RAM
Disk Basic
Assembly Language
One Disk Drive
Editor/Assembler

array has a zero element, so that the array WA(1) has two elements, and the array H(100,1) has 202.

The subroutine called from lines 200 and 300 writes machine language in lines 1000–1030. Two parameters are transferred to MOVE/CMD: the number of bytes to be moved and stored in variable L, and the starting address of the array H to be moved and stored in variable AD.

The sign of L tells the routine to move it to high memory when L>0, or from high memory when L<0. Since Basic stores integers in two bytes, the total length of the array H(100,1) is 404 bytes.

Basic only lets you transfer a single variable with the USR call. You can overcome this by storing all integer variables in a working array, such as WA, and transfer the starting address of that array.

The address of the variable L is stored in WA(0) and the variable AD is stored in WA(1). The call to the MOVE/CMD is done in line 1020. WA(0) could have stored L itself instead of the address of L, but if L is not an integer, this will tell the machine-language routine where to find it.

Listing 2, written for the Model II, is the machine-language routine that moves the array from high to low memory. Lines 110–250 get the parameters L and AD from Basic, and get the address of the working storage area, INDEX, chosen here to be at F900 hex.

The sign of L is checked at line 260. Jumps from high to low memory take place in lines 350–400. The block move Z80 instruction, LDIR, is used where registers BC keep the number of bytes to move (L), registers HL keep the address of the source block, and registers DE keep the address of the destination block.

Model III users should replace lines 110–140 with the single instruction, CALL 0A7FH.

You can move any integer variable by making it an element of array H. Single-precision numbers (4 bytes per number) require that you double the value of L, and double-precision numbers (8 bytes per number) increase the value of L four times.

Strings should be treated differently due to their varying lengths. I have not yet worked with them and welcome ideas from readers. ■

Zvi Barak can be reached at 13 Candy Courtway, Willowdale, Ontario, Canada M2R 2Y7.

```
0F00            00100           ORG     0F00H
0F00 E5         00110 START     PUSH    HL
0F01 DDE1       00120           POP     IX              ;GET ADRESS OF VARPTR OF WA(
0)
0F03 DD6E00     00130           LD      L,(IX+00H)      ;LSB
0F06 DD6601     00140           LD      H,(IX+01H)      ;MSB
0F09 E5         00150           PUSH    HL              ;GET ADDRESS OF WA(0)
0F0A DDE1       00160           POP     IX
0F0C DD6E00     00170           LD      L,(IX+00H)      ;LSB
0F0F DD6601     00180           LD      H,(IX+01H)      ;MSB
0F12 E5         00190           PUSH    HL
0F13 FDE1       00200           POP     IY              ;GET WA(0)=ADDRESS OF PARAME
TER L
0F15 FD4E00     00210           LD      C,(IY+00H)      ;LSB
0F18 FD4601     00220           LD      B,(IY+01H)      ;MSB. BC=ARRAY LENGTH TO MOV
E (PARAMETER L)
0F1B DD5E02     00230           LD      E,(IX+02H)      ;LSB
0F1E DD5603     00240           LD      D,(IX+03H)      ;MSB. DE=ADDRESS OF ARRAY TO
 MOVE (PARAMETER AD)
0F21 2100F9     00250           LD      HL,INDEX        ;ADDRESS OF HIGH MEMORY ARRA
Y
0F24 CB78       00260           BIT     07H,B
0F26 2008       00270           JR      NZ,TOLOW        ;GO IF NEGATIVE ( L<0 )
0F28 71         00280 TOHIGH    LD      (HL),C          ;LSB
0F29 23         00290           INC     HL              ;POINT TO NEXT BYTE
0F2A 70         00300           LD      (HL),B          ;MSB. FIRST 2 BYTES OF INDEX
 ARRAY KEEP LENGTH OF ARRAY
0F2B 23         00310           INC     HL              ;POINT TO NEXT BYTE
0F2C EB         00320           EX      DE,HL           ;HL=SOURCE, DE=DESTINATION
0F2D EDB0       00330           LDIR                    ;MOVE FROM LOW MEMORY TO HIG
H MEMORY
0F2F C9         00340           RET
0F30 4E         00350 TOLOW     LD      C,(HL)          ;LSB OF ARRAY LENGTH
0F31 23         00360           INC     HL              ;POINT TO NEXT BYTE
0F32 46         00370           LD      B,(HL)          ;MSB. BC=ARRAY LENGTH. HL=SO
URCE, DE=DESTINATION
0F33 23         00380           INC     HL              ;POINT TO NEXT BYTE
0F34 EDB0       00390           LDIR                    ;MOVE FROM HIGH MEMORY TO LO
W MEMORY
0F36 C9         00400           RET
F900            00410 INDEX     EQU     0F900H          ;WORKING AREA
0F00            00420           END     START
00000 TOTAL ERRORS
```

Program Listing 2

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Graphics Software Buyer's Guide

TRS-80s are infamous for low-resolution graphics, and you've all experienced the frustrations of limited graphics capabilities.

Now for the good news: Help is on the way. More and more software manufacturers are introducing innovative graphics packages for sophisticated applications.

The many uses of these programs include bar graphs, pie charts, block charts, three-dimensional figures, and decorative enhancements for text.

The products described below are documented with a user's guide or instruction manual, and many include sample files or programs. Responses to this *80 Micro* survey indicate that these graphics packages are unprotected.

Free replacement of defective disks is standard. Individual warranty or replacement policies are described in each product summary.

The brief synopses below are in alphabetical order by manufacturer's name. See Tables 1-3 for quick reference to manufacturers who have products for your operating systems.

CMD Micro
10447—124 St.
Edmonton, Alberta
Canada T5N 1R7
403-488-7109

MX Graphic gives block-graphics capabilities to Epson MX-80 printers with Graftrax Plus. It operates with TRSDOS or NEWDOS on the Model I or III. MX Graphic requires a minimum of16K and is available on cassette only. $19.95 plus $2 for shipping and handling.

Computerware
4403 Manchester Ave.
P.O. Box 668
Encinitas, CA 92024
619-436-3512

Foxygraf is an Assembly-language graphics development package for the Color Computer. It requires 16K and is available on cassette or 5¼-inch disk. Defective media are replaced for 90 days on all three Computerware graphics programs. $29.95 on cassette and $34.95 on disk.

Semi Draw allows you to dump Color Computer drawings to a Line Printer VII, VIII, NEC 8023, or any C. Itoh printer. The program comes on cassette, and requires 32K. $21.95

3D Drawing Board helps users create three-dimensional objects and subsequently change their size or relative locations. Drawings are saved on either cassette or disk. A Color Computer with 16K is required for the cassette version or 32K for the 5¼-inch disk. $24.95 on cassette and $29.95 on disk.

Escape Computer Software Inc.
P.O. Box 1771
Roswell, GA 30077
404-971-5349

Daisy-Aids provides menu-driven graphics for daisy-wheel or thimble-impact printers. It requires CP/M and a minimum of 64K, and is available on 8-inch disks for the Model II. Escape Computer Software Inc. does not specify a warranty policy. $275

Greathouse and Company
P.O. Box 27051
Rancho Bernardo, CA 92127

CoCo Drawer is a joystick-driven graphics editor for the Color Computer. With the joystick, a user selects from over 40 commands on two menus to create a variety of figures. CoCo Drawer requires Extended Color Basic and 32K. *80 Micro* was unable to reach the company for further details on the product. $19.95

Jupiter Island Corporation
1900 Powell St., Suite 1135
Emeryville, CA 94608
415-655-0840

Colortext is a text-enhancement utility that requires a text editor or word-processing program,, an IDS Prism printer, and a Process color ribbon. It operates on CP/M with a minimum of 24K, and is available on a 5¼- or 8-inch disk. $149

Borders by Colortext from Jupiter Island Corporation

Leapac Services
8245 Mediterranean Way
Sacramento, CA 95826
916-381-1717

Perspective Plot Package (L3P) is an enhancement to the L2D package that has several features, including annotation, curve generation, and token generation. It operates on CP/M 2.2 and is available on 8-inch disks. The software requires at least 12K and comes in a combination package with L2D. $360

X-Y Vector Plot Package (L2D) requires a terminal and plotting device. It handles annotations, curve generation, shading and clipping, line, bar, and pie charts. You must have CP/M and at least 12K with an 8-inch disk drive. $249

Libra Laboratories Inc.
495 Main St.
Metuchen, NJ 08840
201-494-2224

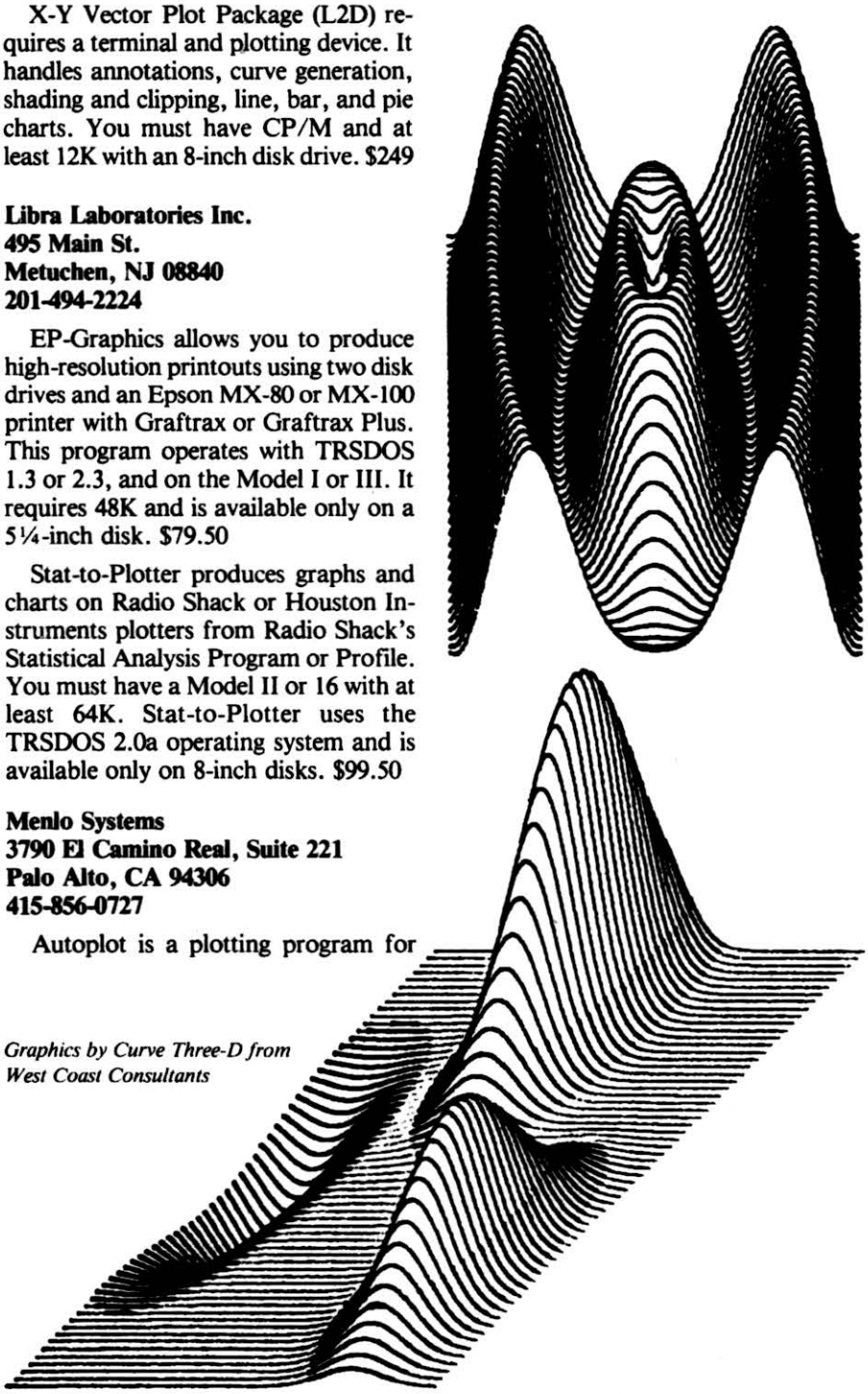
EP-Graphics allows you to produce high-resolution printouts using two disk drives and an Epson MX-80 or MX-100 printer with Graftrax or Graftrax Plus. This program operates with TRSDOS 1.3 or 2.3, and on the Model I or III. It requires 48K and is available only on a 5¼-inch disk. $79.50

Stat-to-Plotter produces graphs and charts on Radio Shack or Houston Instruments plotters from Radio Shack's Statistical Analysis Program or Profile. You must have a Model II or 16 with at least 64K. Stat-to-Plotter uses the TRSDOS 2.0a operating system and is available only on 8-inch disks. $99.50

Menlo Systems
3790 El Camino Real, Suite 221
Palo Alto, CA 94306
415-856-0727

Autoplot is a plotting program for functions or tabulated data; it provides high-resolution graphics on an Epson MX-80 printer with Graftrax. Autoplot operates in TRSDOS, DOSPLUS, NEWDOS, and LDOS. It requires 48K and functions on either the Model I or III. This program is available only on 5¼-inch disks. $79.50 ($99.50 for LNW-80).

Autoplot/CGP is also an automated plotting program, but it uses the Radio Shack Model CGP-115 color graphics printer. This version requires only 16K.



Graphics by Curve Three-D from West Coast Consultants

All other features correspond to those listed above for Autoplot. $69.50

Micro-Labs Inc.
902 Pinecrest Drive
Richardson, TX 75080
214-235-0915

Bizgraph software takes data in DIF format (such as VisiCalc) and plots it on a Model III with a Grafyx Solution board. It supports line, bar, pie, and scatter plots. This program requires 32K and is available on 5¼-inch disks only. Its operating systems include TRSDOS, LDOS, NEWDOS, and DOSPLUS. Each of these Micro-Labs Inc. products has a 90-day limited warranty. $89.95

The Grafyx Solution software package comes complete with an add-on board. It consists of 30 programs and adds 14 commands in Extended Graphics Basic for drawing on the new high-resolution 512 × 192 graphics screen. It requires only 16K and is available on cassette or 5¼-inch disk. The package operates on the Model III with TRSDOS, LDOS, NEWDOS, or DOSPLUS. $299.95

The 80-Grafix software package also contains an add-on board. It consists of 18 programs and includes character-editing software so that up to 128 characters can be created and saved or displayed. 80-Grafix comes on cassette or 5¼-inch disk for the Model I or III. You must have at least 16K and either TRSDOS, LDOS, NEWDOS, or DOSPLUS. $169.95

Micro Software Systems ● Micro Plot Inc.
1815 Smokewood Ave.
Fullerton, CA 92631
714-526-8435

Datagraph Printer Graphics transforms VisiCalc files into high-resolution custom graphs on graphics printers. The program requires at least 48K and is available on 5¼-inch disk. It operates on the Model I or III using TRSDOS, LDOS, NEWDOS, or DOSPLUS. The price of a defective package is refundable, and the replacement charge is $5 plus postage. $79.95

Mikee Electronics Corporation
P.O. Box 3813
Bellevue, WA 98009
206-392-1146

The Mikeegraphic System includes

software and hardware for modifying your Model I or III to produce high-resolution graphics. It works on all operating systems except CP/M. The package requires at least 16K, and the software is on cassette. Mikee Electronics provides a full refund for 30 days and a 90-day guarantee. $340

PowerSoft
11500 Stemmons Expwy., Suite 125
Dallas, TX 75229
214-484-2976

PowerDot is a flexible high-resolution dot addresser. It is available on 5¼-inch disk and functions with all major operating systems (including MULTIDOS and NEWDOS80). The program runs on a Model I or III with a minimum of 32K. PowerSoft contacts all registered owners for updates, and will always resurrect a crashed master disk for a customer. Disks that are defective on arrival are replaced free; later replacements are $5. $49.95

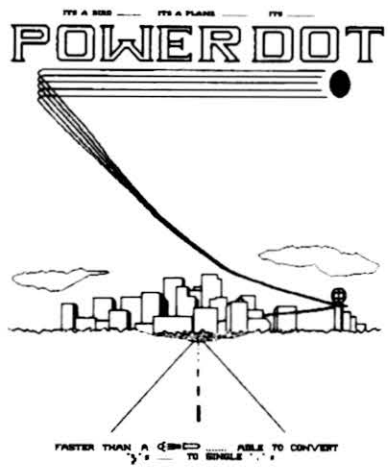
PowerDraw has six different save modes to disk and lets the user merge full-screen graphics with his program. It requires 32K and is available on 5¼-inch disks only. This program is for the Model I or III and uses all major operating systems. $39.95

Printer Graphist Ltd.
P.O. Box 603
Newport, VT 05855
819-564-7704

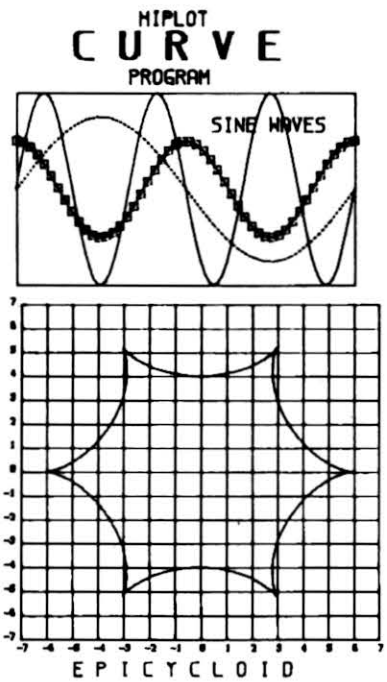
Printer Graphist is an operating system extension that enhances Basic to provide high-resolution graphics. The program can create eight-color graphics on the IDS Prism color printer and one-color graphics on other printers. It operates with TRSDOS, NEWDOS80, LDOS, and DOSPLUS.

You must have at leat 32K and either a Model I or III. A Model II version is currently being developed. Printer Graphist is available on a 5¼-inch disk. No back-ups are possible, but two copies are provided with the package. Printer Graphist Ltd. has a 15-day replacement policy for defective disks. $194.50; $249.50 after May 1, 1983.

Redding Group Inc.
c/o Lifeboat Associates
1651 3rd Ave.



Created by PowerDot from PowerSoft



Graphics by Curve from West Coast Consultants

New York, NY 10028
212-860-0300

Graftalk is an interactive graphics package designed for the business user. It requires at least 48K and is available on 5¼-inch or 8-inch disks. Graftalk requires CP/M. $450

Scion Corporation
12310 Pinecrest Road
Reston, VA 22091
703-476-6100

TEKEM is Tektronix PLOT-10 compatible and includes all standard 4010/4014 features. The software is included free with the MicroAngelo graphics subsystem from Scion Corporation; this system requires that your TRS-80 be compatible with S100-based products. It operates on CP/M and requires 32K. TEKEM is only available on 8-inch disks. Scion Corporation has a 90-day warranty policy.

SofTech Microsystems Inc.
9494 Black Mountain Road
San Diego, CA 92126
619-451-1230

Turtlegraphics contains machine-independent library subroutines that produce high-resolution graphics. It operates under Version IV UCSD p-System and is available on 5¼- and 8-inch disks. The program requires at least 48K. $75

Solectronics
400 Asbury
Evanston, IL 60202
312-866-8737

Color-Graf is an interface between the Model I and a color television that allows the user to control the TV display. The package is available on 5¼-inch disks and requires 48K. Solectronics has a 90-day warranty on parts and labor. (See *80 Micro*'s review of Color-Graf on p. 55.) $199

Southern Software Systems
485 South Tropical Trail
Suite 109
Merritt Island, FL 32952
305-452-2217

The Graph Zapper creates high-resolution line graphs (data or equations) with on-screen numbers and labels. The program is created for the Color Computer, and uses Disk Basic or Extended Color Basic. It requires 16K for the cassette version or 32K for disk. Southern Software Systems provides a 14-day money-back guarantee. $15.95 for cassette or $19.95 for disk, plus $1 for shipping and handling.

The Bar Zapper allows the Color Computer user to create high-resolution bar graphs with multiple bars. It requires 16K for the cassette version and 32K for disk, and operates in Disk Basic or Extended Color Basic. $15.95 for cassette or $19.95 for disk, plus $1 for shipping and handling.

The Pie Zapper draws high-resolution pie charts with shaded sectors. You must have a Color Computer with

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32K TRS 80 COLOR Version $24.95.
Adds a second level with dungeons and more Questing.

CATERPILLAR
O.K., the Caterpillar does look a lot like a Centipede. We have spiders, falling fleas, monsters traipsing across the screen, poison mushrooms, and a lot of other familiar stuff. COLOR 80 requires 16k and Joysticks. This is Edson's best game to date. $19.95 for TRS 80 COLOR.

ADVENTURES!!!
The Adventures below are written in BASIC, are full featured, fast action, full plotted adventures that take 30-50 hours to play. (Adventures are interactive fantasies. It's like reading a book except that you are the main character as you give the computer, commands like "Look in the Coffin" and "Light the torch.")

Adventuring requires 16k on Sinclair, TRS-80, and TRS-80 Color. They require 8k on OSI and 13k on VIC-20. Sinclair requires extended BASIC. Now available for TI99. Any Commodore 64.
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PYRAMID (by Rodger Olsen)
This is our most challenging ADVENTURE. It is a treasure hunt in a pyramid full of problems. Exciting and tough!

DERELICT
(by Rodger Olsen & Bob Anderson)
New winner in the toughest adventure from Aardvark sweepstakes. This one takes place on an alien ship that has been deserted for a thousand years – and is still dangerous!

Dungeons of Death – Just for the 16k TRS-80 COLOR, this is the first D&D type game good enough to qualify at Aardvark. This is serious D&D that allows 1 to 6 players to go on a Dragon Hunting, Monster Killing, Dungeon Exploring Quest. Played on an on-screen map, you get a choice of race and character (Human, Dwarf, Soldier, Wizard, etc.), a chance to grow from game to game, and a 15 page manual. At the normal price for an Adventure ($14.95 tape, $19.95 disk), this is a giveaway.

WIZARDS TOWER – This is very similar to Quest (see above). We added wizards, magic, dragons, and dungeons to come up with a Quest with a D&D flavor. It requires 16k extended color BASIC. $14.95 Tape, $19.95 Disk. VIC 20 Commodore 64.

NEW
PLANET RAIDERS – Not just another defenders copy, this is an original program good in its own right. You pilot a one man ship across a planetary surface dogfighting with alien ships and blasting ground installations while you rescue stranded troopers. Rescue all the troopers and be transported to another harder, faster battle. Joysticks required. ALL MACHINE CODE! EDSONS BEST! 16K Tape TRS80COLOR $19.95 – 32K Disk $21.95.

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TINY COMPILER is written in BASIC. It generates native, relocatable 6502 or 6809 code. It comes with a 20-page manual and can be modified or augmented by the user. $24.95 on tape or disk for OSI, TRS-80 Color, VIC 20, or Commodore 64.

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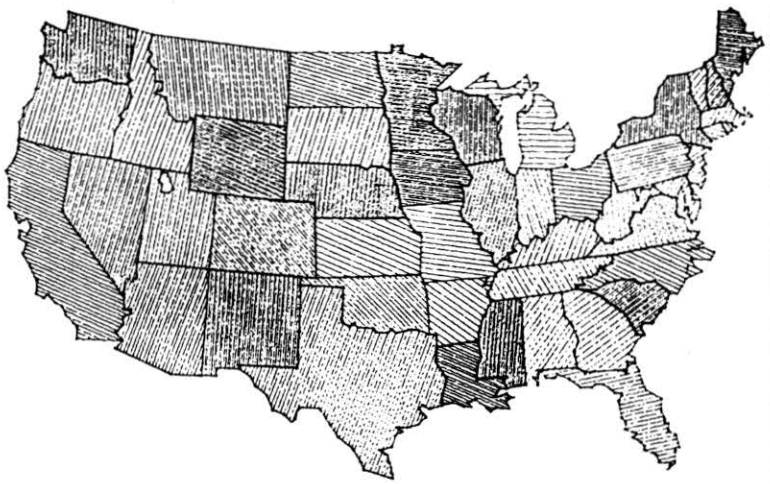

Map by Curve-USA from West Coast Consultants

CMD Micro
Libra Laboratories Inc.
Menlo Systems
Micro-Labs Inc.
Micro Software Systems ● Micro Plot Inc.
Mikee Electronics Corporation
PowerSoft
Printer Graphist Ltd.
Stanton and Sons
The Smallsystem Center
West Coast Consultants
WileSoft

Table 1. Standard Graphics (I/II/III/16)

either Disk Basic or Extended Color Basic. The program needs 16K to run the cassette version and 32K to run the disk. $15.95 for cassette or $19.95 for disk, plus $1 for shipping and handling.

Stanton and Sons
1130—20th Ave. E.
Seattle, WA 98112
206-324-1512

Graphics Master facilitates the creation of moving or animated graphics, and provides optional wrap-around and black/white or left/right reversal. It operates on the Model I Level II and requires at least 16K. Graphics Master is available on cassette only. $24.95

The Smallsystem Center
P.O. Box 268
New Hartford, CT 06057
203-482-3689

Screen Artist II is a machine-language program containing 30 special commands. It generates a Basic subroutine describing the screen, and has a full graphics alphabet. The program requires 32K on a Model I or III. It is available on 5¼-inch disks and operates on all TRSDOS-compatible DOSes. The Smallsystem Center provides free upgrades, a 30-day money-back guarantee, and a five-year replacement policy for defective media. $32.95

SuperSoft Associates
P.O. Box 1628
Champaign, IL 61820
217-359-2112

Stats-Graph is a statistical analysis program with graphics to display data. It operates on CP/M and is available on 5¼- or 8-inch disks. You must have at least 48K. The software has limited back-up, and includes a 90-day warranty and registration card. SuperSoft Associates has a technical hotline at 217-359-2691. $200

West Coast Consultants
1775 Lincoln Blvd.
Tracy, CA 95376
209-835-1780

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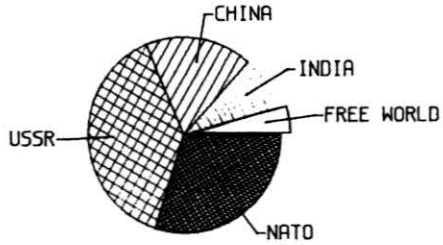
Table 2. Color Computer Graphics

Escape Computer Software Inc.
Jupiter Island Corporation
Leapac Services
Redding Group Inc.
Scion Corporation
SuperSoft Associates

Table 3. For CP/M Systems

analyses, and fits straight lines, polynomials, exponential and power-law equations to data. It operates with TRSDOS 2.3 Level II Basic on the Model I or III. Curvefit requires at least 48K and is available on 5¼-inch disks. West Coast Consultants has a one-year warranty and replacement policy. $99.50



NUCLEAR STRENGTHS

Pie Chart by Curve II from West Coast Consultants

Curve Three-D provides three-dimensional oblique projection of surface functions, user data, and space curves to a variety of plotters. It requires 48K on a Model I or III, and operates with TRSDOS 2.3 Level II Basic. Curve Three-D is available on 5¼-inch disks. $199

Curve II designs general-purpose 2-D business and scientific graphics for use with several plotters. You must have a Model I or III with at least 48K. Curve II is available on 5¼-inch disks and operates with TRSDOS 2.3 Level II Basic. $275

Curve-USA plots a map of the USA or any subset of the states shaded in colors and patterns of the user's choice. It requires 48K and TRSDOS 2.3 Level II Basic. Curve-USA is available on 5¼-inch disks for the Model I or III. $75

WileSoft
12100 Rosemont NE
Albuquerque, NM 87112
505-299-1275 after 4 p.m.

Graphics Extended Basic creates high-resolution figures on Epson, C. Itoh 8510, and NEC 8023A printers. It interfaces with existing Basic for programming purposes, and it stores your graphics in memory. Operating systems for Graphics Extended Basic include LDOS, MULTIDOS, NEWDOS80 versions 1 and 2, and TRSDOS 2.3 for Models I and III. The program is available only on 5¼-inch disks and requires 48K. WileSoft offers a money-back guarantee. For more information, see *80 Micro*'s review (February 1983, p. 52). $69.95■

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Now building a kit is even easier!

Circuit-Board Scanner

James A. Lisowski
902 Willow Lane
S. Milwaukee, WI 53172

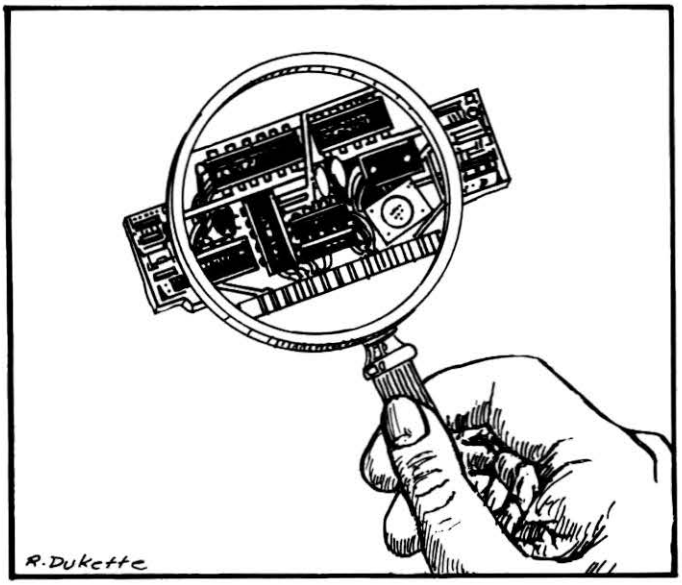
Maybe this situation is familiar: I am building an electronic circuit board in kit form. The instructions say "INSERT R13." I have the part in hand but where am I supposed to insert it? R13, R13, I saw the place just a minute ago. Where is it now? After scanning the board and paging through the manual I find the spot. Now "INSERT C23." There must be a better way!

Basically Not So Simple

My TRS-80 is better at remembering locations than I. Could it help me build an electronic circuit board from a kit? I created, in Basic, a Printed Circuit Board Part Locator that does the trick. PCBPL represents my kit circuit board as a rectangle on the video display. I can move anywhere on screen, outline board landmarks with graphic characters, enter part names with a special control key sequence and, of course, have the program locate the R13 position.

The Key Box

Model I and III
16K RAM
Cassette or Disk Basic
Scripsit 1.0



The problem was that as the number of parts increased, the Basic search routine got slower and took almost as long as the manual method.

I soon discovered missing parts in my project's "complete parts kit." While using Scripsit to compose my complaint letter, an idea came to me. Scripsit doesn't know the difference between a letter and any other collection of characters. It has tape save, load and verify routines built in. With it I can move or "draw" anywhere on screen. Its Global Find command will locate any word at machine language speed. Could Scripsit serve as a printed circuit board part locator? Twenty minutes later version 1.0 of Scripsit PCBPL said "Yes!"

Locator Ideas

Since I wanted to use this method for more than one project, I needed to create an empty, reusable circuit board drawing surface. Most of the board is blank, but a minimal border is necessary to serve as a reference point, aiding placement. Each border is composed of different characters allowing each section to be easily identified. I chose lowercase a b c d as my border characters, with repeating abab sequences for the a/b section junctions. You can use any other characters as long as they are not likely to show up in a part name you may search for. I also added titles and other characters, but you can set the outline any way you like.

Creating a Blank Board

To get the maximum board size, set the video line width to 130 characters. (Refer to the instructions supplied with Scripsit for all commands.) Then, with the cursor at the first line, hold down the a (or whatever border character you want) key so the automatic repeat function prints a continuous line of a's. Stop when you have the line half filled (65 characters). Fill the rest of the line with another border character (b) in the same manner (64 characters). End the line with a forced end-of-line boundary marker and press enter.

For the second line, type one a to form a left border. Press the space bar to position the cursor under the last a of the top line (the border midpoint). Type b (to form a mid-border), then space over to the last position on the line and type another b (to form a right border). Duplicate this process 12 more times to build the full vertical left, mid and right borders. (If you are familiar with the Block commands, save yourself some work by creating a block out of the second line and inserting 12 copies of it below.) After finishing these borders, create a full (129 character) horizontal mid-border

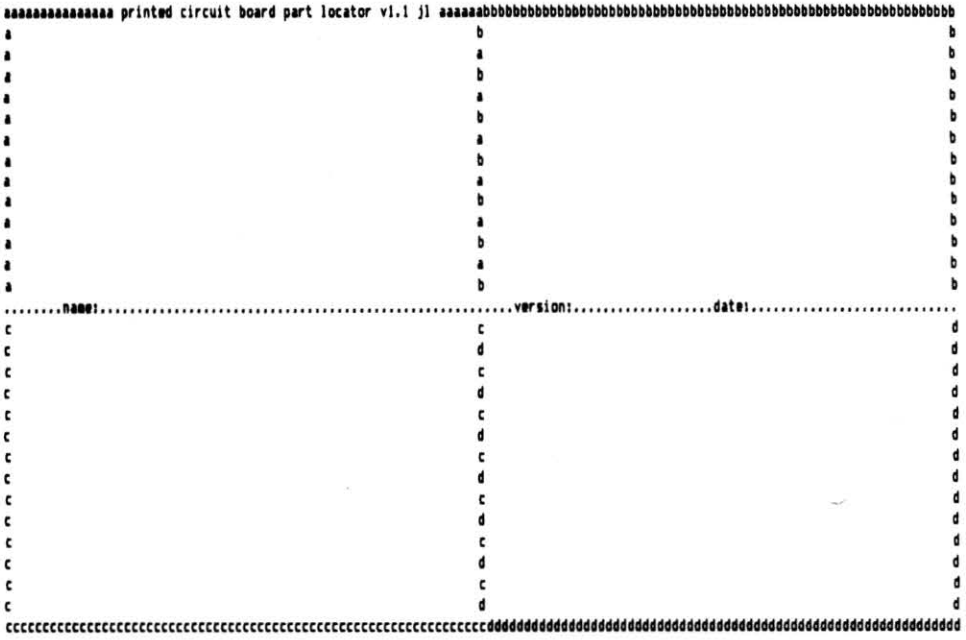


Fig. 1. Completed blank board

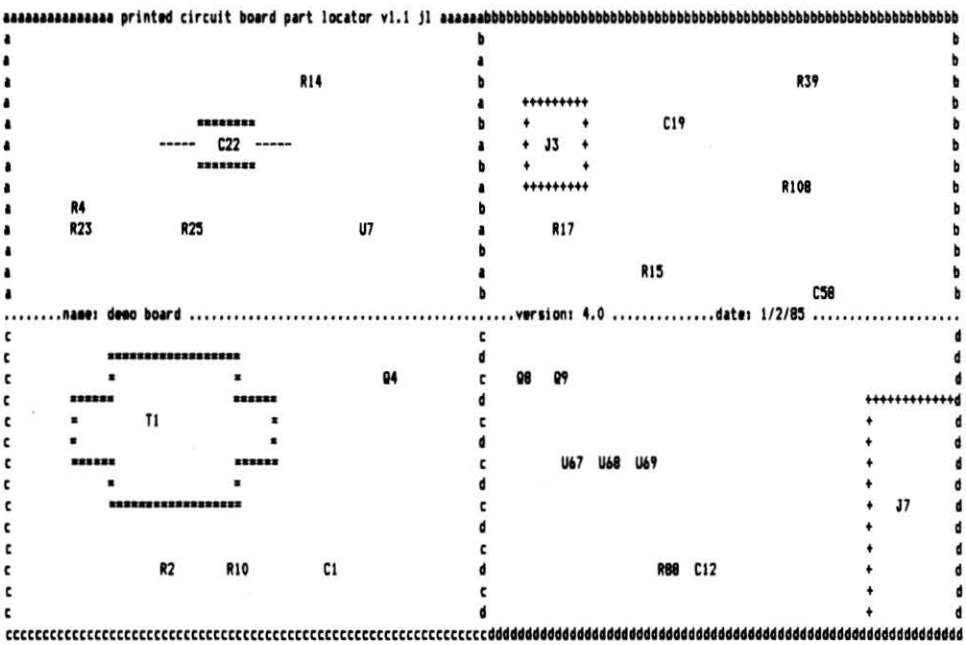


Fig. 2. Filled-in board

made of a third unique character (I used a period).

On the next line type a c, space to the mid-point, type another c, space to the end of the line and type a d to create another set of vertical left, mid and right borders. Add 13 more lines like this one and finish off with half a line of c's (65) then d's (64) to the end of the line, creating a lower set of closed borders like the one made of a's and b's above. This finishes the basic circuit board outlines (Fig. 1).

If you want, go back and add titles or alternate the characters in the vertical mid-border. Save several copies to tape or disk and verify them as good saves. This may take longer than you might expect. The large empty area between borders is made of characters and needs to be recorded also. This Blank Board file can be used in the future as a starting point for your circuit projects.

"You could use it to find . . . a nebula in a star chart."

Using the Locator

Load a copy of the blank board. Then add outlines of some of the more prominent circuit board parts as landmarks using equal signs, dashes, periods and pluses. Once again, do not use characters that are part of the names you will be searching for. Typical landmarks might be: power supply transformers, large capacitors, IC's, connectors. Using the borders and landmarks as position guides, add the part names (R1, C3, and so on) in their proper locations. Use a systematic method to prevent missing any parts. Finish with title and date (Fig. 2). Then save a copy of the complete board to disk or tape.

To locate a part during kit construction, use the Global Find command to search for the part name. If you attempt to find part R1 you may get R11. Scripsit will find the R1 in R11 and then stop looking. Try to search for "R1 " (with a space included as part of the name to be found) to avoid the unwanted match. This wild card match feature can be used to your advantage, though. For example, to find all resistors, just search for R. Keep in mind that Scripsit only searches down, or toward, the end of text. Always move to the top of the board before making a search.

Other Ideas

After you have located and used a part, you can delete that part name and replace it with spaces. (Do it on a copy, not the original.) If you have a printer capable of 132 character lines you can make a hardcopy image of your complete board for documentation purposes.

If you are developing a circuit board, the word processor will allow board revisions without physical erasure. If you are creating a construction manual, blank out the parts that are not pertinent so only the subsection in progress is visible. Then repeat the process for the other subsections, printing a new diagram for each subsection step. You might even consider making the Scripsit file available to the kit builder so he can use it for part location searches.

This technique can be used for more than circuit board layouts. You could use it to find a numbered room in a hotel/plant floorplan, a product in a warehouse or grocery store aisle, a gene sequence in a DNA segment, or a nebula in a star chart. ■

See List of Advertisers on Page 371

Pencil-Plus 2.0

by Dan Robinson

Electric Pencil 2.0 owners can expand its capabilities to include mix-and-match font combinations, keyboard input, and much more.

Like many people, I waited eagerly for the new version of Electric Pencil from IJG and was disappointed to learn that all of the features I really wanted were scheduled to appear in future modules. Electric Pencil 2 is a fine program, but there are many things it won't do.

If you're tired of waiting, try Pencil-Plus 2. Designed to operate with Electric Pencil 2.0, Pencil-Plus 2.0 lets you embed printer codes in the text while you maintain proper line length. You can choose from boldface, emphasized, double-strike, wide, compressed or italic type fonts, and switch from one font to another—even in headers. You can maintain right justification and alter format parameters by including format lines in the text. You can change margins, line lengths, line spacing and right justification, and Pencil-Plus supports nonprinting comment lines, as well.

Expanded fonts are retained, line after line, until they are reset by another code in the text. They won't revert to normal width at the end of each line on the MX-80. Pencil-Plus saves the wide- and compressed-font codes, outputs normal margins, and then restores the type font. Thus the left margin is evenly maintained, regardless of the type font selected.

Pencil-Plus supports mix-and-match font combinations: normal, expanded-compressed, compressed, expanded, boldface and double-strike fonts can appear on one line. Characters not found on the keyboard can be sent to the printer. You can even print graphics (if your printer supports block graphics).

Text can be entered from the keyboard during printout, prompted by your own message on the screen, and can contain up to 255 characters. Keyboard text respects line and page lengths; headers and page numbers are right-justified if desired. Files chained for printing retain the current header, line count and page numbering so that you can print lengthy documents.

Pencil-Plus supports conditional hyphens and will print them only if the word must be broken at the end of a line. Pencil-Plus also supports Electric Webster's automatic hyphenation option.

Boilerplate paragraphs can be inserted in text to avoid repetitive typing.

Pencil-Plus supports file-merge; the files can be of variable lengths, use the field names that you select, and can be created using Pencil-Plus. Line length and right justification is maintained with even variable-length fields, and data can be inserted from the keyboard to replace variable data within a line.

Chained, boilerplate and merge files all recognize the default file extension of /PCL, although any file extension is ok.

Pencil-Plus was written to work with a standard copy of Electric Pencil 2.0, using your own printer's control codes. All changes have been made internally, retaining the size of the text buffer and the program's simplicity. To enable easy recovery, every effort has been made to anticipate the errors an inexperienced operator may make.

Operation

Call Pencil-Plus by pressing clear/2 when you are ready to print your document. The Pencil-Plus menu is displayed on the screen, letting the user select format options.

Pencil-Plus still contains parallel, serial and RS-232 printer drivers, but remember that the commands for selecting the driver and setting baud rates are contained in the normal print module and should be set there. Better yet, set them automatically with a setup file.

Control Character

The menu lets you elect to change the character used by Pencil-Plus to per-

The Key Box

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Assembly Language
Editor/Assembler
NEWDOS (Model I or III)
TRSDOS 2.3 (Model I)
TRSDOS (Model III with changes)

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- **MMF's NEW 24 PAGE INSTALLATION MANUAL IS SECOND TO NONE.** Installing a disk upgrade kit from **MICRO MAINFRAME** is now easier than ever before.

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```
<FJ1<FM006<FL063
                    <PE<PG<P%PENCIL-PLUS<PF<PH<P$


        This is an example of <PG<PEPENCIL-PLUS<PH<PF used with
<P4Electric Pencil 2.0<P5., <PG<PEPENCIL-PLUS<PH<PF permits
writers to imbed printer codes while maintaining the proper
line length with boldface, emphasized, double-strike or
different type fonts-----even in headers.
        With the<PG<PE PENCIL-PLUS<PH<PF enhancement, right
justification can be maintained, even with embedded printer
codes.  Format parameters can be altered by including format
lines in the text.
<FM016<FL043<FS2

       Margins, line lengths, line spacing and right
justification may also be changed. For this paragraph, the
margin was set at 16 and the line length at 43 with double
spacing.
<FM006<FL063<FS1

        <PG<PEPENCIL-PLUS<PH<PF supports non-printing comment
lines.
<F=this is a comment line.
<FL031

        <P%Expanded fonts will be retained, line after line,
until reset by another code in the text, and will not revert to
normal width at the end of each line on the MX-80.
<FL108

<P$        <P(Compressed fonts will also be maintained from one
line to the next until turned off by a print code in the text.
The left margin will be maintained evenly, regardless of the
type font being employed.
<FL054

        <P%<P(Compressed-expanded combinations will print line
after line.
<P$<P)
<FM006<FL059

        <PG<PEPENCIL-PLUS<PF<PH     supports     mix-and-match
combinations:
Normal        <P%<P(expanded-compressed<P$        compressed<P)
<P%expanded<P$ <PE<PGboldface<PF<PH.
<FL063
Characters not on the keyboard may be sent to the printer, such
as <G123<G124<G125<G126<G091<G092<G093<G094<G095<G096 and even
graphics may be printed.

        Text may be entered from the keyboard during printout,
prompted by your own message on the screen, and may contain up
to 255 characters. Keyboard text will respect line and page
lengths, headers and page numbers and will be right-justified
if that option was selected.
<FX=Try some keyboard input.
        Files may be chained for printing, and will retain the
current header, line count and page numbering.
        This is the last line in Sample1/PCL.
<FC=SAMPLE2
        This is the first line of Sample2/PCL.
        Conditional     hyphens     are     supported     with
<PG<PEPENCIL-PLUS<PH<PF, and will print only if the word must
be broken at the end of a line. Try printing the following
line with different spacing at it's beginning:
        This sentence is just one example of the use of
con<Hdi<Htion<Hal hy<Hphens during printing.
        Boilerplate paragraphs may be inserted into the text,
permitting standard paragraphs to be printed without repetitive
typing. The following paragraph comes from Sample4/PCL:
<F*Sample4=100
        <PG<PEPENCIL-PLUS<PH<PF also supports file-merge. The
merged files may be of variable length, using the field names
which you select and may themselves be created using
<PG<PEPENCIL-PLUS<PH<PF. Line length and right justification
will be maintained with even variable-length fields, and data
may be inserted from the keyboard to replace variable data
within a line.
        Chained, boilerplate and merge files all recognize a
default file extension of '/PCL.'
        <PG<PEPENCIL-PLUS<PH<PF is written to work with a
standard copy of <P4Electric Pencil 2.0,<P5 using your own
printer's control codes. All changes have been made internally
so that the size of the text buffer is not reduced, and the
original program's ease of operation has been retained.
```

Fig. 1. Sample Pencil-Plus File

form desired tasks. The default character is <; change it by typing PC and the new character.

Pencil-Plus uses this control character along with a letter key to begin and end several functions:

- <F begins a format line
- <P sends a printer code
- <G sends a graphics code
- <H is a conditional hyphen
- <D begins a data field for file merge
- <E ends the data field

The letter following the control character can be upper- or lowercase. If a control character is inadvertently typed without one of these letters following it, the control character will be ignored and the following character will be converted to uppercase signalling the error. See the section on advanced operations for more information.

The Format Line

Format commands determine how a document appears when printed as text, and are used to signal several means of typing in data during printout. Since the results might not be satisfactory if items such as the line length were changed in the middle of a line, you must enter format commands on separate lines. The only way to ensure that the format command is at the beginning of a line is to precede it with a carriage return.

A letter following the format command tells Pencil-Plus what you expect it to do. It may be either upper- or lowercase.

- <fLnnn sets the line length.
- <fMnnn sets the left margin.
- <fSn sets the line spacing.
- <fJn turns right justification on or off.
- <fC loads and prints a chain file.
- <fX permits entry from the keyboard.
- <f* loads and prints a boilerplate paragraph.
- <f and any other character is interpreted as a nonprinting comment line.

The n represents a number. Three numbers are required to set the left margin or the line length; they can be padded with a leading zero if necessary. A single digit sets line spacing and one digit turns justification on or off.

Several format parameters can appear on the same line, separated by format symbols. The following example sets the line length to 50, turns justification on, sets double spacing, specifies a margin of 15 and prompts for keyboard input:

```
<fL050<fJ1<fS2<fM015<fX = Insert a paragraph
```

Any number of format lines can be

Continues on p. 160

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103

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Program Listing

```
                00100 ; ********************************************************
                00110 ; *     PCLPLUS2/ASM---PENCIL07/SYS OVERLAY              *
                00120 ; *                  ---LOADS 6200H TO 6FFFH             *
                00130 ; ********************************************************
                00140 ; *                                                      *
                00150 ; *  TO MODIFY PENCIL/CMD FOR USE WITH PCLPLUS2:         *
                00160 ; *     1.  SET DEBUG ON                                 *
                00170 ; *     2.  TYPE 'PENCIL' TO LOAD PENCIL/CMD             *
                00180 ; *     3.  CHANGE 6659H FROM 00 TO 07                   *
                00190 ; *     4.  TYPE 'G402D' TO RETURN TO DOS                *
                00200 ; *     5.  USE DUMP COMMAND TO SAVE PENCIL/CMD          *
                00210 ; *           START=52F0H END=668FH ENTRY=6201H          *
                00220 ; *                                                      *
                00230 ; *  TO SAVE PCLPLUS PARAMETERS AS DEFAULTS:             *
                00240 ; *     1.  FROM PENCIL, ENTER PRINT MENU                *
                00250 ; *     2.  ENTER DESIRED VALUES FROM PRINT MENU         *
                00260 ; *     3.  ENTER DESIRED VALUES FROM PCLPLUS MENU       *
                00270 ; *     4.  ENTER DESIRED VALUES FROM SYSTEM MENU        *
                00280 ; *     5.  FROM SYSTEM MENU, TYPE 'SETUP'               *
                00290 ; *                                                      *
                00300 ; ********************************************************
                00310 ; *                                                      *
                00320 ; *     TO USE PCLPLUS WITH SERIAL OR TRS-232 DRIVERS    *
                00330 ; *     SET PARAMETERS FROM PRINT MENU AND SAVE WITH     *
                00340 ; *     SETUP.                                           *
                00350 ; *                                                      *
                00360 ; *          CALL THE PCLPLUS MENU WITH <CLEAR> 2        *
                00370 ; *                                                      *
                00380 ; ********************************************************
6200            00400           ORG     6200H
6200 07         00410           DEFB    07
6201 CDC901     00420           CALL    01C9H
6204 21003C     00430           LD      HL,3C00H
6207 CD9663     00440           CALL    DRWONE
620A EB         00450           EX      DE,HL
620B 13         00460           INC     DE
620C 0E1E       00470           LD      C,1EH
620E 21CA63     00480           LD      HL,PPMENU
6211 EDB0       00490           LDIR
6213 13         00500           INC     DE
6214 EB         00510           EX      DE,HL
6215 CD9663     00520           CALL    DRWONE
6218 0606       00530           LD      B,06H
621A 21E863     00540           LD      HL,PRMENU
621D 11493C     00550           LD      DE,3C49H
6220 C5         00560 DSPLAY    PUSH    BC
6221 D5         00570           PUSH    DE
6222 011400     00580           LD      BC,0014H
6225 EDB0       00590           LDIR
6227 0E0B       00600           LD      C,0BH
6229 EB         00610           EX      DE,HL
622A 09         00620           ADD     HL,BC
622B EB         00630           EX      DE,HL
622C 0E16       00640           LD      C,16H
622E EDB0       00650           LDIR
6230 D1         00660           POP     DE
6231 0E40       00670           LD      C,40H
6233 EB         00680           EX      DE,HL
6234 09         00690           ADD     HL,BC
6235 EB         00700           EX      DE,HL
6236 C1         00710           POP     BC
6237 10E7       00720           DJNZ    DSPLAY
6239 21C03D     00730           LD      HL,3DC0H
623C 063F       00740           LD      B,3FH
623E CD9863     00750           CALL    DRWTWO
6241 21E464     00760           LD      HL,INSTLN
6244 0E2E       00770           LD      C,2EH
6246 11493E     00780           LD      DE,3E49H
6249 EDB0       00790           LDIR
624B 211265     00800           LD      HL,CMDLIN
624E 0E08       00810           LD      C,08H
6250 11583F     00820           LD      DE,3F58H
6253 EDB0       00830           LDIR
6255 3AAE52     00850 DISNUM    LD      A,(52AEH)
6258 F630       00860           OR      30H
625A 32463C     00870           LD      (3C46H),A
625D 3AAF52     00880           LD      A,(52AFH)
6260 F630       00890           OR      30H
6262 32653C     00900           LD      (3C65H),A
6265 3AB052     00910           LD      A,(52B0H)
6268 21863C     00920           LD      HL,3C86H
626B CD9F63     00930           CALL    NUMBER
626E 3AB152     00940           LD      A,(52B1H)
6271 F630       00950           OR      30H
6273 32A53C     00960           LD      (3CA5H),A
6276 3AB252     00970           LD      A,(52B2H)
6279 21C63C     00980           LD      HL,3CC6H
627C CD9F63     00990           CALL    NUMBER
627F 3AB352     01000           LD      A,(52B3H)
6282 F630       01010           OR      30H
6284 32E53C     01020           LD      (3CE5H),A
6287 3AB452     01030           LD      A,(52B4H)
628A 21063D     01040           LD      HL,3D06H
628D CD9F63     01050           CALL    NUMBER
6290 3AB652     01060           LD      A,(52B6H)
6293 21463D     01070           LD      HL,3D46H
6296 CD9F63     01080           CALL    NUMBER
6299 3AB852     01090           LD      A,(52B8H)
629C 21863D     01100           LD      HL,3D86H
629F CD9F63     01110           CALL    NUMBER
62A2 3ABD52     01120           LD      A,(52BDH)
62A5 21253D     01130           LD      HL,3D25H
62A8 CD9F63     01140           CALL    NUMBER
62AB ED5BBA52   01150           LD      DE,(52BAH)
62AF 21653D     01160           LD      HL,3D65H
62B2 CDA263     01170           CALL    NUM0
62B5 3AAC52     01180           LD      A,(CHAR)
62B8 32A53D     01190           LD      (3DA5H),A
62BB FE20       01200           CP      20H
62BD CCF365     01210           CALL    Z,ALTER
62C0 061C       01220 CLEAR     LD      B,1CH
62C2 21613F     01230           LD      HL,3F61H
62C5 E5         01240           PUSH    HL
62C6 3620       01250 CLR1      LD      (HL),20H
62C8 23         01260           INC     HL
62C9 10FB       01270           DJNZ    CLR1
62CB E1         01280           POP     HL
62CC 368F       01290           LD      (HL),8FH
62CE 3E08       01300           LD      A,08H
62D0 CD0553     01310           CALL    5305H
62D3 2A2E52     01320           LD      HL,(522EH)
62D6 7E         01330           LD      A,(HL)
62D7 210000     01340           LD      HL,0000H
62DA B7         01350           OR      A
62DB CA2A66     01360           JP      Z,PRINT
62DE 2A2E52     01370           LD      HL,(522EH)
62E1 0603       01380           LD      B,03H
62E3 7E         01390 LOOKUP    LD      A,(HL)
62E4 FE60       01400           CP      60H
62E6 3803       01410           JR      C,LOOK2
62E8 E65F       01420           AND     5FH
62EA 77         01430           LD      (HL),A
62EB 23         01440 LOOK2     INC     HL
62EC 10F5       01450           DJNZ    LOOKUP
62EE 060C       01460           LD      B,12
62F0 2A2E52     01470           LD      HL,(522EH)
62F3 5E         01480           LD      E,(HL)
62F4 23         01490           INC     HL
62F5 56         01500           LD      D,(HL)
62F6 EB         01510           EX      DE,HL
62F7 110600     01520           LD      DE,0006H
62FA DD212D65   01530           LD      IX,LIST
62FE DD7E00     01540 LOOK3     LD      A,(IX+00H)
6301 BD         01550           CP      L
6302 2006       01560           JR      NZ,LOOK4
6304 DD7E01     01570           LD      A,(IX+01H)
6307 BC         01580           CP      H
6308 281A       01590           JR      Z,LOOK6
630A DD19       01600 LOOK4     ADD     IX,DE
630C 10F0       01610           DJNZ    LOOK3
630E ED5B2E52   01620           LD      DE,(522EH)
6312 210000     01630           LD      HL,0000H
6315 1A         01640 LOOK5     LD      A,(DE)
6316 13         01650           INC     DE
6317 CDF952     01660           CALL    52F9H
631A 38F9       01670           JR      C,LOOK5
631C 7D         01680           LD      A,L
631D B4         01690           OR      H
631E 283C       01700           JR      Z,INPERR
6320 2B         01710           DEC     HL
6321 C32A66     01720           JP      PRINT
6324 DD7E02     01730 LOOK6     LD      A,(IX+02H)
6327 DD6E04     01740           LD      L,(IX+04H)
632A DD6605     01750           LD      H,(IX+05H)
632D B7         01760           OR      A
632E 2001       01770           JR      NZ,GETCMD
6330 E9         01780           JP      (HL)
6331 ED5B2E52   01790 GETCMD    LD      DE,(522EH)
6335 13         01800           INC     DE
6336 13         01810           INC     DE
6337 E5         01820           PUSH    HL
6338 210000     01830           LD      HL,0000H
633B 1A         01840 GETCM1    LD      A,(DE)
633C 13         01850           INC     DE
633D CDF952     01860           CALL    52F9H
6340 38F9       01870           JR      C,GETCM1
6342 7C         01880           LD      A,H
6343 B7         01890           OR      A
6344 2016       01900           JR      NZ,INPERR
6346 DD7E02     01910           LD      A,(IX+02H)
6349 BD         01920           CP      L
634A 3810       01930           JR      C,INPERR
634C DD7E03     01940           LD      A,(IX+03H)
634F B7         01950           OR      A
6350 2804       01960           JR      Z,GETCM2
6352 3D         01970           DEC     A
6353 BD         01980           CP      L
6354 3006       01990           JR      NC,INPERR
6356 7D         02000 GETCM2    LD      A,L
6357 E1         02010           POP     HL
6358 77         02020           LD      (HL),A
6359 C35562     02030           JP      DISNUM
635C 011300     02040 INPERR    LD      BC,0013H
635F 116A3F     02050           LD      DE,3F6AH
6362 211A65     02060           LD      HL,ERRTXT
6365 EDB0       02070           LDIR
6367 CD6000     02080           CALL    0060H
636A 3A7F38     02090 WAIT      LD      A,(387FH)
636D B7         02100           OR      A
636E 28FA       02110           JR      Z,WAIT
6370 C3C062     02120           JP      CLEAR
6373 ED5B2E52   02130 PAGNUM    LD      DE,(522EH)
6377 13         02140           INC     DE
6378 13         02150           INC     DE
6379 210000     02160           LD      HL,0000H
637C 1A         02170 PAGNM2    LD      A,(DE)
637D 13         02180           INC     DE
637E CDF952     02190           CALL    52F9H
6381 38F9       02200           JR      C,PAGNM2
6383 22BA52     02210           LD      (52BAH),HL
6386 C35562     02220           JP      DISNUM
```

Listing continues

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PENCIL-PLUS

This is an example of **PENCIL-PLUS** used with *Electric Pencil 2.0*., **PENCIL-PLUS** permits writers to imbed printer codes while maintaining the proper line length with boldface, emphasized, double-strike or different type fonts-----even in headers.

With the **PENCIL-PLUS** enhancement, right justification can be maintained, even with embedded printer codes. Format parameters can be altered by including format lines in the text.

Margins, line lengths, line spacing and right justification may also be changed. For this paragraph, the margin was set at 16 and the line length at 43 with double spacing.

PENCIL-PLUS supports non-printing comment lines.

Expanded fonts will be retained, line after line, until reset by another code in the text, and will not revert to normal width at the end of each line on the MX-80.

Compressed fonts will also be maintained from one line to the next until turned off by a print code in the text. The left margin will be maintained evenly, regardless of the type font being employed.

Compressed-expanded combinations will print line after line.

PENCIL-PLUS supports mix-and-match combinations: Normal **expanded-compressed** compressed **expanded** **boldface.** Characters not on the keyboard may be sent to the printer, such as {|}~[\]^_' and even graphics may be printed.

Text may be entered from the keyboard during printout, prompted by your own message on the screen, and may contain up to 255 characters. Keyboard text will respect line and page lengths, headers and page numbers and will be right-justified if that option was selected.

This text is from the keyboard, and may be up to 255 characters in length.

Files may be chained for printing, and will retain the current header, line count and page numbering.

This is the last line in Sample1/PCL.

This is the first line of Sample2/PCL.

Conditional hyphens are supported with **PENCIL-PLUS**, and will print only if the word must be broken at the end of a line. Try printing the following line with different spacing at it's beginning:

This sentence is just one example of the use of condi-tional hyphens during printing.

Boilerplate paragraphs may be inserted into the text, permitting standard paragraphs to be printed without repetitive typing. The following paragraph comes from Sample4/PCL:

This is a test of a BOILERPLATE paragraph. It can be written as a portion of a file and then loaded by a command included within a format line. The Boilerplate paragraph will be printed up to the first carriage-return and then printing will resume at the place where it left off in the original text. The file containing the Boilerplate paragraph may contain many standard paragraphs. The selection may be made by prefixing each boilerplate paragraph with a line which contains a three digit number followed bt an asterisk and a carriage return. The boilerplate command in the text will begin with the format sign immediately followed by the filename containing the boilerplate paragraph. If no file extension is used, it will be assumed as '/PCL'. After the filename will be an equals sign and then the three-digit code terminated by a carriage return.

PENCIL-PLUS also supports file-merge. The merged files may be of variable length, using the field names which you select and may themselves be created using **PENCIL-PLUS.** Line length and right justification will be maintained with even variable-length fields, and data may be inserted from the keyboard to replace variable data within a line.

Chained, boilerplate and merge files all recognize a default file extension of '/PCL.'

PENCIL-PLUS is written to work with a standard copy of *Electric Pencil 2.0,* using your own printer's control codes. All changes have been made internally so that the size of the text buffer is not reduced, and the original program's ease of operation has been retained.

Fig. 2. Result of Fig. 1

Continued from p. 156

placed in the text; they can follow one after the other if necessary.

Chain Files

The chain file command permits the loading and printing of another file from disk. Pencil-Plus will retain any current header, and will continue page spacing and numbering as though the chained file were part of the original text. Chain printing is particularly useful in preparing long documents, such as technical manuals.

The chain character should be followed by an equals sign and the file specification of the file to be chained:

<fC = FILESPEC/DOC

Any file extension can be used. If none is given, /PCL will be assumed. If the file is not found, the screen will be cleared and display:

FILE NOT FOUND
PRESS <ENTER> WHEN CORRECTED

Insert the disk containing the file to be chained in the drive and press enter to load and print the file. If the file is not found because of an improper file specification, or if the name of the file that you intended to chain is not known, press break to return to the text display. You can then read or correct the filespec. Position the cursor over the format character of the chain command, and resume printing as though no error had taken place.

Keyboard Input

Interrupt the printing of a document for entry from the keyboard by following the format command with an X, an equals sign, and an optional prompt message. The command can resemble:

<fX = Input data about wigit sales

When the printer reaches this line, it stops and sounds a bell code to alert the operator. The screen clears and the user's prompt line appears on the screen.

Up to 255 characters can be entered from the keyboard. When the enter key is pressed, the text from the keyboard will be printed followed by the remaining text in the file. While the text will not be formatted on the screen as it normally appears with Electric Pencil, it will be properly formatted during printout; line and page lengths, headers and page numbers will be respected.

The following command can be used to interrupt printing at the end of a paragraph to change daisy wheels, address an envelope or perform any other

Continues on p. 164

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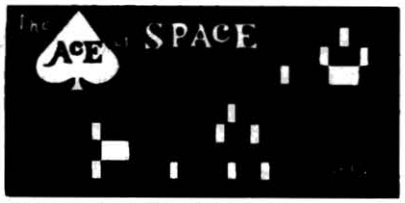

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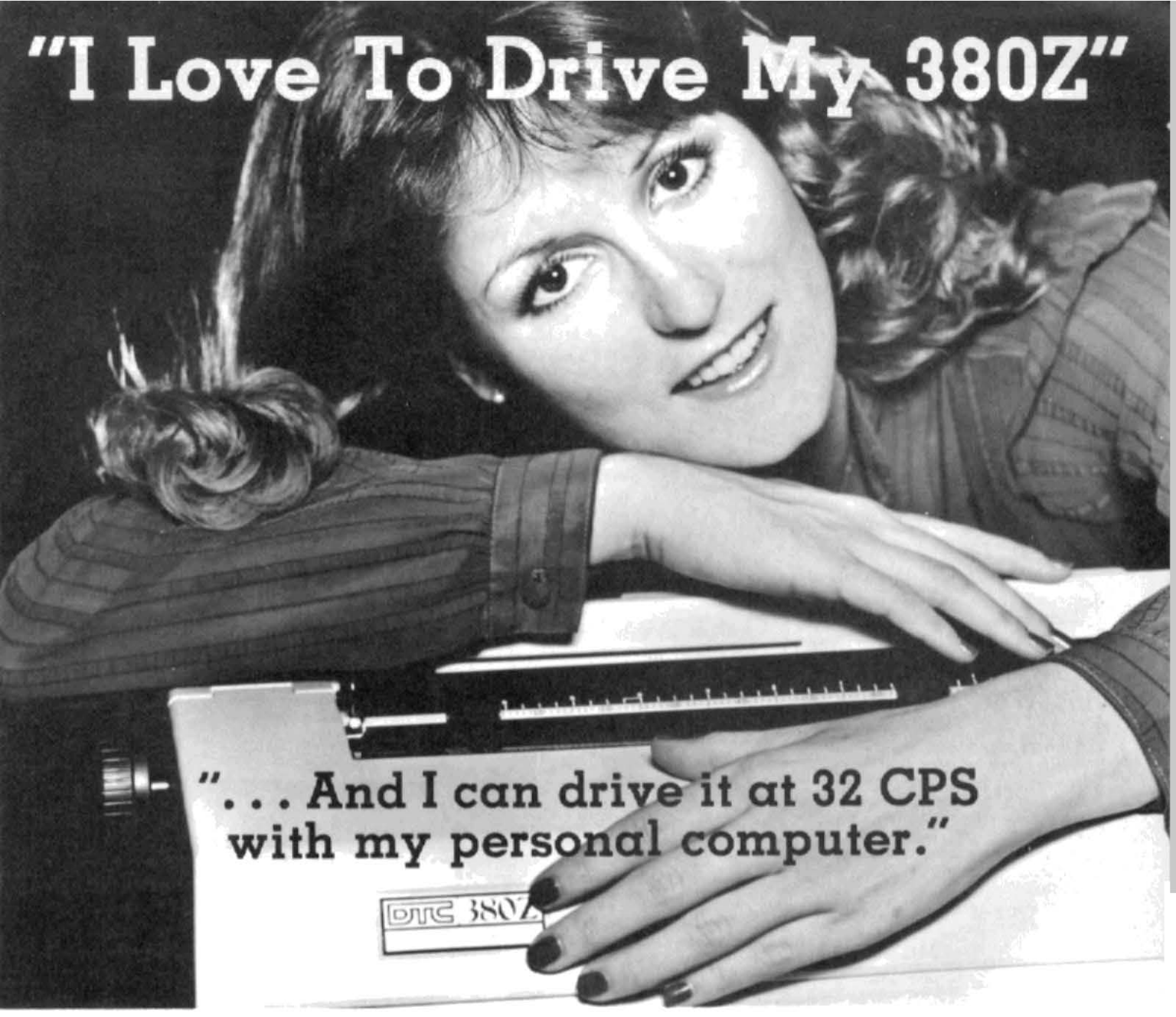
Listing continued

```
6389 ED5B2E52 02230 PCHAR   LD      DE,(522EH)
638D 13       02240         INC     DE
638E 13       02250         INC     DE
638F 1A       02260         LD      A,(DE)
6390 32AC52   02270         LD      (CHAR),A
6393 C35562   02280         JP      DISNUM
6396 060F     02290 DRWONE  LD      B,0FH
6398 3E8C     02300 DRWTWO  LD      A,8CH
639A 77       02310 DRWTHR  LD      (HL),A
639B 23       02320         INC     HL
639C 10FC     02330         DJNZ    DRWTHR
639E C9       02340         RET
639F 1600     02350 NUMBER  LD      D,00H
63A1 5F       02360         LD      E,A
63A2 7B       02370 NUM0    LD      A,E
63A3 B2       02380         OR      D
63A4 2005     02390         JR      NZ,NUM1
63A6 3630     02400         LD      (HL),30H
63A8 2B       02410         DEC     HL
63A9 1817     02420         JR      NUM4
63AB E5       02430 NUM1    PUSH    HL
63AC CD0E53   02440         CALL    530EH
63AF 113452   02450         LD      DE,5234H
63B2 06FF     02460         LD      B,0FFH
63B4 1A       02470 NUM2    LD      A,(DE)
63B5 04       02480         INC     B
63B6 B7       02490         OR      A
63B7 13       02500         INC     DE
63B8 20FA     02510         JR      NZ,NUM2
63BA E1       02520         POP     HL
63BB 1B       02530         DEC     DE
63BC 1B       02540 NUM3    DEC     DE
63BD 1A       02550         LD      A,(DE)
63BE 77       02560         LD      (HL),A
63BF 2B       02570         DEC     HL
63C0 10FA     02580         DJNZ    NUM3
63C2 0604     02590 NUM4    LD      B,04H
63C4 3620     02600 NUM5    LD      (HL),20H
63C6 2B       02610         DEC     HL
63C7 10FB     02620         DJNZ    NUM5
63C9 C9       02630         RET
63CA 54       02640 PRMENU  DEFM    'THE ELECTRIC PENCIL-PLUS MENU '
     48 45 20 45 4C 45 43 54
     52 49 43 20 50 45 4E 43
     49 4C 2D 50 4C 55 53 20
     4D 45 4E 55 20
63E8 52       02650 PRMENU  DEFM    'RGHT JUSTFY  RJ0-1  '
     47 48 54 20 4A 55 53 54
     46 59 20 20 52 4A 30 2D
     31 20 20
63FC 48       02660         DEFM    'HALT FMFEED  HF0-1    '
     41 4C 54 20 46 4D 46 45
     45 44 20 20 48 46 30 2D
     31 20 20 20 20
6412 4C       02670         DEFM    'LEFT MARGIN  LM0-255'
     45 46 54 20 4D 41 52 47
     49 4E 20 20 4C 4D 30 2D
     32 35 35
6426 4C       02680         DEFM    'LFED OFF/ON  LF0-1    '
     46 45 44 20 4F 46 46 2F
     4F 4E 20 20 4C 46 30 2D
     31 20 20 20 20
643C 4C       02690         DEFM    'LINE LENGTH  LL1-255'
     49 4E 45 20 4C 45 4E 47
     54 48 20 20 4C 4C 31 2D
     32 35 35
6450 43       02700         DEFM    'CRTN OFF/ON  CR0-1    '
     52 54 4E 20 4F 46 46 2F
     4F 4E 20 20 43 52 30 2D
     31 20 20 20 20
6466 4C       02710         DEFM    'LINE SPACNG  LS1-255'
     49 4E 45 20 53 50 41 43
     4E 47 20 20 4C 53 31 2D
     32 35 35
647A 50       02720         DEFM    'PRNT RECRDS  PR0-255  '
     52 4E 54 20 52 45 43 52
     44 53 20 20 50 52 30 2D
     32 35 35 20 20
6490 50       02730         DEFM    'PAGE LENGTH  PL1-255'
     41 47 45 20 4C 45 4E 47
     54 48 20 20 50 4C 31 2D
     32 35 35
64A4 50       02740         DEFM    'PAGE NUMBER  PN0-65535'
     41 47 45 20 4E 55 4D 42
     45 52 20 20 50 4E 30 2D
     36 35 35 33 35
64BA 50       02750         DEFM    'PAGE SPACNG  PS0-255'
     41 47 45 20 53 50 41 43
     4E 47 20 20 50 53 30 2D
     32 35 35
64CE 50       02760         DEFM    'PRINT CHARACTER  PC   '
     52 49 4E 54 20 43 48 41
     52 41 43 54 45 52 20 20
     50 43 20 20 20
64E4 50       02770 INSTLN  DEFM    'PRESS <ENTER> TO PRINT / '
     52 45 53 53 20 3C 45 4E
     54 45 52 3E 20 54 4F 20
     50 52 49 4E 54 20 2F 20
64FD 50       02780         DEFM    'PRESS <BREAK> TO EXIT'
     52 45 53 53 20 3C 42 52
     45 41 4B 3E 20 54 4F 20
     45 58 49 54
6512 43       02790 CMDLIN  DEFM    'COMMAND?'
     4F 4D 4D 41 4E 44 3F
651A 3C       02800 ERRTXT  DEFM    '<----- SYNTAX ERROR'
```

Listing continues

"I Love To Drive My 380Z"



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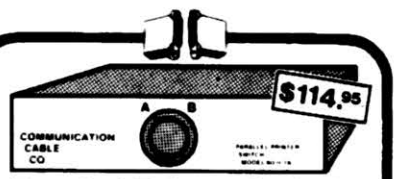

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IT PERMITS MULTIPLE FILES ON DISK OF UP TO 250 LINES OF TEXT PER FILE. TEXT LINES ARE AUTOMATICALLY STORED ON DISK AND ARE AVAILABLE FOR SUBSEQUENT USE. SIX SIMPLE EDITING CODES (ALL ON SCREEN AND SELF PROMPTING) PERMIT THE FOLLOWING VERSATILE FEATURES.

- OPEN TEXT FILES ON DISK FOR STORING TEXT.
- DISPLAY ALL OR ANY PART OF TEXT FOR REVIEW OR CORRECTION.
- ENTER ADDITIONAL TEXT TO ANY EXISTING FILE.
- INSERT OR REMOVE LINES ANYWHERE IN TEXT.
- SAVE CORRECTED TEXT.
- SAVE ALL OR ANY PART OF TEXT UNDER DIFFERENT FILE NAMES. (THESE MAY BE APPENDED TOGETHER TO MAKE UP NEW FILES).
- PRINT ENTIRE TEXT.
- PRINT ANY PART OF TEXT FROM ANY TEXT FILE.
- PRINT MAILING LABELS FOR ADDRESSEE AND SENDER.
- SET NUMBER OF LINES PER PRINTED PAGE.
- APPEND OTHER FILES TO THE ONE IN MEMORY TO MAKE UP NEW TEXT FILES.
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STANDARD FORMAT:		ADVANCED FORMAT:	
<D	Beginning of Data Field	<Clear><Down Arrow>	{
<E	End of Data Field	<Clear><Break>	}
<H	Conditional Hyphen	<Clear><Up Arrow>	|
<P	Printer Code	<Clear><J>	up arrow
	<P% Wide Font Printing On		
	<P$ Wide Font Printing Off		
	<P(Condensed Font Printing On		
	<P) Condensed Font Printing Off		
<Gnnn	Graphics Code	Lowercase '@'	^
<F	Format Code	<Clear><Break>	}

<FC = FILESPEC	Chain File	}C
<F*FILESPEC = nnn	Boilerplate	}*
<FX = PROMPT	Keyboard Input	}X
<FLnnn	Line Length	}L
<FMnnn	Margin Width	}M
<FSn	Line Spacing	}S
<FJn	Justification On/Off	}J
<Fany character	Nonprinting Comment	}

Table 1. Summary of Pencil-Plus Commands

```
<FM010

                                                August 1, 1982


Ms. Matilda Grudge
1234 Hunchback Court
Nostrilhair, VA
        87642


My Dear Ms. Grudge,

        Although you have been one of our valued customers
over the years, circumstances regretfully dictate that I write
you this letter.
<F*SAMPLE4=120
        If we can be of any further assistance, please feel
free to call on us.

                                        Sincerely,


                                        W. Tightfist
                                        Credit Manager
                                        Charity Finance Co.
                                        Folsom, CA.
                                                94042
```

Fig. 3. Letter Calling a Boilerplate Paragraph

Continued from p. 160

task without additional printing:

<fX = Change to 12-pitch wheel

Press enter to resume printing.

Boilerplate Paragraphs

Boilerplate paragraphs may be inserted at any point in the text. They are particularly useful where long paragraphs, such as in a contract, must be inserted in a document, or where a standard letter is to be used with content selected to suit the occasion. A short example of a letter calling for a boilerplate paragraph is shown in Fig. 3. A file of boilerplate paragraphs is depicted in Fig. 4, and Fig. 5 shows the result.

The command for a boilerplate paragraph follows the format command with an asterisk, the file specification, an equals sign and the three-character paragraph code. A boilerplate specification might resemble the following:

<f*STANDARD/LTR = 10A

Once again, the file specification may contain any extension. If none appears,

```
090*
        THIS PARAGRAPH WILL BE IGNORED IF THE CALL IS FOR
ANOTHER NUMBERED PARAGRAPH.
100*
        This is a test of a BOILERPLATE paragraph.  It can be
written as a portion of a file and then loaded by a command
included within a format line.  The Boilerplate paragraph will
be printed up to the first carriage-return and then printing
will resume at the place where it left off in the original
text.  The file containing the Boilerplate paragraph may
contain many standard paragraphs.  The selection may be made
by prefixing each boilerplate paragraph with a line which
contains a three digit number followed bt an asterisk and a
carriage return.  The boilerplate command in the text will
begin with the format sign immediately followed by the
filename containing the boilerplate paragraph.  If no file
extension is used, it will be assumed as '/PCL'.  After the
filename will be an equals sign and then the three-digit code
terminated by a carriage return.
110*
THIS PARAGRAPH WILL BE IGNORED IF THE CALL IS FOR ANOTHER
NUMBERED PARAGRAPH.
120*  Send with bills that are 30 days overdue.
        We wish to remind you that as of this date we have not
yet received payment on your account.
130*  Send with bills that are 60 days overdue.
        Please be reminded that your account is now more than
30 days in arrears.  Addittional service charges will be added
to your account if it is not promptly paid in full.
140*  Send with bills that are 90 days overdue.
        We have found it necessary to suspend further credit
until your account has been paid.  May we remnd you that under
state law we are empowered to add to your bill any further
costs incurred by its collection.
150*  Send with bills that are 120 days overdue.
        We have turned your account over to the Mafia . . .
```

Fig. 4. File of Boilerplate Paragraphs

```
                                        August 1, 1982


Ms. Matilda Grudge
1234 Hunchback Court
Nostrilhair, VA
        87642


My Dear Ms. Grudge,

        Although you have been one of our valued customers
over the years, circumstances regretfully dictate that I write
you this letter.
        We wish to remind you that as of this date we have not
yet received payment on your account.
        If we can be of any further assistance, please feel
free to call on us.

                                Sincerely,


                                W. Tightfist
                                Credit Manager
                                Charity Finance Co.
                                Folsom, CA.
                                        94042
```

Fig. 5. Resulting Letter

then /PCL will be assumed. The paragraph code may contain any three digits. There is no limit on the size of the boilerplate paragraph, except that the resident text and the boilerplate paragraph combined must not exceed Electric Pencil's text buffer.

If the specified file is not found, the screen clears and the following message appears:

FILE NOT FOUND
PRESS <ENTER> WHEN CORRECTED

Insert the disk containing the boilerplate file into a drive and press the enter

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Listing continued

```
      2D 2D 2D 2D 2D 20 53 59
      4E 54 41 58 20 45 52 52
      4F 52
652D 52        02820 LIST    DEFM    'RJ'
      4A
652F 01        02830         DEFB    1
6530 00        02840         DEFB    0
6531 AE52      02850         DEFW    52AEH
6533 48        02860         DEFM    'HF'
      46
6535 01        02870         DEFB    1
6536 00        02880         DEFB    0
6537 AF52      02890         DEFW    52AFH
6539 4C        02900         DEFM    'LM'
      4D
653B FF        02910         DEFB    255
653C 00        02920         DEFB    0
653D B052      02930         DEFW    52B0H
653F 4C        02940         DEFM    'LF'
      46
6541 01        02950         DEFB    1
6542 00        02960         DEFB    0
6543 B152      02970         DEFW    52B1H
6545 4C        02980         DEFM    'LL'
      4C
6547 FF        02990         DEFB    255
6548 01        03000         DEFB    1
6549 B252      03010         DEFW    52B2H
654B 43        03020         DEFM    'CR'
      52
654D 01        03030         DEFB    1
654E 00        03040         DEFB    0
654F B352      03050         DEFW    52B3H
6551 4C        03060         DEFM    'LS'
      53
6553 FF        03070         DEFB    255
6554 01        03080         DEFB    1
6555 B452      03090         DEFW    52B4H
6557 50        03100         DEFM    'PL'
      4C
6559 FF        03110         DEFB    255
655A 01        03120         DEFB    1
655B B652      03130         DEFW    52B6H
655D 50        03140         DEFM    'PS'
      53
655F FF        03150         DEFB    255
6560 00        03160         DEFB    0
6561 B852      03170         DEFW    52B8H
6563 50        03180         DEFM    'PN'
      4E
6565 00        03190         DEFB    0
6566 00        03200         DEFB    0
6567 7363      03210         DEFW    PAGNUM
6569 50        03220         DEFM    'PR'
      52
656B FF        03230         DEFB    255
656C 00        03240         DEFB    0
656D BD52      03250         DEFW    52BDH
656F 50        03260         DEFM    'PC'
      43
6571 00        03270         DEFB    00H
6572 20        03280         DEFB    20H
6573 8963      03290         DEFW    PCHAR
6575 3AAC52    03310 MERG    LD      A,(CHAR)
6578 FE20      03320         CP      20H
657A 2868      03330         JR      Z,ALTER0
657C 328F6B    03340         LD      (CH1+1),A
657F 32256C    03350         LD      (CH2+1),A
6582 32806C    03360         LD      (CH3+1),A
6585 329865    03370         LD      (CH4+1),A
6588 2A2852    03380         LD      HL,(5228H)
658B 01FF6F    03390         LD      BC,6FFFH
658E C5        03400         PUSH    BC
658F C5        03410         PUSH    BC
6590 ED42      03420         SBC     HL,BC
6592 E5        03430         PUSH    HL
6593 C1        03440         POP     BC
6594 E1        03450         POP     HL
6595 D1        03460         POP     DE
6596 1A        03470 COR1    LD      A,(DE)
6597 FE3C      03480 CH4     CP      3CH
6599 CC236F    03490         CALL    Z,COR2
659C 77        03500         LD      (HL),A
659D 23        03510         INC     HL
659E 13        03520         INC     DE
659F 0B        03530         DEC     BC
65A0 78        03540         LD      A,B
65A1 B1        03550         OR      C
65A2 20F2      03560         JR      NZ,COR1
65A4 222852    03570         LD      (5228H),HL
65A7 70        03580         LD      (HL),B
65A8           03590 MERG0   EQU     $
               03600 ; ********************************************************
65A8 0000      03610 HOOK    DEFW    0000H           ; HOOK TO ROUTINE IN
65AA 0000      03620         DEFW    0000H           ; HIGH MEMORY
65AC 0000      03630         DEFW    0000H           ; ROUTINE MUST PATCH
65AE 0000      03640         DEFW    0000H           ; PCLPLUS CODE AS
65B0 0000      03650         DEFW    0000H           ; NEEDED
65B2 0000      03660         DEFW    0000H
65B4 0000      03670         DEFW    0000H
65B6 00        03680         DEFB    00H
               03690 ; ********************************************************
65B7 3A0070    03700         LD      A,(7000H)
65BA 2ABA52    03710         LD      HL,(52BAH)
65BD FE7B      03720         CP      7BH
65BF C2B366    03730         JP      NZ,CONT
65C2 E5        03740         PUSH    HL
```

Listing continues

key. The appropriate boilerplate paragraph is loaded and printed, and printing of the remaining text will resume.

If you have forgotten the name of the boilerplate file, or if you entered the wrong file specification, press break to return to the text. Read or correct the file specification, position the cursor over the format command calling for the boilerplate paragraph and resume printing.

If the paragraph selected is not found in the file, the program will not crash. The boilerplate paragraph will simply be ignored, and printing of the text file will continue.

Boilerplate files may be written with Electric Pencil, and may be of any size. The three-digit code must be followed by an asterisk, and any comments or instructions desired terminated by enter. The next paragraph is then loaded and printed. As an illustration:

2V5* SEND TO ALL CALIFORNIA CUSTOMERS

This is the paragraph that will be printed if the code 2V5 is specified.

D19* SEND TO ALL TEXAS CUSTOMERS

This is the paragraph that will be printed if the code D19 is specified.

THIS IS A COMMENT PARAGRAPH, AND WILL BE IGNORED

Any number of boilerplate paragraphs can be printed one after the other, and may come from different files.

Comment Lines

Any character that follows the format command other than L, M, S, J, C, X, or * is regarded as a comment line and ignored. For example:

<f# Send this letter when bills 30 days overdue.

Format and comment parameters may span several lines if necessary, with comments appearing last, terminated by enter.

Printer Control Codes

Pencil-Plus uses a special set of codes to utilize the capabilities of smart printers. The control character followed by P and a letter designates the print code. Four characters control font width. These are replaced at print time with the codes that you provided when you configured your Pencil-Plus disk.

- <p% begins expanded font printing.
- <p$ ends expanded font printing.

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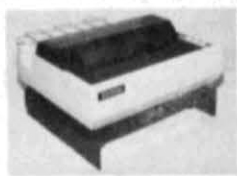

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Listing continued

```
65C3 AF        03750          XOR     A
65C4 320062    03760          LD      (6200H),A
65C7 3C        03770          INC     A
65C8 321E52    03780          LD      (521EH),A
65CB 210170    03790          LD      HL,7001H
65CE 110165    03800          LD      DE,WORK5
65D1 CDE76F    03810 MERG1    CALL    MOVE
65D4 210163    03820 MERG1A   LD      HL,WORK2
65D7 0600      03830          LD      B,0
65D9 CD2444    03840          CALL    DOS4
65DC CA436C    03850          JP      Z,MERG1B
65DF CDDD6D    03860          CALL    ERCK
65E2 18F0      03870          JR      MERG1A
65E4 21A865    03880 ALTER0   LD      HL,MERG0
65E7 E5        03890          PUSH    HL
65E8 3EFF      03900          LD      A,0FFH
65EA 328F6B    03910          LD      (CH1+1),A
65ED 32256C    03920          LD      (CH2+1),A
65F0 32B06C    03930          LD      (CH3+1),A
65F3 3E7D      03940 ALTER    LD      A,7DH
65F5 32F05D    03950          LD      (5DF0H),A
65F8 3D        03960          DEC     A
65F9 32F15D    03970          LD      (5DF1H),A
65FC 3D        03980          DEC     A
65FD 32F25D    03990          LD      (5DF2H),A
6600 AF        04000          XOR     A
6601 32065D    04010          LD      (5D06H),A
6604 32075D    04020          LD      (5D07H),A
6607 329953    04030          LD      (5399H),A
660A 3EF2      04040          LD      A,0F2H
660C 323253    04050          LD      (5332H),A
660F 3E51      04060          LD      A,51H
6611 323353    04070          LD      (5333H),A
6614 212066    04080          LD      HL,ALTER1
6617 11F251    04090          LD      DE,51F2H
661A 010A00    04100          LD      BC,000AH
661D EDB0      04110          LDIR
661F C9        04120          RET
6620 361B      04130 ALTER1   LD      (HL),1BH
6622 23        04140          INC     HL
6623 E5        04150          PUSH    HL
6624 211D52    04160          LD      HL,521DH
6627 34        04170          INC     (HL)
6628 E1        04180          POP     HL
6629 C9        04190          RET
               04210 ; EVERYTHING ABOVE THIS POINT MAY BE OVERWRITTEN IN MERGE
662A 3EFF      04230 PRINT    LD      A,0FFH
662C 323A52    04240          LD      (523AH),A
662F E5        04250          PUSH    HL
6630 CD4966    04260          CALL    PPPRNT
6633 E1        04270          POP     HL
6634 7D        04280          LD      A,L
6635 B4        04290          OR      H
6636 2803      04300          JR      Z,PRTFIN
6638 2B        04310          DEC     HL
6639 18EF      04320          JR      PRINT
663B AF        04330 PRTFIN   XOR     A
663C 323A52    04340          LD      (523AH),A
663F CD5F6F    04350          CALL    RESTOR
6642 2A2252    04360          LD      HL,(5222H)
6645 CDFF52    04370          CALL    52FFH
6648 C9        04380          RET
6649 3ABF52    04390 PPPRNT   LD      A,(52BFH)
664C FE55      04400          CP      55H
664E 2823      04410          JR      Z,SERIAL
6650 FE50      04420          CP      50H
6652 285C      04430          JR      Z,PARAL
6654 3A0352    04440          LD      A,(5203H)
6657 FE31      04450          CP      31H
6659 21046A    04460          LD      HL,BAUD2
665C 2803      04470          JR      Z,PP50
665E 21166A    04480          LD      HL,BAUD3
6661 3AB552    04490 PP50     LD      A,(52B5H)
6664 CB07      04500          RLC     A
6666 5F        04510          LD      E,A
6667 1600      04520          LD      D,00H
6669 19        04530          ADD     HL,DE
666A 5E        04540          LD      E,(HL)
666B 23        04550          INC     HL
666C 56        04560          LD      D,(HL)
666D ED53C069  04570          LD      (PRTQ),DE
6671 183D      04580          JR      PARAL
6673 AF        04590 SERIAL   XOR     A
6674 D3E8      04600          OUT     (0E8H),A
6676 0E04      04610          LD      C,04H
6678 3ABE52    04620          LD      A,(52BEH)
667B FE01      04630          CP      01H
667D 2804      04640          JR      Z,PP52
667F 3E10      04650          LD      A,10H
6681 B1        04660          OR      C
6682 4F        04670          LD      C,A
6683 3AB952    04680 PP52     LD      A,(52B9H)
6686 0608      04690          LD      B,08H
6688 FE4D      04700          CP      4DH
668A 2806      04710          JR      Z,PP53
668C 0680      04720          LD      B,80H
668E FE45      04730          CP      45H
6690 2003      04740          JR      NZ,PP54
6692 79        04750 PP53     LD      A,C
6693 B0        04760          OR      B
6694 4F        04770          LD      C,A
6695 3ABC52    04780 PP54     LD      A,(52BCH)
6698 FE08      04790          CP      08H
669A 3E60      04800          LD      A,60H
669C 2802      04810          JR      Z,PP55
669E 3E20      04820          LD      A,20H
66A0 B1        04830 PP55     OR      C
```

Listing continues

- <p(begins narrow font printing.
- <p) ends narrow font printing.

When printing, the normal character width is used for margin spacing and then the previously active font is restored. This permits an even margin when mixing normal, compressed and wide type fonts and prevents the MX-80 from reverting to normal-width printing at the end of a line. Remember to change the line width when you switch from one width font to another.

If your printer recognizes the escape code (027 or 1BH), then the <P may be followed by any suitable character. For example, the MX-80 with Graftrax recognizes <P4 to begin printing in the italic font. The P of the print control code may be either upper- or lowercase.

Graphics Printing

If your printer supports block graphics, the graphics characters may be sent to the printer by following the control character with a G and the three-digit decimal code for the graphics symbol. For example, <G191 causes your printer to print the solid block character.

Your printer may also print graphics while in the condensed- or expanded-type modes or with emphasized or double-strike for some unusual effects.

The graphics code can also be used to print characters that do not appear on the TRS-80 keyboard. Try <G091, <G092, <G093, <G094, <G095, <G096, <G123, <G124, <G125, and <G126.

The graphics code can also send additional commands to your printer. For instance, if your printer changes line spacing on receipt of a decimal 19 code (DC3 or 13H), the <G019 would send the proper code. You can send the bell code to your printer with '<G007.'

There's one problem with this command: Since your intent is not known, Pencil-Plus assumes that any code higher than 127 decimal is a graphics symbol, and so one character is included in the line spacing count. Otherwise, the program assumes you are sending part of a control code to your printer and the character count is not incremented. Experiment with the graphics code, and use it carefully.

Conditional Hyphens

Insert a conditional hyphen into a word with <H. If the entire word will fit on one line, the conditional hyphen will be ignored. But if the word must be broken, the break will take place at the conditional hyphen.

Continues on p. 174

™TRS80 color

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 informations 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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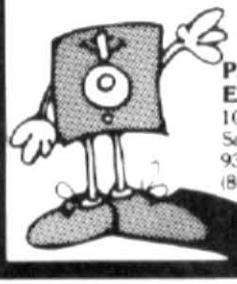

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```
66A1 D3EA     04840          OUT     (0EAH),A
66A3 3AB552   04850          LD      A,(52B5H)
66A6 5F       04860          LD      E,A
66A7 1600     04870          LD      D,00H
66A9 21FB69   04880          LD      HL,BDTBL
66AC 19       04890          ADD     HL,DE
66AD 7E       04900          LD      A,(HL)
66AE D3E9     04910          OUT     (0E9H),A
66B0 C37565   04920 PARAL    JP      MERG
66B3 2B       04930 CONT     DEC     HL
66B4 22306A   04940          LD      (PP70),HL
66B7 3ABD52   04950          LD      A,(52BDH)
66BA 32326A   04960          LD      (PP7),A
66BD CDFC52   04970          CALL    52FCH
66C0 222D6A   04980          LD      (PP5),HL
66C3 222B6A   04990          LD      (PP4),HL
66C6 CDE267   05000 PP9      CALL    RDYPRT
66C9 CD0853   05010 PP10     CALL    5308H
66CC AF       05020 PP10A    XOR     A
66CD 57       05030          LD      D,A
66CE 5F       05040          LD      E,A
66CF 32296A   05050          LD      (PP2),A
66D2 2A2D6A   05060          LD      HL,(PP5)
66D5 221F52   05070 PP10B    LD      (521FH),HL
66D8 CDE868   05080          CALL    PP8
66DB DA9367   05090          JP      C,PP29
66DE CD446D   05100 PP10C    CALL    HYP4AA
66E1 CD626D   05110          CALL    KK0
66E4 B9       05120          CP      C
66E5 DAC869   05130          JP      C,LLERR
66E8 23       05140 PP14     INC     HL
66E9 7E       05150          LD      A,(HL)
66EA FE20     05160          CP      20H
66EC 28FA     05170          JR      Z,PP14
66EE 222D6A   05180          LD      (PP5),HL
66F1 2A1F52   05190          LD      HL,(521FH)
66F4 CD626D   05200          CALL    KK0
66F7 91       05210          SUB     C
66F8 2827     05220          JR      Z,PP20
66FA 5F       05230          LD      E,A
66FB 41       05240          LD      B,C
66FC 7E       05250 PP15     LD      A,(HL)
66FD 23       05260          INC     HL
66FE 05       05270          DEC     B
66FF FE20     05280          CP      20H
6701 28F9     05290          JR      Z,PP15
6703 7E       05300 PP16     LD      A,(HL)
6704 23       05310          INC     HL
6705 FE20     05320          CP      20H
6707 2001     05330          JR      NZ,PP17
6709 14       05340          INC     D
670A 05       05350 PP17     DEC     B
670B 20F6     05360          JR      NZ,PP16
670D 7A       05370 PP18     LD      A,D
670E 93       05380          SUB     E
670F 300F     05390          JR      NC,PP19
6711 2F       05400          CPL
6712 3C       05410          INC     A
6713 BB       05420          CP      E
6714 280A     05430          JR      Z,PP19
6716 5F       05440          LD      E,A
6717 3A296A   05450          LD      A,(PP2)
671A 3C       05460          INC     A
671B 32296A   05470          LD      (PP2),A
671E 18ED     05480          JR      PP18
6720 57       05490 PP19     LD      D,A
6721 CD8368   05500 PP20     CALL    PP38
6724 CD8F68   05510          CALL    PP39
6727 3A286A   05520 PP21     LD      A,(PP1)
672A B7       05530          OR      A
672B 2806     05540          JR      Z,PP22
672D CDBB67   05550          CALL    PP32
6730 C3C966   05560          JP      PP10
6733 3AB452   05570 PP22     LD      A,(52B4H)
6736 3D       05580          DEC     A
6737 4F       05590          LD      C,A
6738 3E0A     05600          LD      A,0AH
673A 212F6A   05610          LD      HL,PP6
673D CDFF68   05620 PP23     CALL    PP47
6740 35       05630          DEC     (HL)
6741 2807     05640          JR      Z,PP24
6743 0D       05650          DEC     C
6744 F23D67   05660          JP      P,PP23
6747 C3C966   05670          JP      PP10
674A 3AB152   05680 PP24     LD      A,(52B1H)
674D B7       05690          OR      A
674E 2803     05700          JR      Z,PP25
6750 CDBB67   05710          CALL    PP32
6753 3A2F6A   05720 PP25     LD      A,(PP6)
6756 B7       05730          OR      A
6757 2803     05740          JR      Z,PP26
6759 CD8967   05750          CALL    PP27
675C 3AB852   05760 PP26     LD      A,(52B8H)
675F CD8967   05770          CALL    PP27
6762 3AAF52   05780          LD      A,(52AFH)
6765 B7       05790          OR      A
6766 2818     05800          JR      Z,PP62
6768 3A2F6A   05810          LD      A,(PP6)
676B B7       05820          OR      A
676C 2006     05830          JR      NZ,PP60
676E 3AB852   05840          LD      A,(52B8H)
6771 B7       05850          OR      A
6772 280C     05860          JR      Z,PP62
6774 3A7F38   05870 PP60     LD      A,(387FH)
6777 B7       05880          OR      A
6778 28FA     05890          JR      Z,PP60
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677D B7        05910         OR      A
677E 20FA      05920         JR      NZ,PP61
6780 2A2D6A    05930 PP62    LD      HL,(PP5)
6783 7E        05940         LD      A,(HL)
6784 B7        05950         OR      A
6785 C2C666    05960         JP      NZ,PP9
6788 C9        05970         RET
6789 4F        05980 PP27    LD      C,A
678A 3E0A      05990         LD      A,0AH
678C 0D        06000 PP28    DEC     C
678D F8        06010         RET     M
678E CDFF68    06020         CALL    PP47
6791 18F9      06030         JR      PP28
6793 47        06040 PP29    LD      B,A
6794 B1        06050         OR      C
6795 281F      06060         JR      Z,PP31
6797 222D6A    06070         LD      (PP5),HL
679A 79        06080         LD      A,C
679B B7        06090         OR      A
679C 2810      06100         JR      Z,PP30
679E CD8368    06110         CALL    PP38
67A1 CD8F68    06120         CALL    PP39
67A4 21326A    06130         LD      HL,PP7
67A7 7E        06140         LD      A,(HL)
67A8 B7        06150         OR      A
67A9 2803      06160         JR      Z,PP30
67AB 35        06170         DEC     (HL)
67AC 2808      06180         JR      Z,PP31
67AE 78        06190 PP30    LD      A,B
67AF FE0C      06200         CP      0CH
67B1 2897      06210         JR      Z,PP24
67B3 D22767    06220         JP      NC,PP21
67B6 3E0A      06230 PP31    LD      A,0AH
67B8 C3FF68    06240         JP      PP47
67BB C5        06250 PP32    PUSH    BC
67BC 3AB352    06260         LD      A,(52B3H)
67BF B7        06270         OR      A
67C0 3E0D      06280         LD      A,0DH
67C2 2802      06290         JR      NZ,PP33
67C4 3E0A      06300         LD      A,0AH
67C6 F5        06310 PP33    PUSH    AF
67C7 3E20      06320         LD      A,20H
67C9 CD0D69    06330         CALL    PRTA
67CC F1        06340         POP     AF
67CD CD0D69    06350         CALL    PRTA
67D0 3AB752    06360         LD      A,(52B7H)
67D3 4F        06370         LD      C,A
67D4 AF        06380         XOR     A
67D5 CDDA67    06390         CALL    PP34
67D8 C1        06400         POP     BC
67D9 C9        06410         RET
67DA 0C        06420 PP34    INC     C
67DB 0D        06430 PRTNXT  DEC     C
67DC C8        06440         RET     Z
67DD CD0D69    06450         CALL    PRTA
67E0 18F9      06460         JR      PRTNXT
67E2 3AB652    06470 RDYPRT  LD      A,(52B6H)
67E5 322F6A    06480         LD      (PP6),A
67E8 EB        06490         EX      DE,HL
67E9 2A2B6A    06500         LD      HL,(PP4)
67EC EB        06510         EX      DE,HL
67ED 222B6A    06520         LD      (PP4),HL
67F0 CDF867    06530         CALL    HDRCHK
67F3 C8        06540         RET     Z
67F4 EB        06550         EX      DE,HL
67F5 222B6A    06560         LD      (PP4),HL
67F8 7E        06570 HDRCHK  LD      A,(HL)
67F9 FE24      06580         CP      24H
67FB C8        06590         RET     NZ
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67FD CDE868    06610         CALL    PP8
6800 FE0D      06620         CP      0DH
6802 C8        06630         RET     NZ
6803 CD626D    06640         CALL    KK0
6806 D60A      06650         SUB     0AH
6808 B9        06660         CP      C
6809 D8        06670         RET     C
680A CD8368    06680         CALL    PP38
680D 79        06690         LD      A,C
680E 90        06700         SUB     B
680F 47        06710         LD      B,A
6810 110000    06720         LD      DE,0000H
6813 E5        06730         PUSH    HL
6814 2A2B6A    06740         LD      HL,(PP4)
6817 23        06750         INC     HL
6818 0C        06760         INC     C
6819 CDA568    06770         CALL    PP41
681C 3AB252    06780         LD      A,(52B2H)
681F D606      06790         SUB     06H
6821 4F        06800         LD      C,A
6822 E5        06810         PUSH    HL
6823 D5        06820         PUSH    DE
6824 C5        06830         PUSH    BC
6825 ED5B306A  06840         LD      DE,(PP70)
6829 13        06850         INC     DE
682A ED53306A  06860         LD      (PP70),DE
682E CD0E53    06870         CALL    530EH
6831 C1        06880         POP     BC
6832 213452    06890         LD      HL,5234H
6835 0C        06900         INC     C
6836 AF        06910         XOR     A
6837 0D        06920 CONTPT  DEC     C
6838 7E        06930         LD      A,(HL)
6839 B7        06940         OR      A
683A 23        06950         INC     HL
```

Listing continues

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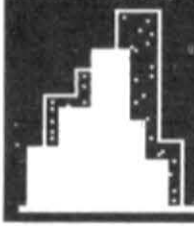

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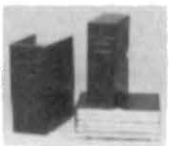

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Continued from p. 168

The H may be upper- or lowercase, and any number of conditional hyphens can appear in a word. For example, constitutionality could be typed:

con<Hsti<Htu<Htion<Hal<Hi<Hty

Conditional hyphens are particularly helpful when using variable-length data from a merged file to avoid having a hyphenated word appear in the middle of a line. They're also handy when printing narrow columns for newsletters.

File Merge

Pencil-Plus includes its own file-merge capability. Data from a record can be inserted in the text during printing when indicated by the text. Then the printing is repeated with data from the following records until all records have been processed.

Figure 6 is a section of a data file. It is called by the short letter in Fig. 7. The final result is shown in Fig. 8.

The beginning of data insertion is signaled with <D and ended with <E. Between these symbols is the field to be inserted. For example:

<dNAME<e

This inserts data from the name field of the current record in place of the <dNAME<e in the text. Line and page lengths, headers, page numbers and right justification are adjusted for data length.

Any text that uses a merge file must signal this intention to Pencil-Plus on the first line of text. The program will then be prepared to print a copy of the text with data from each record. The text must begin with the data symbol followed immediately by the file specification of the merge file:

<dMERGE/TXT

Any file extension can be used; if none appears then /PCL is assumed. If the file is not found, the screen clears and the following message is displayed:

FILE NOT FOUND
PRESS <ENTER> WHEN CORRECTED

Insert the disk containing the merge file in a drive and press the enter key to continue. If you have made an error in typing the file specification, or have forgotten the name of the file, press break to return to the text. Read or correct the file specification, return the cursor to the <D and resume printing.

To obtain a copy of your letter without invoking the series of data-merge copies, place the cursor beyond the file-spec and command a print. One copy of the letter will be printed showing the field names without the terminating <D and <E.

The <D and <E can be upper- or lowercase as can be the field names within the text file. Pencil-Plus will match the field name of the text with that of the merge file even if they are not in the same case.

If Pencil-Plus encounters a field not included in the merge file, it assumes that this information is to come from the keyboard. The printer bell sounds to alert the operator, the screen clears, and an insert prompt appears followed by the field name.

Up to 255 characters can be inserted in this manner. Although the data is not formatted on the screen, printing will respect justification, line and page

Continues on p. 178

```
<DNAME<E
<DFIRST<E
<DADDRESS<E
<DCITY<E
<DSTATE<E
<DZIP<E
<DPHONE<E
<DCOMMENT<E
<D<E
<DW. H. Bludgeon<E
<DWilbert<E
<DCell 458, State Prison<E
<DFolsom<E
<DCa<E
<D94066<E
<D(408) 225-6791<E
<Dauthor of the book, "Creative Accounting for Bankers"<E
<D<E
<DH. A. Sneed<E
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<D1 Hilltop Rd.<E
<DBeverly Hills<E
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<D(213) 445-1122<E
<DDirector of Poverty, Inc., National Charities Ass'n<E
<D<E
<DA. V. Nostrilhair<E
<DArnold<E
<D123 Penthouse Plaza<E
<DNew York<E
<DNY<E
<D10017<E
<D<H<E
<DPresident of Sewer Service, Int'l<E
<D<E
```

Fig. 6. Data File Section

```
<DSAMPLE6

                                        August 1, 1982


<DNAME<E
<DADDRESS<E
<DCITY<E, <DSTATE<E
<DZIP<E


Dear <DFIRST<E,

        As <DCOMMENT<E, we are certain you will be interested
to know that our famous non-slip spaghetti forks are once
again in stock and that orders are now being taken.

                        Best Regards,

                                Herman Wooley
                                Sales Manager
                                Famous Fork Co.
                                1 Main Street
                                Hot Springs, ND
                                      77625
```

Fig. 7. Letter Calling the Data File

August 1, 1982

H. A. Sneed
1 Hilltop Rd.
Beverly Hills, CA
94002

Dear Hubert,

As Director of Poverty, Inc., National Charities Ass'n, we are certain you will be interested to know that our famous non-slip spaghetti forks are once again in stock and that orders are now being taken.

Best Regards,

Herman Wooley
Sales Manager
Famous Fork Co.
1 Main Street
Hot Springs, ND
77625

August 1, 1982

A. V. Nostrilhair
123 Penthouse Plaza
New York, NY
10017

Dear Arnold,

As President of Sewer Service, Int'l, we are certain you will be interested to know that our famous non-slip spaghetti forks are once again in stock and that orders are now being taken.

Best Regards,

Herman Wooley
Sales Manager
Famous Fork Co.
1 Main Street
Hot Springs, ND
77625

August 1, 1982

W. H. Bludgeon
Cell 458, State Prison
Folsom, Ca
94066

Dear Wilbert,

As author of the book, "Creative Accounting for Bankers", we are certain you will be interested to know that our famous non-slip spaghetti forks are once again in stock and that orders are now being taken.

Best Regards,

Herman Wooley
Sales Manager
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1 Main Street
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Fig. 8. Resulting Letter

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Listing continued

```
683B 20FA     06960          JR      NZ,CONTPT
683D 0C       06970          INC     C
683E D1       06980          POP     DE
683F E1       06990          POP     HL
6840 79       07000          LD      A,C
6841 90       07010          SUB     B
6842 4F       07020          LD      C,A
6843 3E20     07030          LD      A,20H
6845 CDDA67   07040          CALL    PP34
6848 216E6A   07050          LD      HL,PAGE
684B 0E06     07060          LD      C,06H
684D CDA568   07070          CALL    PP41
6850 213452   07080          LD      HL,5234H
6853 7E       07090          LD      A,(HL)
6854 B7       07100          OR      A
6855 2002     07110          JR      NZ,PP35
6857 3E30     07120          LD      A,30H
6859 CDFF68   07130 PP35     CALL    PP47
685C 23       07140          INC     HL
685D 7E       07150          LD      A,(HL)
685E B7       07160          OR      A
685F 20F8     07170          JR      NZ,PP35
6861 212F6A   07180          LD      HL,PP6
6864 3AB452   07190          LD      A,(52B4H)
6867 3D       07200          DEC     A
6868 4F       07210          LD      C,A
6869 0C       07220          INC     C
686A 3E0A     07230          LD      A,0AH
686C CDFF68   07240 PP36     CALL    PP47
686F 35       07250          DEC     (HL)
6870 0D       07260          DEC     C
6871 F26C68   07270          JP      P,PP36
6874 2A2D6A   07280          LD      HL,(PP5)
6877 D1       07290          POP     DE
6878 CDF568   07300          CALL    CHKREG
687B 3004     07310          JR      NC,PP37
687D EB       07320          EX      DE,HL
687E 222D6A   07330          LD      (PP5),HL
6881 AF       07340 PP37     XOR     A
6882 C9       07350          RET
6883 C5       07360 PP38     PUSH    BC
6884 C36D6D   07370          JP      MARG
              07390 ; ***************************************************
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              07440 ; ***************************************************
6887 00       07460 X1       DEFB    00H     ; DOUBLE-WIDE PRINTING ON
6888 0E       07470          DEFB    0EH
6889 00       07480 X2       DEFB    00H     ; DOUBLE-WIDE PRINTING OFF
688A 14       07490          DEFB    14H
688B 00       07500 X3       DEFB    00H     ; CONDENSED PRINTING ON
688C 0F       07510          DEFB    0FH
688D 00       07520 X4       DEFB    00H     ; CONDENSED PRINTING OFF
688E 12       07530          DEFB    12H
              07550 ; ***************************************************
688F 3A2A6A   07570 PP39     LD      A,(PP3)
6892 2F       07580          CPL
6893 322A6A   07590          LD      (PP3),A
6896 2A1F52   07600          LD      HL,(521FH)
6899 0C       07610          INC     C
689A 0D       07620 PP40     DEC     C
689B C8       07630          RET     Z
689C 7E       07640          LD      A,(HL)
689D 23       07650          INC     HL
689E CDFF68   07660          CALL    PP47
68A1 FE20     07670          CP      20H
68A3 20F5     07680          JR      Z,PP40
68A5 0D       07690 PP41     DEC     C
68A6 C8       07700          RET     Z
68A7 7E       07710          LD      A,(HL)
68A8 23       07720          INC     HL
68A9 CDFF68   07730          CALL    PP47
68AC FE20     07740          CP      20H
68AE 20F5     07750          JR      NZ,PP41
68B0 3AAE52   07760          LD      A,(52AEH)
68B3 B7       07770          OR      A
68B4 28EF     07780          JR      Z,PP41
68B6 3A2A6A   07790          LD      A,(PP3)
68B9 B7       07800          OR      A
68BA 2811     07810          JR      Z,PP43
68BC 7A       07820          LD      A,D
68BD B7       07830          OR      A
68BE 2014     07840          JR      NZ,PP44
68C0 B3       07850          OR      E
68C1 28E2     07860          JR      Z,PP41
68C3 3A296A   07870 PP42     LD      A,(PP2)
68C6 3C       07880          INC     A
68C7 CDDE68   07890          CALL    PP45
68CA 1D       07900          DEC     E
68CB 18D8     07910          JR      PP41
68CD 7B       07920 PP43     LD      A,E
68CE B7       07930          OR      A
68CF 20F2     07940          JR      NZ,PP42
68D1 B2       07950          OR      D
68D2 28D1     07960          JR      Z,PP41
68D4 3A296A   07970 PP44     LD      A,(PP2)
68D7 B7       07980          OR      A
68D8 C4DE68   07990          CALL    NZ,PP45
68DB 15       08000          DEC     D
68DC 18C7     08010          JR      PP41
68DE 47       08020 PP45     LD      B,A
68DF 3E20     08030          LD      A,20H
68E1 CDFF68   08040 PP46     CALL    PP47
68E4 05       08050          DEC     B
```

Listing continues

Listing continued

```
68E5 20FA    00860          JR      NZ,PP46
68E7 C9      00870          RET
68E8 C3736A  00880 PP8      JP      BA1
68EB 49      00890 FIELD    DEFM    'INPUT '
     4E 50 55 54 20
68F1 50      00100 PCL      DEFB    50H
68F2 43      00110          DEFB    43H
68F3 4C      00120          DEFB    4CH
68F4 00      00130 COUNT    DEFB    00H
68F5 7D      00140 CHKREG   LD      A,L
68F6 93      00150          SUB     E
68F7 7C      00160          LD      A,H
68F8 9A      00170          SBC     A,D
68F9 D8      00180          RET     C
68FA C0      00190          RET     NZ
68FB 7D      00200          LD      A,L
68FC 93      00210          SUB     E
68FD B7      00220          OR      A
68FE C9      00230          RET
68FF FE0A    00240 PP47     CP      0AH
6901 F5      00250          PUSH    AF
6902 CCBB67  00260          CALL    Z,PP32
6905 3AB152  00270          LD      A,(52B1H)
6908 B7      00280          OR      A
6909 2003    00290          JR      NZ,PRTB
690B F1      00300          POP     AF
690C C8      00310          RET     Z
690D F5      00320 PRTA     PUSH    AF
690E F1      00330 PRTB     POP     AF
690F F5      00340          PUSH    AF
6910 CD1569  00350          CALL    PRTC
6913 F1      00360          POP     AF
6914 C9      00370          RET
6915 F5      00380 PRTC     PUSH    AF
6916 3A3C52  00390          LD      A,(523CH)
6919 B7      00400          OR      A
691A 2022    00410          JR      NZ,PRTG
691C F1      00420          POP     AF
691D FE20    00430          CP      20H
691F 2009    00440          JR      NZ,PRTD
6921 3A336A  00450          LD      A,(PP80)
6924 B7      00460          OR      A
6925 3E20    00470          LD      A,20H
6927 2811    00480          JR      Z,PRTF
6929 C9      00490          RET
692A FEB0    00500 PRTD     CP      0B0H
692C 2004    00510          JR      NZ,PRTE
692E 3E20    00520          LD      A,20H
6930 1808    00530          JR      PRTF
6932 FEB3    00540 PRTE     CP      0B3H
6934 2004    00550          JR      NZ,PRTF
6936 32336A  00560          LD      (PP80),A
6939 C9      00570          RET
693A CD476E  00580 PRTF     CALL    ASCII
693D F5      00590 NEXT     PUSH    AF
693E 3ABF52  00600 PRTG     LD      A,(52BFH)
6941 FE54    00610          CP      54H
6943 CA9169  00620          JP      Z,PRTL
6946 FE55    00630          CP      55H
6948 CA7969  00640          JP      Z,PRTK
694B 3A2740  00650          LD      A,(4027H)
694E FE30    00660          CP      30H
6950 300E    00670          JR      NC,PRTI
6952 3A4038  00680 PRTH     LD      A,(3840H)
6955 FE02    00690          CP      02H
6957 281E    00700          JR      Z,PRTJ
6959 3AE837  00710          LD      A,(37E8H)
695C FEFF    00720          CP      0FFH
695E 28F2    00730          JR      Z,PRTH
6960 F1      00740 PRTI     POP     AF
6961 F5      00750          PUSH    AF
6962 D5      00760          PUSH    DE
6963 E5      00770          PUSH    HL
6964 DD2A2840 00780         LD      IX,(4028H)
6968 210000  00790          LD      HL,0000H
696B 222840  00800          LD      (4028H),HL
696E CD3B00  00810          CALL    003BH
6971 DD222840 00820         LD      (4028H),IX
6975 E1      00830          POP     HL
6976 D1      00840          POP     DE
6977 F1      00850 PRTJ     POP     AF
6978 C9      00860          RET
6979 3A4038  00870 PRTK     LD      A,(3840H)
697C FE02    00880          CP      02H
697E CA7769  00890          JP      Z,PRTJ
6981 DBEA    00900          IN      A,(0EAH)
6983 CB77    00910          BIT     6,A
6985 28F2    00920          JR      Z,PRTK
6987 00      00930          NOP
6988 00      00940          NOP
6989 00      00950          NOP
698A 00      00960          NOP
698B 00      00970          NOP
698C 00      00980          NOP
698D F1      00990          POP     AF
698E D3EB    01000          OUT     (0EBH),A
6990 C9      01010          RET
6991 F1      01020 PRTL     POP     AF
6992 F3      01030          DI
6993 C5      01040          PUSH    BC
6994 E5      01050          PUSH    HL
6995 F5      01060          PUSH    AF
6996 37      01070          SCF
6997 F5      01080          PUSH    AF
6998 CDB769  01090          CALL    PRTN
699B 0E09    01100          LD      C,09H
```

Listing continues

See List of Advertisers on Page 371

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<FX=DATE
<FM006


<FX=NAME
<FX=COMPANY
<FX=ADDRESS
<FX=CITY, STATE
<FX=ZIP


<FX=Dear Mr. ?


<FX=PARAGRAPH 1
<FX=PARAGRAPH 2
<FX=PARAGRAPH 3
<FX=PARAGRAPH 4


                        Sincerely Yours,


                                    Rupert Jittney
                                      Sales Manager


RJ:mb
```

Fig. 9. Format Template

Continued from p. 174

lengths, headers and page numbers.

If more than one copy of a document has been specified during printing, one copy of the letter will be printed for each record in the merge file and then the process will be repeated until the specified number of copies of each document has been printed.

When using a header with a merged data file, the header appears on the second line of text rather than the first. Since the merge routine is intended to produce multiple copies of a letter, it cannot be mixed with chain printing. It is, however, compatible with printing boilerplate paragraphs or text entered from the keyboard.

Merge files can be created with Electric Pencil. The first record of the file must contain the field names enclosed by the <D and <E symbols. The end of the record is indicated by the data symbols with no characters in between. For instance:

```
<dNAME<e
<dSTREET<e
<Dcity<E
<dState<E
<dZIP<e
<dCOMMENT<e
<d<e
```

The document into which the data is to be merged might resemble:

```
Dear <dNAME<e,
As one of <dSTATE<e's leading
<Dcomment<e...
```

Records that follow contain the actual data, and are constructed in the same manner. The data fields must follow the same order as the first record, and must contain the same number of fields. If any field is to be left blank, it should contain a conditional hyphen, <H, so that printing will not be disrupted. For example:

```
<dFred Jones<e
<D<h<e
<dHoggback<e
<dMontana<e
<d87765<e
<Ddog food manufacturer<e
<D<E
```

Notes for Advanced Users

Pencil-Plus can print your document complete with codes and comment lines, as has been done in the previous section of the documentation. From the Pencil-Plus menu, specify a different character for control that is not used in the text prior to commanding a printout. Pencil-Plus converts the user-coded symbols into different symbols for operation, and then translates them back once again on completion of printing. This is done to be compatible with the automatic hyphenation option offered with Electric Webster and to permit operation by advanced users.

For advanced applications, type PC followed by a space and then enter from the Pencil-Plus menu. Two things happen: the conversion of symbols will no longer take place, and the Electric Pencil Command module will be overlayed with instructions offering single-key coding.

The clear/down arrow will put a 7BH or { in the text file and will be recognized in place of <D to mark the beginning of a data field from a merge file. The combination clear/break will put a 7DH or } in the text file to be recognized in place of <E to mark the end of a data field in a merge file. The clear/up arrow will be used as a conditional hyphen, and will appear as a | or 7CH. The unshifted @ sign will replace the <G for graphics codes and will appear as a ‘ or 60H character. The <P will be replaced by an up arrow on the screen representing the 1BH character, and can be input with clear/J. With the older TRS-80 character generator, these symbols will appear somewhat different, but will function properly.

You may have decided to use the advanced capabilities of Pencil-Plus and wish to convert your old files into the advanced format. The conversion is done as follows.

Load the file to be converted and place the cursor at the beginning of the file. Select the conversion character used for the file, such as <, and turn your printer off. Command a print and hold the break key. The text will be displayed in the advanced format and can be saved to disk.

There are many tricky combinations that you can use with Pencil-Plus. Figure 9 is a demonstration of a template or outline to save the repeated effort of formatting a document. It can contain a company logo or letterhead, show the typist where to insert the date and salutation, and permit entry of a number of paragraphs. When enough has been typed, press enter to the remaining prompts and the proper closing will be typed. The same result can be achieved by placing items such as the company logo and closing in boilerplate paragraphs.

Another trick you can use is a dummy merge data file with a single dummy

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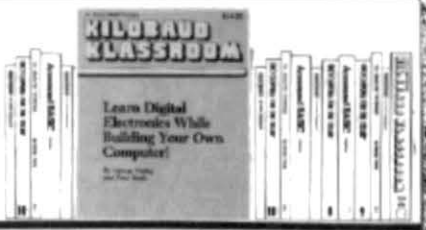
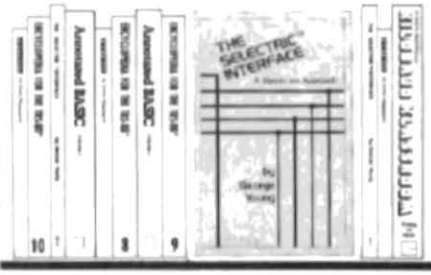


THE SELECTRIC INTERFACE by George Young



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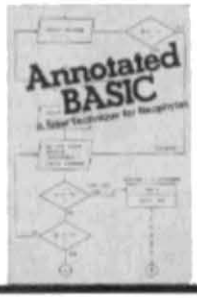

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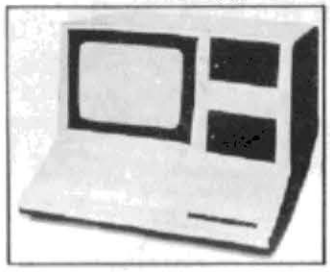

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69A3 DCBB69    09150         CALL    C,PRTO
69A6 0D        09160         DEC     C
69A7 20F4      09170         JR      NZ,PRTM
69A9 21BE52    09180         LD      HL,52BEH
69AC CB4E      09190         BIT     1,(HL)
69AE CCBB69    09200         CALL    Z,PRTO
69B1 F1        09210         POP     AF
69B2 F1        09220         POP     AF
69B3 E1        09230         POP     HL
69B4 C1        09240         POP     BC
69B5 FB        09250         EI
69B6 C9        09260         RET
69B7 3E11      09270 PRTN    LD      A,11H
69B9 1802      09280         JR      PRTP
69BB 3E10      09290 PRTO    LD      A,10H
69BD D3FF      09300 PRTP    OUT     (0FFH),A
69BF 210000    09310         LD      HL,0000H
69C0           09320 PRTQ    EQU     $-02H
69C2 2B        09330 PRTR    DEC     HL
69C3 7C        09340         LD      A,H
69C4 B5        09350         OR      L
69C5 20FB      09360         JR      NZ,PRTR
69C7 C9        09370         RET
69C8 CDC901    09380 LLERR   CALL    01C9H
69CB 0640      09390         LD      B,40H
69CD 11003E    09400         LD      DE,3E00H
69D0 2A1F52    09410         LD      HL,(521FH)
69D3 7E        09420 LERDSP  LD      A,(HL)
69D4 FE21      09430         CP      21H
69D6 3805      09440         JR      C,LLERMS
69D8 12        09450         LD      (DE),A
69D9 23        09460         INC     HL
69DA 13        09470         INC     DE
69DB 10F6      09480         DJNZ    LERDSP
69DD 013A00    09490 LLERMS  LD      BC,003AH
69E0 11823D    09500         LD      DE,3D82H
69E3 21346A    09510         LD      HL,LLEMSG
69E6 EDB0      09520         LDIR
69E8 3A7F38    09530 CHKKEY  LD      A,(387FH)
69EB B7        09540         OR      A
69EC 28FA      09550         JR      Z,CHKKEY
69EE 210000    09560         LD      HL,0000H
69F1 221D52    09570         LD      (521DH),HL
69F4 2A1F52    09580         LD      HL,(521FH)
69F7 CDFF52    09590         CALL    52FFH
69FA C9        09600         RET
69FB 22        09610 BDTBL   DEFB    22H
69FC 33        09620         DEFB    33H
69FD 44        09630         DEFB    44H
69FE 55        09640         DEFB    55H
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6A0C 006F      09740         DEFW    6F00H
6A0E 0036      09750         DEFW    3600H
6A10 0019      09760         DEFW    1900H
6A12 00A0      09770         DEFW    0A000H
6A14 0003      09780         DEFW    0300H
6A16 02C2      09790 BAUD3   DEFW    0C202H
6A18 0241      09800         DEFW    4102H
6A1A 0206      09810         DEFW    0602H
6A1C 0102      09820         DEFW    0201H
6A1E 0080      09830         DEFW    8000H
6A20 003F      09840         DEFW    3F00H
6A22 001D      09850         DEFW    1D00H
6A24 00C0      09860         DEFW    0C000H
6A26 0004      09870         DEFW    0400H
6A28 00        09880 PP1     DEFB    00H
6A29 00        09890 PP2     DEFB    00H
6A2A 00        09900 PP3     DEFB    00H
6A2B 0000      09910 PP4     DEFW    0000H
6A2D 0000      09920 PP5     DEFW    0000H
6A2F 00        09930 PP6     DEFB    00H
6A30 0000      09940 PP70    DEFW    0000H
6A32 00        09950 PP7     DEFB    00H
6A33 00        09960 PP80    DEFB    00H
6A34 50        09970 LLEMSG  DEFM    'PRINT REQUEST TERMINATED - '
     52 49 4E 54 20 52 45 51
     55 45 53 54 20 54 45 52
     4D 49 4E 41 54 45 44 20
     2D 20
6A4F 4C        09980         DEFM    'LINE BELOW EXCEEDS PRINT LENGTH'
     49 4E 45 20 42 45 4C 4F
     57 20 45 58 43 45 45 44
     53 20 50 52 49 4E 54 20
     4C 45 4E 47 54 48
6A6E 50        09990 PAGE    DEFM    'PAGE '
     41 47 45 20
               10010 ; ***************************************************
               10020 ; *     THE PCLPLUS MARKING CHARACTER MAY BE SET FROM   *
               10030 ; *        THE PCLPLUS MENU BY TYPING 'PC' AND THE      *
               10040 ; *                 DESIRED CHARACTER                   *
               10050 ; *     IF A SPACE IS ENTERED AS THE PCLPLUS CHARACTER, *
               10060 ; *      THE KEYBOARD WILL BE MODIFIED TO PERFORM THE   *
               10070 ; *              FOLLOWING FUNCTIONS:                   *
               10080 ; ***************************************************
```

Listing continues

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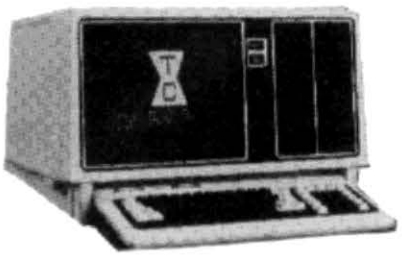
Listing continued

```
                        10090 ; * <CLEAR> J = ESCAPE CHARACTER (1BH)                *
                        10100 ; *       OR      <P                                 *
                        10110 ; * LOWER-CASE '@'+ 3 DIGITS =                       *
                        10120 ; *     GRAPHIC AND NON-KEYBOARD CODES               *
                        10130 ; *     OR <G                                        *
                        10140 ; * <CLEAR>-<DOWN ARROW> = 7BH = LEFT BRACE =        *
                        10150 ; *     MARK START OF FILE MERGE FIELD NAME          *
                        10160 ; *     OR <D                                        *
                        10170 ; * <CLEAR>-<UP ARROW> = 7CH = CONDITIONAL HYPHEN    *
                        10180 ; *     OR <H                                        *
                        10190 ; * <CLEAR><BREAK> = 7DH = RIGHT BRACE =            *
                        10200 ; *     MARK END OF  FIELD NAME IN MERGE             *
                        10210 ; *     OR <E                                        *
                        10220 ; * ALSO USED AS FORMAT SPECIFIER                    *
                        10230 ; *     OR <F                                        *
                        10240 ; *                                                  *
                        10250 ; *   FORMAT SPECIFIER:  L = LINE LENGTH            *
                        10260 ; *                      S = LINE SPACING            *
                        10270 ; *                      M = MARGIN                  *
                        10280 ; *                      J = JUSTIFY                 *
                        10290 ; *                      C = CHAIN PRINT             *
                        10300 ; *                      * = BOILERPLATE PARAGRAPH   *
                        10310 ; *                      X = PROMPTED LINE INPUT     *
                        10320 ; *           ANYTHING ELSE = NON-PRINTING COMMENT    *
                        10330 ; ************************************************
6A73 AF                 10350 BA1     XOR     A
6A74 32286A             10360         LD      (PP1),A
6A77 4F                 10370         LD      C,A
6A78 47                 10380         LD      B,A
6A79 7E                 10390         LD      A,(HL)
6A7A FE7D               10400         CP      7DH
6A7C 2863               10410         JR      Z,FMT1
6A7E 7E                 10420 BA2     LD      A,(HL)
6A7F 23                 10430         INC     HL
6A80 FE7B               10440         CP      7BH
6A82 CC9E6C             10450         CALL    Z,MERG3
6A85 FE7D               10460         CP      7DH
6A87 CCF86C             10470         CALL    Z,MERG8
6A8A FE0E               10480         CP      0EH
6A8C 381A               10490         JR      C,BA5B
6A8E FE1B               10500         CP      1BH
6A90 281F               10510         JR      Z,BA3
6A92 FE60               10520         CP      60H
6A94 2831               10530         JR      Z,BA3A
6A96 FE7C               10540         CP      7CH
6A98 2838               10550         JR      Z,BA4
6A9A FE5F               10560         CP      5FH
6A9C 20D3               10570         JR      NZ,BA5
6A9E 32286A             10580         LD      (PP1),A
6AA1 0C                 10590 BA5     INC     C
6AA2 3AB252             10600 BA5A    LD      A,(52B2H)
6AA5 B9                 10610         CP      C
6AA6 20D6               10620         JR      NZ,BA2
6AA8 F5                 10630 BA5B    PUSH    AF
6AA9 78                 10640         LD      A,B
6AAA 32F468             10650         LD      (COUNT),A
6AAD 81                 10660         ADD     A,C
6AAE 4F                 10670         LD      C,A
6AAF F1                 10680         POP     AF
6AB0 C9                 10690         RET
6AB1 04                 10700 BA3     INC     B
6AB2 04                 10710         INC     B
6AB3 7E                 10720         LD      A,(HL)
6AB4 23                 10730         INC     HL
6AB5 FE25               10740         CP      25H
6AB7 281C               10750         JR      Z,BA6
6AB9 FE24               10760         CP      24H
6ABB 2818               10770         JR      Z,BA6
6ABD FE28               10780         CP      28H
6ABF 2819               10790         JR      Z,BA7
6AC1 FE29               10800         CP      29H
6AC3 2815               10810         JR      Z,BA7
6AC5 18B7               10820         JR      BA2
6AC7 CD276E             10830 BA3A    CALL    NUMB
6ACA 23                 10840         INC     HL
6ACB 04                 10850         INC     B
6ACC 04                 10860         INC     B
6ACD 04                 10870         INC     B
6ACE FE7F               10880         CP      127
6AD0 38CF               10890         JR      C,BA5
6AD2 04                 10900 BA4     INC     B
6AD3 18CD               10910         JR      BA5A
6AD5 32DF6A             10920 BA6     LD      (CODE1),A
6AD8 18A4               10930         JR      BA2
6ADA 32E06A             10940 BA7     LD      (CODE2),A
6ADD 189F               10950         JR      BA2
6ADF 24                 10960 CODE1   DEFB    24H
6AE0 29                 10970 CODE2   DEFB    29H
6AE1 23                 10990 FMT1    INC     HL
6AE2 7E                 11000         LD      A,(HL)
6AE3 23                 11010 FMT2    INC     HL
6AE4 FE2A               11020         CP      2AH
6AE6 CAAC6B             11030         JP      Z,BOIL
6AE9 E65F               11040         AND     5FH
6AEB FE4A               11050         CP      4AH
6AED 2850               11060         JR      Z,FMTJ
6AEF FE53               11070         CP      53H
6AF1 2854               11080         JR      Z,FMTS
6AF3 FE4C               11090         CP      4CH
6AF5 2858               11100         JR      Z,FMTL
6AF7 FE4D               11110         CP      4DH
6AF9 285C               11120         JR      Z,FMTM
6AFB FE43               11130         CP      43H
6AFD 2860               11140         JR      Z,FMTC
6AFF FE58               11150         CP      58H
6B01 2029               11160         JR      NZ,FMTEND
6B03 CDC901             11180 LININP  CALL    01C9H
6B06 23                 11190         INC     HL
6B07 CD6744             11200         CALL    DOS2
6B0A 3E07               11210         LD      A,07H
6B0C CD3D69             11220         CALL    NEXT
6B0F E5                 11230         PUSH    HL
6B10 D5                 11240         PUSH    DE
6B11 C5                 11250         PUSH    BC
6B12 21403C             11260         LD      HL,3C40H
6B15 368F               11270         LD      (HL),8FH
6B17 A8                 11280         XOR     B
6B18 3EFF               11290         LD      A,0FFH
6B1A ED5B2852           11300         LD      DE,(5228H)
6B1E 13                 11310         INC     DE
6B1F CDD95B             11320         CALL    5BD9H
6B22 2A2852             11330         LD      HL,(5228H)
6B25 23                 11340         INC     HL
6B26 CDD566             11350         CALL    PP10B
6B29 C1                 11360         POP     BC
6B2A D1                 11370         POP     DE
6B2B E1                 11380         POP     HL
6B2C 23                 11390 FMTEND  INC     HL
6B2D 7E                 11400         LD      A,(HL)
6B2E FE0D               11410         CP      0DH
6B30 2806               11420         JR      Z,FMT3
6B32 FE7D               11430         CP      7DH
6B34 28AB               11450         JR      Z,FMT1
6B36 18F4               11460         JR      FMTEND
6B38 23                 11470 FMT3    INC     HL
6B39 221F52             11480         LD      (521FH),HL
6B3C C3736A             11490         JP      BA1
6B3F 7E                 11500 FMTJ    LD      A,(HL)
6B40 D630               11510         SUB     30H
6B42 32AE52             11520         LD      (52AEH),A
6B45 18E5               11530         JR      FMTEND
6B47 7E                 11540 FMTS    LD      A,(HL)
6B48 D630               11550         SUB     30H
6B4A 32B452             11560         LD      (52B4H),A
6B4D 18DD               11570         JR      FMTEND
6B4F CD276E             11580 FMTL    CALL    NUMB
6B52 32B252             11590         LD      (52B2H),A
6B55 18D5               11600         JR      FMTEND
6B57 CD276E             11610 FMTM    CALL    NUMB
6B5A 32B052             11620         LD      (52B0H),A
6B5D 18CD               11630         JR      FMTEND
6B5F 113E52             11640 FMTC    LD      DE,523EH
6B62 23                 11650 CHN1    INC     HL
6B63 CDE76F             11660         CALL    MOVE
6B66 2A2B6A             11670         LD      HL,(PP4)
6B69 110070             11680         LD      DE,7000H
6B6C ED532B6A           11690         LD      (PP4),DE
6B70 7E                 11700         LD      A,(HL)
6B71 FE24               11710         CP      24H
6B73 2008               11720         JR      NZ,CHN2A
6B75 7E                 11730 CHN2    LD      A,(HL)
6B76 12                 11740         LD      (DE),A
6B77 23                 11750         INC     HL
6B78 13                 11760         INC     DE
6B79 FE0D               11770         CP      0DH
6B7B 20F8               11780         JR      NZ,CHN2
6B7D ED532D6A           11790 CHN2A   LD      (PP5),DE
6B81 D5                 11800         PUSH    DE
6B82 113E52             11810         LD      DE,523EH
6B85 CDCF6D             11820         CALL    OPEN
6B88 E1                 11830         POP     HL
6B89 CD1300             11840 CHN4    CALL    DOS6
6B8C 2009               11850         JR      NZ,CHN5
6B8E FE3C               11860 CH1     CP      3CH
6B90 CC4F6F             11870         CALL    Z,COR8
6B93 77                 11880         LD      (HL),A
6B94 23                 11890         INC     HL
6B95 18F2               11900         JR      CHN4
6B97 222852             11910 CHN5    LD      (5228H),HL
6B9A AF                 11920         XOR     A
6B9B 77                 11930         LD      (HL),A
6B9C CD546F             11940         CALL    CLOSE
6B9F CDC901             11950         CALL    01C9H
6BA2 210000             11960         LD      HL,0000H
6BA5 221D52             11970         LD      (521DH),HL
6BA8 E1                 11980         POP     HL
6BA9 C3CC66             11990         JP      PP10A
6BAC D5                 12000 BOIL    PUSH    DE
6BAD 113E52             12010         LD      DE,523EH
6BB0 D5                 12020         PUSH    DE
6BB1 7E                 12030 BOIL1   LD      A,(HL)
6BB2 FE60               12040         CP      60H
6BB4 3802               12050         JR      C,BOIL2
6BB6 E65F               12060         AND     5FH
6BB8 12                 12070 BOIL2   LD      (DE),A
6BB9 23                 12080         INC     HL
6BBA 13                 12090         INC     DE
6BBB FE3D               12100         CP      3DH
6BBD 20F2               12110         JR      NZ,BOIL1
6BBF 1B                 12120         DEC     DE
6BC0 3E0D               12130         LD      A,0DH
6BC2 12                 12140         LD      (DE),A
6BC3 11166C             12150         LD      DE,PARK
6BC6 0603               12160         LD      B,3
6BC8 7E                 12170 BOIL3   LD      A,(HL)
6BC9 12                 12180         LD      (DE),A
6BCA 23                 12190         INC     HL
6BCB 13                 12200         INC     DE
6BCC 10FA               12210         DJNZ    BOIL3
6BCE D1                 12220         POP     DE
6BCF E5                 12230         PUSH    HL
6BD0 CDF76F             12240         CALL    MOVE2
6BD3 CDCF6D             12250         CALL    OPEN
6BD6 01166C             12260 BOIL4   LD      BC,PARK
```

Listing continues

PERSONAL COMPUTERS

WE HAVE THE NEWEST TRS-80·
MODEL 12



80K

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TRS-80·
MODEL III
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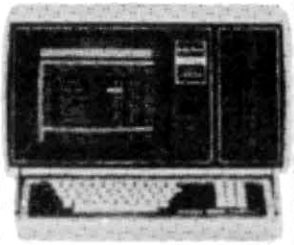

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48K.....	**$799**
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MODEL 16 — 1 DRIVE
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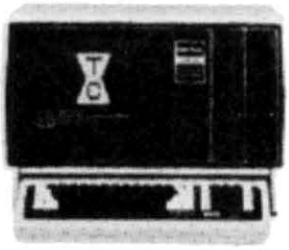
MODEL 16 — 2 DRIVE
.....**$4799**
DT-1 VIDEO.....**$620**



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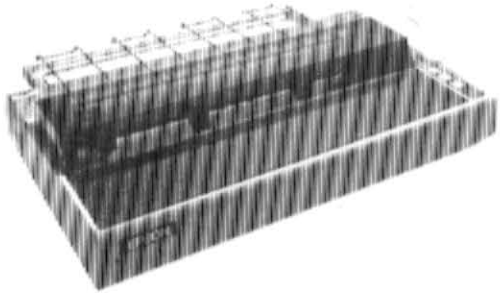
```
6BD9 CD1A6C   12270          CALL    BOIL7
6BDC 0A       12280 BOIL5    LD      A,(BC)
6BDD FE2A     12290          CP      2AH
6BDF 2807     12300          JR      Z,BOIL6
6BE1 BE       12310          CP      (HL)
6BE2 03       12320          INC     BC
6BE3 23       12330          INC     HL
6BE4 28F6     12340          JR      Z,BOIL5
6BE6 18EE     12350          JR      BOIL4
6BE8 2A2852   12360 BOIL6    LD      HL,(5228H)
6BEB 23       12370          INC     HL
6BEC E5       12380          PUSH    HL
6BED C1       12390          POP     BC
6BEE E5       12400          PUSH    HL
6BEF 2A3052   12410          LD      HL,(5230H)
6BF2 ED42     12420          SBC     HL,BC
6BF4 E5       12430          PUSH    HL
6BF5 C1       12440          POP     BC
6BF6 E1       12450          POP     HL
6BF7 3E00     12460 ZERO     LD      A,00H
6BF9 77       12470          LD      (HL),A
6BFA 23       12480          INC     HL
6BFB 0B       12490          DEC     BC
6BFC 78       12500          LD      A,B
6BFD B1       12510          OR      C
6BFE 20F7     12520          JR      NZ,ZERO
6C00 CD1A6C   12530          CALL    BOIL7
6C03 CD546F   12540          CALL    CLOSE
6C06 AF       12550          XOR     A
6C07 57       12560          LD      D,A
6C08 5F       12570          LD      E,A
6C09 221F52   12580          LD      (521FH),HL
6C0C CD736A   12590 BOIL6A   CALL    BA1
6C0F 3827     12600          JR      C,BOIL6B
6C11 CDDE66   12610          CALL    PP10C
6C14 18F6     12620          JR      BOIL6A
6C16 00       12630 PARK     DEFB    00H
6C17 0000     12640          DEFW    0000H
6C19 2A       12650          DEFB    2AH
6C1A 2A2852   12660 BOIL7    LD      HL,(5228H)
6C1D 23       12670          INC     HL
6C1E E5       12680          PUSH    HL
6C1F CD1300   12690 BOIL8    CALL    DOS6
6C22 200F     12700          JR      NZ,BOIL6C
6C24 FE3C     12710 CH2      CP      3CH
6C26 CC4F6F   12720          CALL    Z,COR8
6C29 FE0D     12730          CP      0DH
6C2B 2804     12740          JR      Z,BOIL9
6C2D 77       12750          LD      (HL),A
6C2E 23       12760          INC     HL
6C2F 18EE     12770          JR      BOIL8
6C31 E1       12780 BOIL9    POP     HL
6C32 C9       12790          RET
6C33 E1       12800 BOIL6C   POP     HL
6C34 E1       12810          POP     HL
6C35 CD546F   12820          CALL    CLOSE
6C38 E1       12830 BOIL6B   POP     HL
6C39 23       12840          INC     HL
6C3A D1       12850          POP     DE
6C3B F1       12860          POP     AF
6C3C AF       12870          XOR     A
6C3D 32296A   12880          LD      (PP2),A
6C40 C3D566   12890          JP      PP10B
6C43 210162   12900 MERG1B    LD      HL,WORK1
6C46 CD766C   12910          CALL    READ
6C49 210162   12920          LD      HL,WORK1
6C4C 06FF     12930          LD      B,0FFH
6C4E 7E       12940 SET      LD      A,(HL)
6C4F FE7B     12950          CP      7BH
6C51 3007     12960          JR      NC,SET1
6C53 FE60     12970          CP      60H
6C55 3803     12980          JR      C,SET1
6C57 E65F     12990          AND     5FH
6C59 77       13000          LD      (HL),A
6C5A 23       13010 SET1     INC     HL
6C5B 10F1     13020          DJNZ    SET
6C5D 210164   13030 MERG2    LD      HL,WORK3
6C60 CD766C   13040          CALL    READ
6C63 E1       13050          POP     HL
6C64 E5       13060          PUSH    HL
6C65 CDB366   13070          CALL    CONT
6C68 18F3     13080          JR      MERG2
6C6A CD546F   13090 MERG2A   CALL    CLOSE
6C6D D1       13100          POP     DE
6C6E D1       13110          POP     DE
6C6F 6F       13120          LD      L,A
6C70 67       13130          LD      H,A
6C71 221D52   13140          LD      (521DH),HL
6C74 E1       13150          POP     HL
6C75 C9       13160          RET
6C76 D5       13170 READ     PUSH    DE
6C77 110165   13180          LD      DE,WORK5
6C7A CD1300   13190 READ1    CALL    DOS6
6C7D 20EB     13200          JR      NZ,MERG2A
6C7F FE3C     13210 CH3      CP      3CH
6C81 CC4F6F   13220          CALL    Z,COR8
6C84 77       13230          LD      (HL),A
6C85 23       13240          INC     HL
6C86 FE7D     13250          CP      7DH
6C88 20F0     13260          JR      NZ,READ1
6C8A 2B       13270          DEC     HL
6C8B 2B       13280          DEC     HL
6C8C 7E       13290          LD      A,(HL)
6C8D 23       13300          INC     HL
6C8E 23       13310          INC     HL
6C8F FE7B     13320          CP      7BH
6C91 20E7     13330          JR      NZ,READ1
6C93 AF       13340          XOR     A
6C94 CD576F   13350          CALL    CLOSE1
6C97 77       13360          LD      (HL),A
6C98 D1       13370          POP     DE
6C99 C9       13380          RET
6C9A 0000     13390 STOR1    DEFW    0000H
6C9C 0000     13400 STOR2    DEFW    0000H
6C9E 3A0062   13410 MERG3    LD      A,(6200H)
6CA1 FE07     13420          CP      07H
6CA3 C8       13430          RET     Z
6CA4 D5       13440          PUSH    DE
6CA5 C5       13450          PUSH    BC
6CA6 0600     13460          LD      B,0
6CA8 110062   13470          LD      DE,WORK1-1
6CAB E5       13480 MERG4    PUSH    HL
6CAC 7E       13490 MERG4A   LD      A,(HL)
6CAD FE7D     13500          CP      7DH
6CAF 280A     13510          JR      Z,MERG4B
6CB1 FE60     13520          CP      60H
6CB3 3803     13530          JR      C,MER4AA
6CB5 E65F     13540          AND     5FH
6CB7 77       13550          LD      (HL),A
6CB8 23       13560 MER4AA   INC     HL
6CB9 18F1     13570          JR      MERG4A
6CBB E1       13580 MERG4B   POP     HL
6CBC E5       13590 MERG4C   PUSH    HL
6CBD 2B       13600          DEC     HL
6CBE 2B       13610          DEC     HL
6CBF 13       13620 MERG5    INC     DE
6CC0 23       13630          INC     HL
6CC1 1A       13640          LD      A,(DE)
6CC2 FE7D     13650          CP      7DH
6CC4 2819     13660          JR      Z,MERG7
6CC6 BE       13670          CP      (HL)
6CC7 28F6     13680          JR      Z,MERG5
6CC9 CDD86C   13690          CALL    MERG6
6CCC 04       13700          INC     B
6CCD 1A       13710          LD      A,(DE)
6CCE FE7D     13720          CP      7DH
6CD0 CABC6E   13730          JP      Z,KEYBD
6CD3 1B       13740          DEC     DE
6CD4 1B       13750          DEC     DE
6CD5 E1       13760          POP     HL
6CD6 18E4     13770          JR      MERG4C
6CD8 1A       13780 MERG6    LD      A,(DE)
6CD9 13       13790          INC     DE
6CDA FE7B     13800          CP      7BH
6CDC 20FA     13810          JR      NZ,MERG6
6CDE C9       13820          RET
6CDF 04       13830 MERG7    INC     B
6CE0 110164   13840          LD      DE,WORK3
6CE3 CDD86C   13850 MERG7A   CALL    MERG6
6CE6 10FB     13860          DJNZ    MERG7A
6CE8 C1       13870          POP     BC
6CE9 0B       13880          DEC     BC
6CEA ED439C6C 13890          LD      (STOR2),BC
6CEE 23       13900          INC     HL
6CEF 229A6C   13910          LD      (STOR1),HL
6CF2 EB       13920          EX      DE,HL
6CF3 7E       13930          LD      A,(HL)
6CF4 23       13940          INC     HL
6CF5 C1       13950          POP     BC
6CF6 D1       13960          POP     DE
6CF7 C9       13970          RET
6CF8 3A0062   13980 MERG8    LD      A,(6200H)
6CFB FE07     13990          CP      07H
6CFD C8       14000          RET     Z
6CFE 2A9A6C   14010          LD      HL,(STOR1)
6D01 7E       14020          LD      A,(HL)
6D02 23       14030          INC     HL
6D03 C9       14040          RET
6D04 2B       14050 HYP0     DEC     HL
6D05 0D       14060          DEC     C
6D06 CAF559   14070          JP      Z,59F5H
6D09 7E       14080 HYP      LD      A,(HL)
6D0A FE20     14090          CP      20H
6D0C 2825     14100          JR      Z,HYP2
6D0E FE7B     14110          CP      7BH
6D10 283B     14120          JR      Z,HYP4A
6D12 FE7D     14130          CP      7DH
6D14 2837     14140          JR      Z,HYP4A
6D16 FE1B     14150          CP      1BH
6D18 2838     14160          JR      Z,HYP4B
6D1A FE60     14170          CP      60H
6D1C 2839     14180          JR      Z,HYP4C
6D1E FE7C     14190 HYP1     CP      7CH
6D20 20E2     14200          JR      NZ,HYP0
6D22 CD626D   14210          CALL    KK0
6D25 3D       14220          DEC     A
6D26 3D       14230          DEC     A
6D27 99       14240          SBC     A,C
6D28 38DA     14250          JR      C,HYP0
6D2A 0C       14260          INC     C
6D2B 36FC     14270          LD      (HL),0FCH
6D2D E5       14280          PUSH    HL
6D2E 21F468   14290          LD      HL,COUNT
6D31 35       14300          DEC     (HL)
6D32 E1       14310          POP     HL
6D33 AF       14320 HYP2     XOR     A
6D34 323B52   14330          LD      (523BH),A
6D37 2B       14340 HYP3     DEC     HL
6D38 0D       14350          DEC     C
6D39 CAF559   14360          JP      Z,59F5H
6D3C 7E       14370          LD      A,(HL)
6D3D FE20     14380          CP      20H
6D3F 28F6     14390          JR      Z,HYP3
```

Listing continues

PRINTERS *For All Your Printing Needs*

EPSON PRINTERS



MX-80	$419
MX-80 F/T	$499
MX-100	$630
FX 80	$599

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~~$389~~ 10" / ~~$499~~ 15" *Call for Prices!*

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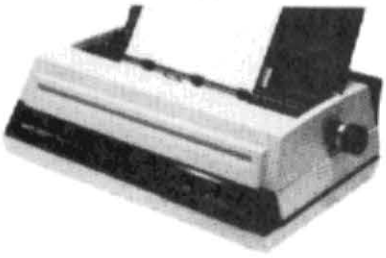
The Smith-Corona TP-1 text printer is a microprocessor controlled daisy wheel printer which delivers fully formed executive quality printout at a speed of 144 words per minute. The printer is a simple, low cost, and reliable unit which can be utilized with word processing systems, microcomputers, personal computers, small business systems, or in any environment which requires high quality printing. Its compact size and attractive packaging will allow it to blend into any environment.

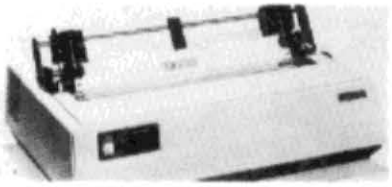
COMPATIBLE WITH ALMOST ALL COMPUTER SYSTEMS



*Smith-Corona is a registered TRADEMARK of SCM Corporation

$559

OKIDATA PRINTERS



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Listing continued

```
6D41 23       14400          INC     HL
6D42 0C       14410          INC     C
6D43 C9       14420          RET
6D44 7E       14430 HYP4AA   LD      A,(HL)
6D45 FE1B     14440          CP      1BH
6D47 2804     14450          JR      Z,HYP4A
6D49 FE60     14460          CP      60H
6D4B 20BC     14470          JR      NZ,HYP
6D4D 3AF468   14480 HYP4A    LD      A,(COUNT)
6D50 180A     14490          JR      HYP5B
6D52 3AF468   14500 HYP4B    LD      A,(COUNT)
6D55 1804     14510          JR      HYP5A
6D57 3AF468   14520 HYP4C    LD      A,(COUNT)
6D5A 3D       14530          DEC     A
6D5B 3D       14540 HYP5A    DEC     A
6D5C 3D       14550 HYP5B    DEC     A
6D5D 32F468   14560          LD      (COUNT),A
6D60 18A2     14570          JR      HYP0
6D62 D5       14580 KK0      PUSH    DE
6D63 3AF468   14590          LD      A,(COUNT)
6D66 5F       14600          LD      E,A
6D67 3AB252   14610          LD      A,(52B2H)
6D6A 83       14620          ADD     A,E
6D6B D1       14630          POP     DE
6D6C C9       14640          RET
6D6D 3ADF6A   14650 MARG     LD      A,(CODE1)
6D70 FE25     14660          CP      25H
6D72 2812     14670          JR      Z,MARGX
6D74 3AE06A   14680          LD      A,(CODE2)
6D77 FE28     14690          CP      28H
6D79 280B     14700          JR      Z,MARGX
6D7B 3AB052   14710 MARGZ    LD      A,(52B0H)
6D7E 4F       14720          LD      C,A
6D7F 3E20     14730          LD      A,20H
6D81 CDDA67   14740          CALL    PP34
6D84 C1       14750          POP     BC
6D85 C9       14760          RET
6D86 3A8968   14770 MARGX    LD      A,(X2)
6D89 CD3D69   14780          CALL    NEXT
6D8C 3A8A68   14790          LD      A,(X2+1)
6D8F CD3D69   14800          CALL    NEXT
6D92 3A8D68   14810          LD      A,(X4)
6D95 CD3D69   14820          CALL    NEXT
6D98 3A8E68   14830          LD      A,(X4+1)
6D9B CD3D69   14840          CALL    NEXT
6D9E 3AB052   14850          LD      A,(52B0H)
6DA1 4F       14860          LD      C,A

6DA2 3E20     14870          LD      A,20H
6DA4 CDDA67   14880          CALL    PP34
6DA7 3ADF6A   14890          LD      A,(CODE1)
6DAA FE25     14900          CP      25H
6DAC 200C     14910          JR      NZ,MARG1
6DAE 3A8768   14920          LD      A,(X1)
6DB1 CD3D69   14930          CALL    NEXT
6DB4 3A8868   14940          LD      A,(X1+1)
6DB7 CD3D69   14950          CALL    NEXT
6DBA 3AE06A   14960 MARG1    LD      A,(CODE2)
6DBD FE28     14970          CP      28H
6DBF 200C     14980          JR      NZ,MARG3
6DC1 3A8B68   14990          LD      A,(X3)
6DC4 CD3D69   15000          CALL    NEXT
6DC7 3A8C68   15010          LD      A,(X3+1)
6DCA CD3D69   15020          CALL    NEXT
6DCD C1       15030 MARG3    POP     BC
6DCE C9       15040          RET
6DCF 2A3052   15050 OPEN     LD      HL,(5230H)
6DD2 0600     15060          LD      B,0
6DD4 CD2444   15070          CALL    DOS4
6DD7 C8       15080          RET     Z
6DD8 CDDD6D   15090          CALL    ERCK
6DDB 18F2     15100          JR      OPEN
6DDD CDC901   15110 ERCK     CALL    01C9H
6DE0 F680     15120          OR      80H
6DE2 CD0944   15130          CALL    DOS3
6DE5 210C6E   15140          LD      HL,MSG
6DE8 CD6744   15150          CALL    DOS2
6DEB 3A4038   15160 ERR1     LD      A,(3840H)
6DEE FE01     15170          CP      1
6DF0 2816     15180          JR      Z,ERR2
6DF2 FE04     15190          CP      4
6DF4 20F5     15200          JR      NZ,ERR1
6DF6 CDC901   15210          CALL    01C9H
6DF9 CD5F6F   15220          CALL    RESTOR
6DFC 210070   15230          LD      HL,7000H
6DFF 222252   15240          LD      (5222H),HL
6E02 31C041   15250          LD      SP,41C0H
6E05 C35D54   15260          JP      545DH
6E08 CDC901   15270 ERR2     CALL    01C9H
6E0B C9       15280          RET
6E0C 50       15290 MSG      DEFM    'PRESS ENTER WHEN CORRECTED'
     52 45 53 53 20 45 4E 54
     45 52 20 57 48 45 4E 20
     43 4F 52 52 45 43 54 45
     44
```

Listing continues

MODEL III TECHNICAL MANUAL
- Written by factory technician
- Packed with rare hardware info
- A must if you have F version CPU boards. Written for use with Radio Shack's Tech Ref Manual below.

$12.00 postage paid, 26 pages.

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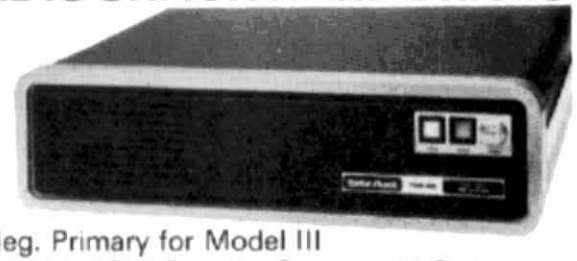

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Listing continued

```
6E26 0D       15300          DEFB   0DH
6E27 D5       15310 NUMB     PUSH   DE
6E28 7E       15320          LD     A,(HL)
6E29 D630     15330          SUB    30H
6E2B 57       15340          LD     D,A
6E2C 23       15350          INC    HL
6E2D 7E       15360          LD     A,(HL)
6E2E D630     15370          SUB    30H
6E30 5F       15380          LD     E,A
6E31 23       15390          INC    HL
6E32 7E       15400          LD     A,(HL)
6E33 D630     15410          SUB    30H
6E35 14       15420          INC    D
6E36 1C       15430          INC    E
6E37 1D       15440 NUMB1    DEC    E
6E38 2005     15450          JR     NZ,NUMB3
6E3A 15       15460 NUMB2    DEC    D
6E3B 2006     15470          JR     NZ,NUMB4
6E3D D1       15480 NUMB5    POP    DE
6E3E C9       15490          RET
6E3F C60A     15500 NUMB3    ADD    A,10
6E41 18F4     15510          JR     NUMB1
6E43 C664     15520 NUMB4    ADD    A,100
6E45 18F3     15530          JR     NUMB2
6E47 FE7B     15540 ASCII    CP     7BH
6E49 CC9E6C   15550          CALL   Z,MERG3
6E4C FE7D     15560          CP     7DH
6E4E CCF86C   15570          CALL   Z,MERG8
6E51 FE1B     15580          CP     1BH
6E53 2826     15590          JR     Z,SWITCH
6E55 FEFC     15600          CP     0FCH
6E57 2816     15610          JR     Z,ASCIIE
6E59 FE7C     15620          CP     7CH
6E5B 281A     15630          JR     Z,ASCIIC
6E5D FE60     15640 ASCIIA   CP     60H
6E5F 2007     15650          JR     NZ,ASCIID
6E61 CD276E   15660          CALL   NUMB
6E64 23       15670          INC    HL
6E65 0D       15680          DEC    C
6E66 0D       15690          DEC    C
6E67 0D       15700          DEC    C
6E68 F5       15710 ASCIID   PUSH   AF
6E69 AF       15720          XOR    A
6E6A 32336A   15730          LD     (PP80),A
6E6D F1       15740          POP    AF
6E6E C9       15750          RET
6E6F 2B       15760 ASCIIE   DEC    HL
6E70 367C     15770          LD     (HL),7CH
6E72 23       15780          INC    HL
6E73 3E2D     15790          LD     A,2DH
6E75 18F1     15800          JR     ASCIID
6E77 3E00     15810 ASCIIC   LD     A,00H
6E79 18ED     15820          JR     ASCIID
6E7B D5       15830 SWITCH   PUSH   DE
6E7C 7E       15840          LD     A,(HL)
6E7D E5       15850          PUSH   HL
6E7E FE25     15860          CP     25H
6E80 2813     15870          JR     Z,SW1
6E82 FE24     15880          CP     24H
6E84 2814     15890          JR     Z,SW2
6E86 FE28     15900          CP     28H
6E88 2815     15910          JR     Z,SW3
6E8A FE29     15920          CP     29H
6E8C 2816     15930          JR     Z,SW4
6E8E E1       15940          POP    HL
6E8F D1       15950          POP    DE
6E90 2B       15960          DEC    HL
6E91 7E       15970          LD     A,(HL)
6E92 23       15980          INC    HL
6E93 1820     15990          JR     SW6
6E95 218768   16000 SW1      LD     HL,X1
6E98 180D     16010          JR     SW5
6E9A 218968   16020 SW2      LD     HL,X2
6E9D 1808     16030          JR     SW5
6E9F 218B68   16040 SW3      LD     HL,X3
6EA2 1803     16050          JR     SW5
6EA4 218D68   16060 SW4      LD     HL,X4
6EA7 7E       16070 SW5      LD     A,(HL)
6EA8 23       16080          INC    HL
6EA9 5E       16090          LD     E,(HL)
6EAA E1       16100          POP    HL
6EAB 23       16110          INC    HL
6EAC CDB56E   16120          CALL   SW6
6EAF CD3D69   16130          CALL   NEXT
6EB2 7B       16140          LD     A,E
6EB3 D1       16150          POP    DE
6EB4 0D       16160          DEC    C
6EB5 F5       16170 SW6      PUSH   AF
6EB6 AF       16180          XOR    A
6EB7 32336A   16190          LD     (PP80),A
6EBA F1       16200          POP    AF
6EBB C9       16210          RET
6EBC 3A226F   16220 KEYBD    LD     A,(KEY)
6EBF 2F       16230          CPL
```

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TIMEX	$69	16 MEM	$42
TRS 80 COLOR COMP 16K			$269
MOD III 48K 2/40TRK S/S RS232			$1,730

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6EC0 32226F   16240          LD      (KEY),A
6EC3 FE00     16250          CP      00H
6EC5 284C     16260          JR      Z,KEY4
6EC7 210061   16270          LD      HL,WORK4
6ECA 11EB68   16280          LD      DE,FIELD
6ECD 0606     16290          LD      B,6
6ECF 1A       16300 KEY1     LD      A,(DE)
6ED0 77       16310          LD      (HL),A
6ED1 23       16320          INC     HL
6ED2 13       16330          INC     DE
6ED3 10FA     16340          DJNZ    KEY1
6ED5 D1       16350          POP     DE
6ED6 1B       16360          DEC     DE
6ED7 ED539C6C 16370          LD      (STOR2),DE
6EDB 13       16380          INC     DE
6EDC 1A       16390 KEY2     LD      A,(DE)
6EDD 77       16400          LD      (HL),A
6EDE 23       16410          INC     HL
6EDF 13       16420          INC     DE
6EE0 FE7D     16430          CP      7DH
6EE2 20F8     16440          JR      NZ,KEY2
6EE4 360D     16450          LD      (HL),0DH
6EE6 ED539A6C 16460          LD      (STOR1),DE
6EEA CDC901   16470          CALL    01C9H
6EED 210061   16480          LD      HL,WORK4
6EF0 E5       16490          PUSH    HL
6EF1 CD6744   16500          CALL    DOS2
6EF4 3E07     16510          LD      A,07H
6EF6 CD3D69   16520          CALL    NEXT
6EF9 21403C   16530          LD      HL,3C40H
6EFC 368F     16540          LD      (HL),8FH
6EFE A8       16550          XOR     B
6EFF 3EFF     16560          LD      A,0FFH
6F01 110161   16570          LD      DE,WORK4+1
6F04 CDD95B   16580          CALL    5BD9H
6F07 E1       16590          POP     HL
6F08 367B     16600          LD      (HL),7BH
6F0A 3E7D     16610          LD      A,7DH
6F0C 12       16620          LD      (DE),A
6F0D 23       16630 KEY3     INC     HL
6F0E 7E       16640          LD      A,(HL)
6F0F 23       16650          INC     HL
6F10 C1       16660          POP     BC
6F11 D1       16670          POP     DE
6F12 C9       16680          RET
6F13 E1       16690 KEY4     POP     HL
6F14 7E       16700 KEY5     LD      A,(HL)
6F15 23       16710          INC     HL
6F16 FE7D     16720          CP      7DH
6F18 20FA     16730          JR      NZ,KEY5
6F1A 229A6C   16740          LD      (STOR1),HL
6F1D 210061   16750          LD      HL,WORK4
6F20 18EB     16760          JR      KEY3
6F22 00       16770 KEY      DEFB    00H
6F23 13       16780 COR2     INC     DE
6F24 1A       16790          LD      A,(DE)
6F25 E65F     16800 COR2A    AND     5FH
6F27 FE46     16810          CP      46H
6F29 2815     16820          JR      Z,COR3
6F2B FE45     16830          CP      45H
6F2D 2811     16840          JR      Z,COR3
6F2F FE44     16850          CP      44H
6F31 2810     16860          JR      Z,COR4
6F33 FE48     16870          CP      48H
6F35 280F     16880          JR      Z,COR5
6F37 FE47     16890          CP      47H
6F39 280E     16900          JR      Z,COR6
6F3B FE50     16910          CP      50H
6F3D 280D     16920          JR      Z,COR7
6F3F C9       16930          RET
6F40 3E7D     16940 COR3     LD      A,7DH
6F42 C9       16950          RET
6F43 3E7B     16960 COR4     LD      A,7BH
6F45 C9       16970          RET
6F46 3E7C     16980 COR5     LD      A,7CH
6F48 C9       16990          RET
6F49 3E60     17000 COR6     LD      A,60H
6F4B C9       17010          RET
6F4C 3E1B     17020 COR7     LD      A,1BH
6F4E C9       17030          RET
6F4F CD1300   17040 COR8     CALL    DOS6
6F52 18D1     17050          JR      COR2A
6F54 CD2844   17060 CLOSE    CALL    DOS5
6F57 E5       17070 CLOSE1   PUSH    HL
6F58 2A3052   17080          LD      HL,(5230H)
6F5B AF       17090          XOR     A
6F5C 77       17100          LD      (HL),A
6F5D E1       17110          POP     HL
6F5E C9       17120          RET
6F5F 3AAC52   17140 RESTOR   LD      A,(CHAR)
6F62 FE20     17150          CP      20H
6F64 C8       17160          RET     Z
6F65 2A2852   17170          LD      HL,(5228H)
6F68 01FF6F   17180          LD      BC,6FFFH
6F6B E5       17190          PUSH    HL
6F6C ED42     17200          SBC     HL,BC
6F6E E5       17210          PUSH    HL
6F6F C1       17220          POP     BC
6F70 E1       17230          POP     HL
6F71 C5       17240          PUSH    BC
6F72 ED5B2A52 17250          LD      DE,(522AH)
6F76 EDB8     17260          LDDR
6F78 C1       17270          POP     BC
6F79 AF       17280          XOR     A
6F7A 12       17290          LD      (DE),A
6F7B 210070   17300          LD      HL,7000H
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Listing continues

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Listing continued

```
6F7E DD21AC52 17310          LD      IX,CHAR
6F82 13       17320 REST0    INC     DE
6F83 1A       17330          LD      A,(DE)
6F84 FE00     17340          CP      00H
6F86 28FA     17350          JR      Z,REST0
6F88 1A       17360 REST1    LD      A,(DE)
6F89 FE00     17370          CP      00H
6F8B 281C     17380          JR      Z,REST1B
6F8D FE7D     17390          CP      7DH
6F8F 281E     17400          JR      Z,RES2
6F91 FE7B     17410          CP      7BH
6F93 282E     17420          JR      Z,RES3
6F95 FE7C     17430          CP      7CH
6F97 2833     17440          JR      Z,RES4
6F99 FE60     17450          CP      60H
6F9B 2838     17460          JR      Z,RES5
6F9D FE1B     17470          CP      1BH
6F9F 283D     17480          JR      Z,RES6
6FA1 77       17490          LD      (HL),A
6FA2 23       17500 REST1A   INC     HL
6FA3 13       17510          INC     DE
6FA4 0B       17520          DEC     BC
6FA5 78       17530          LD      A,B
6FA6 B1       17540          OR      C
6FA7 20DF     17550          JR      NZ,REST1
6FA9 222852   17560 REST1B   LD      (5228H),HL
6FAC AF       17570          XOR     A
6FAD 77       17580          LD      (HL),A
6FAE C9       17590          RET
6FAF 1B       17600 RES2     DEC     DE
6FB0 1A       17610          LD      A,(DE)
6FB1 FE0E     17620          CP      0EH
6FB3 13       17630          INC     DE
6FB4 DD7E00   17640          LD      A,(IX)
6FB7 77       17650          LD      (HL),A
6FB8 23       17660          INC     HL
6FB9 3004     17670          JR      NC,RES2A
6FBB 3646     17680          LD      (HL),46H
6FBD 18E3     17690          JR      REST1A
6FBF 3645     17700 RES2A    LD      (HL),45H
6FC1 18DF     17710          JR      REST1A
6FC3 DD7E00   17720 RES3     LD      A,(IX)
6FC6 77       17730          LD      (HL),A
6FC7 23       17740          INC     HL
6FC8 3644     17750          LD      (HL),44H
6FCA 18D6     17760          JR      REST1A
6FCC DD7E00   17770 RES4     LD      A,(IX)
6FCF 77       17780          LD      (HL),A
6FD0 23       17790          INC     HL
6FD1 3648     17800          LD      (HL),48H
6FD3 18CD     17810          JR      REST1A
6FD5 DD7E00   17820 RES5     LD      A,(IX)
6FD8 77       17830          LD      (HL),A
6FD9 23       17840          INC     HL
6FDA 3647     17850          LD      (HL),47H
6FDC 18C4     17860          JR      REST1A
6FDE DD7E00   17870 RES6     LD      A,(IX)
6FE1 77       17880          LD      (HL),A
6FE2 23       17890          INC     HL
6FE3 3650     17900          LD      (HL),50H
6FE5 18BB     17910          JR      REST1A
6FE7 D5       17920 MOVE     PUSH    DE
6FE8 7E       17930          LD      A,(HL)
6FE9 FE60     17940          CP      60H
6FEB 3802     17950          JR      C,MOVE1
6FED E65F     17960          AND     5FH
6FEF 12       17970 MOVE1    LD      (DE),A
6FF0 23       17980          INC     HL
6FF1 13       17990          INC     DE
6FF2 FE0D     18000          CP      0DH
6FF4 20F2     18010          JR      NZ,MOVE+1
6FF6 D1       18020          POP     DE
6FF7 21F168   18030 MOVE2    LD      HL,PCL
6FFA CD7344   18040          CALL    DOS1
6FFD C9       18050          RET
6FFE 0000     18070          DEFW    0000H
52AC          18090 CHAR     EQU     52ACH
6201          18100 WORK1    EQU     6201H
6301          18110 WORK2    EQU     6301H
6401          18120 WORK3    EQU     6401H
6100          18130 WORK4    EQU     6100H
6501          18140 WORK5    EQU     6501H
              18160 ; ***************************************************
              18170 ; *                                                 *
              18180 ; * THE FOLLOWING DOS CODES WORK WITH TRSDOS 2.3 FOR *
              18190 ; * THE MODEL i; AND FOR ALL VERSIONS OF NEWDOS FOR  *
              18200 ; * FOR THE MODEL I AND THE MODEL iii.  tO USE       *
              18210 ; * MODEL iii TRSDOS, SUBSTITUTE THE CODES INDICATED *
              18220 ; *                                                 *
              18230 ; ***************************************************
4473          18250 DOS1     EQU     4473H           ; 444BH FOR MIII TRSDOS
4467          18260 DOS2     EQU     4467H           ; 021BH
4409          18270 DOS3     EQU     4409H           ; DISPLAY ERROR MESSSAGE
4424          18280 DOS4     EQU     4424H           ; OPEN EXISTING FILE
4428          18290 DOS5     EQU     4428H           ; CLOSE FILE
0013          18300 DOS6     EQU     0013H           ; SINGLE-BYTE READ
402D          18320          END     402DH
00000 TOTAL ERRORS
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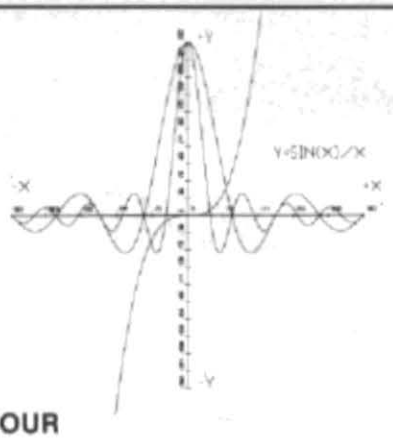

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4) BASIC strings
5) BASIC arrays (New in version 1.3!)
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Rapid Prints

by Delmer Hinrichs

Forget tedious mathematical calculations! Draw hundreds of figures and shorten printing time with these Fortran and Basic programs.

Bit mapping, the ability to position printer dots at any location on a page, provides dot-matrix printer owners with graphics capability. But bit-mapped graphics often require tedious manual calculations or are based on complex mathematical formulae that compile slowly in Basic.

Many commercially available graphics programs generate a single fixed pattern that quickly become uninteresting.

The programs listed here generate hundreds of different figures when used with an Epson MX-80 printer with the Graftrax option. The basic figure is a network of lines connecting a number of equispaced points on the circumference of an eight-inch circle. The user chooses the number of points (up to 50), whether to make a polygon or star-form figure by connecting or not connecting adjacent points, and whether or not to circumscribe the figure with a circle. All figures are plotted at high definition—120 dots per inch horizontally, 72 dots per inch vertically.

I wrote the program in Fortran to increase plotting speed (see Program Listing 1). The Microsoft Fortran compiler generates a smaller, faster CMD file (compiled program ready to run) than does the Microsoft Basic compiler. While other Microsoft Basic compilers produce an even smaller CHN file, they require a separate run-time module (BRUN/CMD) and are still slower than Fortran.

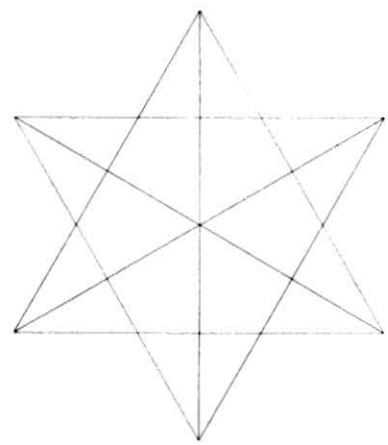
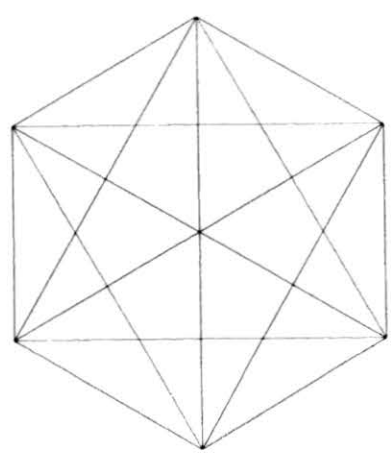
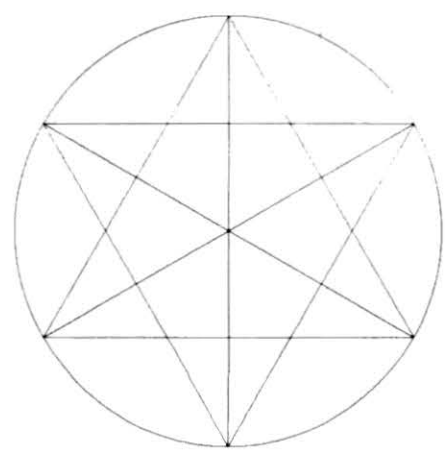


Fig. 1. The four forms of 6-point Network figures that can be made with these programs: star, polygon, star with circle, and polygon with circle.





For those without a Fortran compiler, the corresponding Basic program is also given (see Program Listing 2). This program is written so that Microsoft Basic compilers can either compile it as is, or as a Level II or Disk Basic program. Compiled versions of the program (Fortran or Basic) calculate and print faster. (See under "Time" below.)

If several copies of one figure are wanted, it may be better to save the figure as a disk data file, then read the disk data file back to plot the figure instead of recalculating it for each plot. Listings 1 and 2 will either print the figure as it is calculated, or save it as a disk file. Program Listing 3 (Fortran) or 4 (Basic) are then used to read the disk file and print the figure. Note that the disk file is written onto disk as a sequential file, but is read from disk as a random file.

Figure Variations

The four forms these Network pro-

grams generate are shown in Fig. 1, using a six-point figure in all cases.

Both open centers and closed centers may be printed, as demonstrated by Fig. 2 with 15 points, and by Fig. 3 with 16 points. An odd number of points results in an open center while an even number of points yields a closed center.

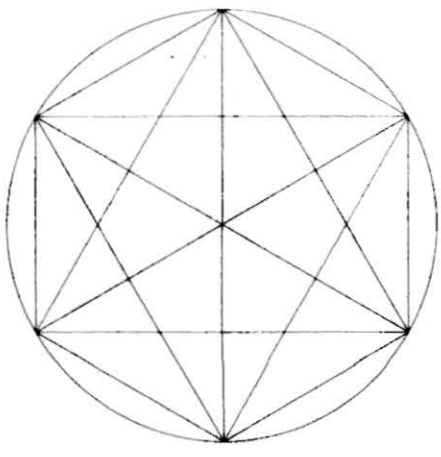
A larger number of points results in what I consider to be a more interesting design, such as Fig. 4 with 25 points. With more points, there is little change to the figure from using the star form, or from adding a circumscribed circle.

Time

The time required to print one of these figures consists of a fixed print time plus a variable calculation time. The print time is about four minutes for the compiled versions and about 16 minutes for the Basic versions. Why should Basic take four times as long to print the same figure? Because Fortran or compiled Basic can send the graphics characters to the printer fast enough to keep up with it, but Basic cannot; therefore, each line requires four passes of the print head in Basic, while faster, compiled programs print each line in one pass.

The calculation time varies with the square of the number of points.

Table 1 compares the speed of various programs for printing these network figures. Calculation time in Basic for a 16-point polygon (such as Fig. 3) is speeded up by approximately 5 percent by using integer calculations and comparisons, as in the Basic program of Listing 5. Listing 5 is a slight variation on Listing 2; similar changes can be made to the Fortran program of Listing 1. In addition, Basic calculation speed is increased by approximately 14 percent by specifying frequently used variables



Program Listing 1. Fortran program to print Network figure or to save it on disk as a disk file.

```
00010   C               *****   Network   *****
00020   C
00030   C       Written by:     Delmer D. Hinrichs
00040   C                       2116 S. E. 377th Ave.
00050   C                       Washougal, Wash.  98671
00060   C
00070   C       FORTRAN version of NETWORK/BAS, a program to
00080   C       print the network of lines connecting a number
00090   C       of equi-spaced points on the circumference of a
00100   C       circle.   The following may be chosen by user:
00110   C
00120   C       1.  The number of points, from 2 to 50.
00130   C       2.  Polygon form (connect adjacent points), or
00140   C           star form (adjacent points not connected).
00150   C       3.  Whether or not to circumscribe the figure
00160   C           with a circle.
00170   C
00180   C
00190           DIMENSION LL(960), P(2,50)
00200           LOGICAL UI, PU, PL, DU, DL, SU, SL, YU, YL, NU, NL, B(256)
00210           DATA PU /'P'/, PL /'p'/, DU /'D'/, DL /'d'/, SU /'S'/,
00220        1       SL /'s'/, YU /'Y'/, YL /'y'/, NU /'N'/, NL /'n'/
00230   C
00240    99     CALL OUT (254, 1)
00250           MM=960
00260           DO 1 I=1,MM
00270             LL(I)=0
00280    1        CONTINUE
00290           IC=0
00300           ID=0
00310           IS=0
00320   C
00330   C       Get user inputs
00340   C
00350           WRITE (5, 2)
00360    2      FORMAT ('  ', 22X, '***   Network   ***'/
00370        1          15X, '(c)   by  Delmer D. Hinrichs   1982'///
00380        2          ' Save figure on Printer or Disk (P/D)? _[X')
00390           READ (1, 3) UI
00400    3      FORMAT (A1)
00410           IF (UI .EQ. DU .OR. UI .EQ. DL) ID=1
00420           IF (ID .EQ. 0 .AND. UI .NE. PU .AND. UI .NE. PL) GOTO 1
00430    101    WRITE (5, 4)
00440    4      FORMAT (' Number of points to use (2 to 50)? _[X')
00450           READ (1, 5) N
00460    5      FORMAT (I3)
00470           IF (N .LT. 2 .OR. N .GT. 50) GOTO 101
00480    102    WRITE (5, 6)
00490    6      FORMAT (' Make Star or Polygon figure (S/P)? _[X')
00500           READ (1, 3) UI
00510           IF (UI .EQ. SL .OR. UI .EQ. SU) IS=1
00520           IF (IS .EQ. 0 .AND. UI .NE. PU .AND. UI .NE. PL) GOTO 102
00530    103    WRITE (5, 7)
00540    7      FORMAT (' Enclose figure with circle (Y/N)? _[X')
00550           READ (1, 3) UI
00560           IF (UI .EQ. YL .OR. UI .EQ. YU) IC=1
00570           IF (IC .EQ. 0 .AND. UI .NE. NU .AND. UI .NE. NL) GOTO 103
00580   C
00590   C       Initialize for calculations
00600   C
00610           P2=3.141593*2.0
00620           R=0.0
00630           S=1.0/576.0
00640           U=1.0/8192.0
00650           Y=1.0+S+S
00660           M=480
00670           IB=M
00680           IZ=M
00690           JJ=1
00700           KK=1
00710           NC=0
00720           M1=0
00730           K=7
00740           N1=N-1
00750   C
00760           DO 8 I=1,N
00770             P(1,I)=SIN(R)
00780             P(2,I)=COS(R)
00790             R=R+P2/(FLOAT(N))
00800    8        CONTINUE
00810   C
00820   C       Is figure to be saved on Printer or Disk?
00830   C
00840           IF (ID .EQ. 0) GOTO 9
00850   C
00860   C       Open disk file to save figure on disk
00870   C
00880           CALL OUT (254, 0)
00890           CALL OPEN (6, 'NETWORK/DAT ', 256)
00900           CALL OUT (254, 1)
00910           GOTO 14
00920   C
00930   C       Set printer (MX-80 with Graftrax) for graphics
00940   C
00950    9      IF (PEEK(14312) .GT. 127) GOTO 9
00960           CALL POKE (14312, 27)
00970    10     IF (PEEK(14312) .GT. 127) GOTO 10
00980           CALL POKE (14312, 64)
00990    11     IF (PEEK(14312) .GT. 127) GOTO 11
01000           CALL POKE (14312, 27)
01010    12     IF (PEEK(14312) .GT. 127) GOTO 12
01020           CALL POKE (14312, 65)
01030    13     IF (PEEK(14312) .GT. 127) GOTO 13
01040           CALL POKE (14312, 8)
```

Listing 1 continues

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PICKLES TROUT

Listing 1 continued

```
01050   C
01060   C       Calculate graphics dots for each line
01070   C
01080    14     DO 90 LN=1,577
01090             WRITE (5, 15) LN
01100    15       FORMAT (' Line # ', I3)
01110             NS=1
01120             IF (K .EQ. 0) GOTO 16
01130             DO 16 I=1,K
01140               NS=NS+NS
01150    16         CONTINUE
01160             Y=Y-S-S
01170             XM=SQRT(1.0-Y*Y)-U
01180             XN=-XM
01190             IA=IFIX(479.0*XN)+M
01200             IY=IFIX(480.0*XM)+M
01210   C
01220   C         Make circumscribed circle?
01230   C
01240             IF (IC .EQ. 0) GOTO 21
01250             I1=IA
01260             I2=IB-1
01270             IF (IA .GT. IB) I1=IB
01280             IF (IA .GT. IB) I2=IA-1
01290             DO 17 I=I1,I2
01300               LL(I)=LL(I) .OR. NS
01310    17         CONTINUE
01320             IB=IA
01330             I1=IY
01340             I2=I1-1
01350             IF (IY .GT. I1) I1=I1
01360             IF (IY .GT. I1) I2=IY-1
01370             DO 20 I=I1,I2
01380               LL(I)=LL(I) .OR. NS
01390    20         CONTINUE
01400             I1=IY
01410    21       DO 80 I=1,N1
01420               X1=P(1,I)
01430               Y1=P(2,I)
01440               II=I+1
01450               DO 70 J=II,N
01460   C
01470   C             Star form network?
01480   C
01490                 IF (IS .EQ. 0) GOTO 22
01500                 L=IABS(I-J)
01510                 IF (L .EQ. 1 .OR. L .EQ. N-1) GOTO 70
01520    22           X2=P(1,J)
01530                 Y2=P(2,J)
01540   C
01550   C             Is plotted line crossed by drawn line?
01560   C
01570                 IF (Y .LT. Y1-S .AND. Y .LT. Y2-S) GOTO 70
01580                 IF (Y .GT. Y1+S .AND. Y .GT. Y2+S) GOTO 70
01590   C
01600   C             Is drawn line horizontal?
01610   C
01620                 IF (ABS(Y1-Y2) .GT. S) GOTO 30
01630                 IF (ABS(Y-Y1) .GT. S .OR. ABS(Y-Y2) .GT. S) GOTO 30
01640                 DO 25 L=IA,IY
01650                   LL(L)=LL(L) .OR. NS
01660    25             CONTINUE
01670                 GOTO 70
01680   C
01690   C             Set all dots where drawn line is in plotted line
01700   C
01710    30           F=(X1-X2)/(Y1-Y2)
01720                 X=X1-(Y1-Y-S)*F
01730                 Z=X1-(Y1-Y+S)*F
01740                 I1=IFIX(X*480.0)+M
01750                 I2=IFIX(Z*480.0)+M
01760                 IF (I1 .LT. I2) GOTO 35
01770                 IT=I1
01780                 I1=I2
01790                 I2=IT
01800    35           IF (I1 .LT. IA) I1=IA
01810                 IF (I2 .GT. IY) I2=IY
01820                 I2=I2-1
01830                 DO 40 L=I1,I2
01840                   LL(L)=LL(L) .OR. NS
01850    40             CONTINUE
01860    70           CONTINUE
01870    80         CONTINUE
01880              K=K-1
01890              IF (K .LT. 0) GOTO 500
01900    90        CONTINUE
01910             IF (K .LT. 7) GOTO 500
01920             IF (ID .EQ. 0) GOTO 92
01930             IF (M1 .EQ. 1) GOTO 95
01940   C
01950   C         Calculate bytes to fill disk sector
01960   C
01970             PR=FLOAT(NC)*(FLOAT(MM)/256.0)
01980             MM=IFIX(AMOD(PR, 256.0))
01990             M1=1
02000             IF (MM .NE. 0) GOTO 500
02010             GOTO 95
02020   C
02030   C         Reset printer for normal print
02040   C
02050    92       IF (PEEK(14312) .GT. 127) GOTO 92
02060             CALL POKE (14312, 27)
02070    93       IF (PEEK(14312) .GT. 127) GOTO 93
02080             CALL POKE (14312, 64)
02090             WRITE (2, 94)
02100    94       FORMAT (/////)
02110   C
```

Listing 1 continues

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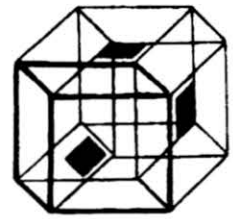

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in the dimension statement, so that the Basic interpreter could find them more quickly during operation.

Considering only the calculation time, floating point calculations and comparisons with compiled Basic are about seven times as fast as with Basic, while Fortran is about ten times as fast as Basic. With integer calculations, compiled Basic is nearly 17 times faster

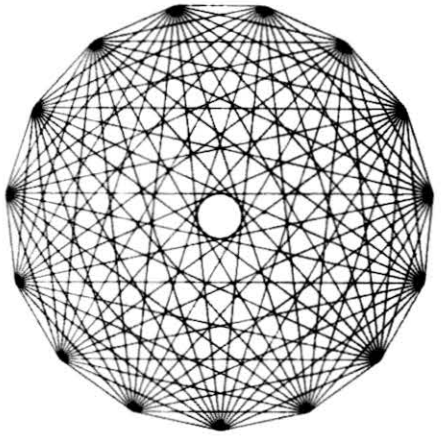

Fig. 2. Fifteen-point polygon Network figure showing the open-center form.

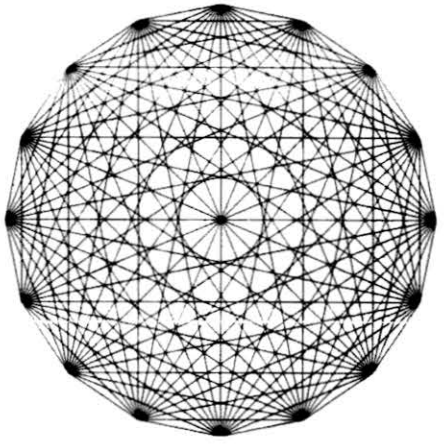

Fig. 3. Sixteen-point polygon Network figure showing the closed-center form.

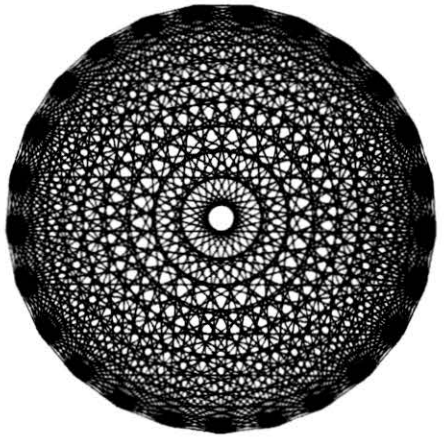

Fig. 4. Twenty-five-point polygon Network figure.

Listing 1 continued

```
02120   C       Program end
02130   C
02140    95     CALL OUT (254, 0)
02150           IF (ID .EQ. 1) ENDFILE 6
02160           WRITE (5, 96)
02170    96     FORMAT (// ' Finally Done!!!' //
02180       1           ' Do you want to make another one (Y/N)? _[X')
02190           READ (1, 3) UI
02200           IF (UI .EQ. YL .OR. UI .EQ. YU) GOTO 99
02210           WRITE (5, 97)
02220    97     FORMAT (// ' Program End' ///)
02230           GOTO 999
02240   C
02250   C       Is figure to be saved on disk or on printer?
02260   C
02270    500    IF (ID .EQ. 0) GOTO 510
02280   C
02290   C       Write bit-mapped graphics characters onto disk
02300   C
02310           DO 505 J=1,MM
02320             NX=LL(J)
02330             IF (NX .GT. 127) NX=NX-256
02340             B(JJ)=NX
02350             LL(J)=0
02360             JJ=JJ+1
02370             IF (JJ .LT. 257) GOTO 505
02380             CALL OUT (254, 0)
02390             WRITE (6, REC=KK, END=900) B
02400             CALL OUT (254, 1)
02410             KK=KK+1
02420             JJ=1
02430    505      CONTINUE
02440           K=7
02450           NC=NC+1
02460           WRITE (5, 560)
02470           GOTO 90
02480   C
02490   C       Print bit-mapped graphics characters
02500   C
02510    510    IF (PEEK(14312) .GT. 127) GOTO 510
02520           CALL POKE (14312, 27)
02530    511    IF (PEEK(14312) .GT. 127) GOTO 511
02540           CALL POKE (14312, 76)
02550    512    IF (PEEK(14312) .GT. 127) GOTO 512
02560           CALL POKE (14312, 192)
02570    513    IF (PEEK(14312) .GT. 127) GOTO 513
02580           CALL POKE (14312, 3)
02590           DO 550 J=1,MM
02600    520      IF (PEEK(14312) .GT. 127) GOTO 520
02610             CALL POKE (14312, LL(J))
02620             LL(J)=0
02630    550      CONTINUE
02640           K=7
02650           WRITE (5, 560)
02660           WRITE (2, 560)
02670    560    FORMAT (' ')
02680           GOTO 90
02690   C
02700    900    WRITE (5, 910)
02710    910    FORMAT (/// ' **  DISK ERROR  **' ///)
02720           ENDFILE 6
02730   C
02740   C       For Model III TRS-80s, change all statements of:
02750   C
02760   C                 CALL POKE (14312, n)
02770   C
02780   C                       to:
02790   C
02800   C                 CALL OUT (248, n)
02810   C
02820    999    END
```

Calculate and Print 16-Point Polygon

	Floating Point	Integer	Print any Figure Loaded from Disk
Basic	161.9	154.1	45.2
Basic, Dim	141.6	135.9	44.7
Compiled Basic	21.5	11.2	5.5
Fortran	18.4	9.2	5.4

Table 1. Relative speed of printing Network figures using different programs. The numbers are the time in minutes. Basic is NEWDOS80 Disk Basic. Basic, Dim is with frequently used variables set in the dimension statement. Compiled Basic is with the Microsoft compiler. Fortran is with the Microsoft compiler. See text for further explanation.

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than Basic, while Fortran is 23 times faster. Thus, compiled integer calculations are about 2.4 times as fast as compiled floating point calculations, compared to only a 5 percent improvement using Basic. In terms of speed, therefore, it is more important to use integers with the compiled programs than it is when using Basic. One drawback with integers is that an occasional

```
10 CLS :PRINT TAB(20)" *****   Network   *****"
20 '      (c)   by Delmer D. Hinrichs   1982
30 ' Bit-mapped graphics program for the Epson MX-80 w/Graftrax
40 OUT 254,1
50 DEFINT I-N :DIM NS, L, S, Y, Y1, Y2, L(960), P(1,49)
60 IC=0 :ID=0 :IS=0 :NC=0
70 PRINT :PRINT"Save figure on Printer or Disk (P/D)? ";
80 GOSUB 570 :IF A$="D" THEN ID=1 ELSE IF A$<>"P" GOTO 80
90 PRINT :PRINT :INPUT"Number of points to use (2 to 50)"; A$
100 N=VAL(A$) :N1=N-1 :IF N<2 OR N>50 GOTO 90
110 PRINT :PRINT"Make Star or Polygon figure (S/P)? ";
120 GOSUB 570 :IF A$="S" THEN IS=1 ELSE IF A$<>"P" GOTO 120
130 PRINT :PRINT :PRINT"Enclose figure with circle (Y/N)? ";
140 GOSUB 570 :IF A$="Y" THEN IC=1 ELSE IF A$<>"N" GOTO 140
150 PRINT :PRINT :P2=2*3.141593 :R=0 :S=1/576 :U=1/8192 :M=480
160 FOR I=0 TO N1
170   P(0,I)=SIN(R) :P(1,I)=COS(R) :R=R+P2/N
180   NEXT I
190 IF ID OUT 254,0 :OPEN"O",1,"NETWORK/DAT" :OUT 254,1
200 IF ID=0 LPRINT CHR$(27); "@"; CHR$(27); "A"; CHR$(8)
210 IB=M :IZ=M :K=7 :Y=1+S+S
220 FOR LN=1 TO 577 :PRINT"Line #"; LN,
230   NS=1 :IF K FOR L=1 TO K :NS=NS+NS :NEXT L
240   Y=Y-S-S :XM=SQR(1-Y*Y)-U :XN=-XM
250   IA=XN*(M-1)+M :IY=XM*M+M
260   IF IC=0 GOTO 310
270   IF IA>IB THEN I1=IB :I2=IA ELSE I1=IA :I2=IB
280   FOR I=I1 TO I2-1 :L(I)=L(I) OR NS :NEXT I :IB=IA
290   IF IY>IZ THEN I1=IZ :I2=IY ELSE I1=IY :I2=IZ
300   FOR I=I1 TO I2-1 :L(I)=L(I) OR NS :NEXT I :IZ=IY
310   FOR I=0 TO N1-1 :X1=P(0,I) :Y1=P(1,I)
320     FOR J=I+1 TO N1
330       IF IS THEN L=ABS(I-J) :IF L=1 OR L=N1 GOTO 440
340       X2=P(0,J) :Y2=P(1,J)
350       IF Y<Y1-S AND Y<Y2-S OR Y>Y1+S AND Y>Y2+S GOTO 440
360       IF ABS(Y1-Y2)>S GOTO 390
370       IF ABS(Y-Y1)>S OR ABS(Y-Y2)>S GOTO 390
380       FOR L=IA TO IY :L(L)=L(L) OR NS :NEXT L :GOTO 440
390       F=(X1-X2)/(Y1-Y2) :X=X1-(Y1-Y-S)*F :Z=X1-(Y1-Y+S)*F
400       IF X>Z THEN I1=Z*M+M:I2=X*M+M ELSE I1=X*M+M:I2=Z*M+M
410       IF I1<IA THEN I1=IA
420       IF I2>IY THEN I2=IY
430       FOR L=I1 TO I2-1 :L(L)=L(L) OR NS :NEXT L
440       NEXT J
450     NEXT I :K=K-1 :IF K<0 GOSUB 620
460   NEXT LN :IF K<7 GOSUB 620
470 PR=NC*(M+M)/256 :M=(1-(PR-INT(PR)))*128
480 IF M AND ID GOSUB 620
490 IF ID=0 LPRINT CHR$(27); "@"; STRING$(5,13)
500 OUT 254,0
510 PRINT :PRINT"Finally Done!!!"
520 PRINT:PRINT:PRINT"Do you want to make another one (Y/N)? ";
530 GOSUB 570 :IF A$="Y" GOTO 10 ELSE IF A$<>"N" GOTO 530
540 PRINT :PRINT :PRINT"Program End"
550 END
560 ' Get one character from keyboard
570 PRINT CHR$(95); CHR$(24);
580 A$=INKEY$ :IF A$="" GOTO 580
590 A=ASC(A$) :IF A>95 THEN A=A-32 :A$=CHR$(A)
600 PRINT A$; CHR$(24); :RETURN
610 ' Is figure to be saved on printer or on disk?
620 IF ID=0 GOTO 700
630 ' Save bit-mapped graphics characters onto disk
640 OUT 254,0
650 FOR J=1 TO M+M
660   PRINT #1, CHR$(L(J)); :L(J)=0
670   NEXT J :OUT 254,1 :PRINT :K=7 :NC=NC+1
680 RETURN
690 ' Print bit-mapped graphics characters on MX-80
700 LPRINT CHR$(27); "L"; CHR$(192); CHR$(3);
710 FOR J=1 TO M+M
720   IF PEEK(14312)>127 GOTO 720
730   POKE 14312,L(J) :L(J)=0
740   NEXT J :K=7 :PRINT :LPRINT
750 RETURN
760 ' For Model III TRS-80s, in line 730 change:
770 '     POKE 14312,L(J)    to:    OUT 248,L(J)
```

Program Listing 2. Basic program to print Network figure or to save it on disk as a disk file.

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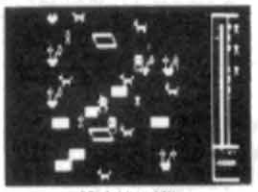

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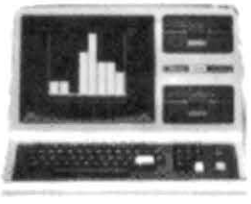

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Fortran is about 28 percent faster than compiled Basic in calculating and printing a network figure from scratch, but is only slightly faster in printing a figure from a disk file (see Table 1).

The times given in Table 1 are for comparison only; your times will prob-

```
00010   C       ***   Loader for Network Data   ***
00020   C
00030   C       Based on program by Bob Boothe
00040   C       80 Microcomputing, March 1982, p. 116
00050   C
00060   C       This FORTRAN version by Delmer D. Hinrichs
00070   C
00080   C
00090           LOGICAL UI, YU, YL, B(256)
00100           DIMENSION L(960)
00110           DATA YU /'Y'/, YL /'y'/
00120   C
00130    1      WRITE (5, 2)
00140    2      FORMAT (' ', 15X, '***   Loader for Network Data   ***' ///,
00150        1          ' Press <ENTER> to load "NETWORK/DAT" file from disk',
00160        2          ' and print it' //)
00170           PAUSE
00180           CALL OPEN (6, 'NETWORK/DAT ', 256)
00190           CALL OUT (254, 1)
00200    6      IF (PEEK(14312) .GT. 127) GOTO 6
00210           CALL POKE (14312, 27)
00220    7      IF (PEEK(14312) .GT. 127) GOTO 7
00230           CALL POKE (14312, 64)
00240    8      IF (PEEK(14312) .GT. 127) GOTO 8
00250           CALL POKE (14312, 27)
00260    9      IF (PEEK(14312) .GT. 127) GOTO 9
00270           CALL POKE (14312, 65)
00280    10     IF (PEEK(14312) .GT. 127) GOTO 10
00290           CALL POKE (14312, 8)
00300           J=257
00310           K=1
00320    11     IF (PEEK(14312) .GT. 127) GOTO 11
00330           CALL POKE (14312, 27)
00340    12     IF (PEEK(14312) .GT. 127) GOTO 12
00350           CALL POKE (14312, 76)
00360    13     IF (PEEK(14312) .GT. 127) GOTO 13
00370           CALL POKE (14312, 192)
00380    14     IF (PEEK(14312) .GT. 127) GOTO 14
00390           CALL POKE (14312, 3)
00400           DO 20 I=1,960
00410             IF (J .LT. 257) GOTO 15
00420             CALL OUT (254, 8)
00430             READ (6, REC=K, END=500) B
00440             CALL OUT (254, 1)
00450             K=K+1
00460             J=1
00470    15       N=B(J)
00480             IF (N .LT. 0) N=N+256
00490             L(I)=N
00500             J=J+1
00510    20       CONTINUE
00520           DO 25 I=1,960
00530    22       IF (PEEK(14312) .GT. 127) GOTO 22
00540             CALL POKE (14312, L(I))
00550             L(I)=0
00560    25       CONTINUE
00570           WRITE (2, 27)
00580    27     FORMAT (' ')
00590           GOTO 11
00600   C
00610   C       Final Cleanup
00620   C
00630    500    CALL OUT (254, 8)
00640           ENDFILE 6
00650           DO 550 I=1,960
00660    510      IF (PEEK(14312) .GT. 127) GOTO 510
00670             CALL POKE (14312, L(I))
00680    550      CONTINUE
00690    555    IF (PEEK(14312) .GT. 127) GOTO 555
00700           CALL POKE (14312, 27)
00710    557    IF (PEEK(14312) .GT. 127) GOTO 557
00720           CALL POKE (14312, 64)
00730           WRITE (2, 560)
00740    560    FORMAT (////)
00750   C
00760           WRITE (5, 600)
00770    600    FORMAT (//// ' Finally Done!!' //
00780        1          ' Do you want to print another one (Y/N)? _\')
00790           READ (1, 602) UI
00800    602    FORMAT (A1)
00810           IF (UI .EQ. YU .OR. UI .EQ. YL) GOTO 1
00820   C
00830   C       For Model III TRS-80s, change all statements of:
00840   C       CALL POKE (14312, n)      to:     CALL OUT (248, n)
00850   C
00860           END
```

Program Listing 3. Fortran program to read Network data file from disk and print it.

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The readers of 80 Micro were asked to select their favorite operating system for the TRS-80 Model I&III. LDOS, DOSPLUS, TRSDOS, MULTIDOS, WOBOS I and NEWDOS/80 were all on the ballot. They picked NEWDOS/80.

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ably be different. They were run using the Archbold clock control board, which speeds up my system by 50 percent, but the Basic programs were run under NEWDOS80 Disk Basic, which slows down my system by 6 percent. The features added by Disk Basic take their toll in speed.

If you do not have Fortran or Basic compilers, already compiled versions are available from me.

Program Details

The CALL OUT (254, 1) statement, or the corresponding OUT 254,1 statement in Basic, increases the TRS-80's clock speed if the Archbold clock control board has been installed. CALL OUT (254, 0) then slows it back to normal, for disk operations or for the end of the program. If you do not have this board, these statements have no effect.

In line 360 of Listing 1, there are the strange characters '[\[__' in a Format statement. This is how the EDIT/CMD program lists the ASCII characters 28 and 31 (Control \ and Control __). These characters, *Home* and *Clear to end of frame*, are the equivalent of the Basic CLS statement. I put them into the program using the Superzap utility of NEWDOS80. They may be left out with no effect on the program except that the video display is less neat.

Likewise, the '__[X' characters in lines 380, 440, 490, 540, and 2180 are ASCII 95 and 24 (underline and Control X, or backspace), to simulate the INPUT prompt of Basic.

For the Model III TRS-80, minor

```
10 CLS :PRINT TAB(14)"***   Loader for Network Data   ***"
20 '        (c)   by  Delmer D. Hinrichs   1982
30 CLEAR 300 :DEFINT I-N :DIM J, B$(255), L(960)
40 PRINT :PRINT :INPUT"Get disk ready, then press any key"; A$
50 OPEN"R",1,"NETWORK/DAT" :OUT 254,1
60 LPRINT CHR$(27); "@"; CHR$(27); "A"; CHR$(8)
70 FOR I=0 TO 255 :FIELD 1, I*1 AS P$, 1 AS B$(I) :NEXT I
80 J=256 :PRINT :PRINT :PRINT"Loading Data";
90 LPRINT CHR$(27); "L"; CHR$(192); CHR$(3);
100 FOR I=1 TO 960
110   IF J=256 OUT 254,0 :GET 1
     :IF EOF(1) THEN 140 ELSE OUT 254,1 :J=0
120   L(I)=ASC(B$(J)) :J=J+1
130   NEXT I
140 FOR I=1 TO 960
150   IF PEEK(14312)>127 GOTO 150
160   POKE 14312,L(I) :L(I)=0
170   NEXT I :LPRINT :IF EOF(1)=0 GOTO 90
180 CLOSE
190 LPRINT CHR$(27); "@"; STRING$(5,13)
200 PRINT" Completed"
210 PRINT:PRINT:PRINT"Do you want to load another one (Y/N)? ";
220 A$=INKEY$ :IF A$="" GOTO 220
230 IF A$="Y" OR A$="y" GOTO 10
240 CLS :PRINT"Program End"
250 END
260 ' For Model III TRS-80s, in line 160 change:
270 '  POKE 14312,L(I)      to:      OUT 248,L(I)
```

Program Listing 4. Basic program to read Network data file from disk and print it.

Program Listing 5. Basic program similar to Listing 2, but using integer calculations for greater speed.

```
10 CLS :PRINT TAB(16)"*****   Integer Network   *****"
20 '       (c)   by Delmer D. Hinrichs   1982
30 ' Bit-mapped graphics program for the Epson MX-80 w/Graftrax
40 OUT 254,1
50 DEFINT I-N, Y :DIM NS, L, Y, JY, KY, L(960), IP(1,49)
60 IC=0 :ID=0 :IS=0 :NC=0
70 PRINT :PRINT"Save figure on Printer or Disk (P/D)? ";
80 GOSUB 590 :IF A$="D" THEN ID=1 ELSE IF A$<>"P" GOTO 80
90 PRINT :PRINT :INPUT"Number of points to use (2 to 50)"; A$
100 N=VAL(A$) :N1=N-1 :IF N<2 OR N>50 GOTO 90
110 PRINT :PRINT"Make Star or Polygon figure (S/P)? ";
120 GOSUB 590 :IF A$="S" THEN IS=1 ELSE IF A$<>"P" GOTO 120
130 PRINT :PRINT :PRINT"Enclose figure with circle (Y/N)? ";
140 GOSUB 590 :IF A$="Y" THEN IC=1 ELSE IF A$<>"N" GOTO 140
150 PRINT :PRINT :P2=2*3.141593 :M=480 :MM=576 :R=0
160 FOR I=0 TO N1
170   IP(0,I)=SIN(R)*M :IP(1,I)=COS(R)*MM :R=R+P2/N
180   NEXT I
190 IF ID OUT 254,0 :OPEN"O",1,"NETWORK/DAT" :OUT 254,1
```

Listing 5 continues

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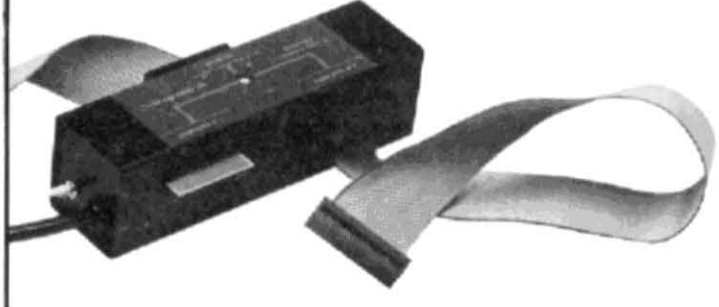

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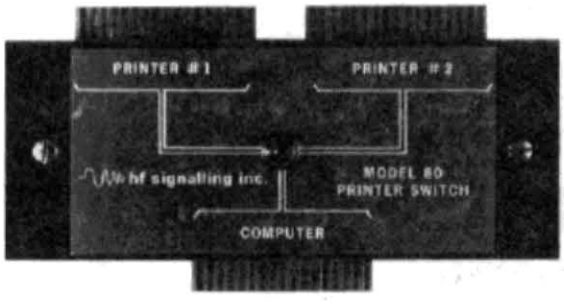

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changes in the graphics print routines are needed, due to the different way that the Model III handles characters sent to the printer. The CALL POKE (14312, n) statements for the Model I must be changed to CALL OUT (248, n) for the Model III. The S (substitute) command in the Edit program for Fortran makes this change throughout the program with only one user entry.

Other Printers

These programs can be readily changed to print these Network figures with bit-mapped graphics printers other than the Epson MX-80 with Graftrax for which they were written. To make the necessary changes, you must know how the MX-80 prints graphics, and how your printer prints graphics.

The MX-80 is first set for a line spacing of 8/72 inch. Then, before each graphics line is printed, the printer is told to interpret the next n characters it receives as graphics characters. For these figures, n equals 960. Each graphics character may be any ASCII character from zero to 255. The 8 bits of each character print a dot if the bit is "on" and do not print if the bit is "off." Thus, each pass of the print head prints eight horizontal lines of dots. The highest bit, 128, prints the highest dot, 64 prints the next highest dot, on down to 1, which prints the lowest dot.

The programs calculate horizontal lines of dots in groups of eight, and display the lines they are working on, also in groups of eight. The variable NS is set to 128, 64, 32, 16, 8, 4, 2, or 1 to correspond to the dot line. If any dot is to be set "on," NS is ORed with the proper integer from the 960 values in the "Line" array. That is, the dot is set on either if it is already set on, or if the value of NS sets it on.

If your printer prints other than 960 dots per line horizontally, then the variable M should be set to half the number of dots per line, instead of to 480 as in these programs. In addition, 480.0 (and 479.0) in the Fortran program should be adjusted.

The variable K is decremented from seven to zero to keep track of which line of dots is being calculated. For printers that print fewer lines of dots at a time, instead of eight values, K should have a corresponding smaller range. For printers that set the highest dot with the lowest number bit, K should initially set to zero (instead of to seven) and incremented for each succeeding line of dots. A little trial and error will get things right.

Acknowledgement

Bob Boothe's excellent article on MX-80 graphics in the March 1982 issue of *80 Micro* pointed the way to get started with bit-mapped graphics. ■

Delmer D. Hinrichs can be reached at 2116 SE 377th Ave., Washougal, WA 98671.

Listing 5 continued

```
200 IF ID=0 LPRINT CHR$(27); "@"; CHR$(27); "A"; CHR$(8)
210 IB=M :I2=M :K=7
220 FOR LN=0 TO MM :Y=(288-LN)*2 :PRINT"Line #"; LN,
230   NS=1 :IF K FOR L=1 TO K :NS=NS+NS :NEXT L
240   Z=Y/MM :MX=SQR(1-Z*Z)*M :MN=-MX
250   IA=MN+M+1 :IY=MX+M
260   IF IC=0 GOTO 310
270   IF IA>IB THEN I1=IB :I2=IA ELSE I1=IA :I2=IB
280   FOR I=I1 TO I2-1 :L(I)=L(I) OR NS :NEXT I :IB=IA
290   IF IY>I2 THEN I1=I2 :I2=IY ELSE I1=IY :I2=I2
300   FOR I=I1 TO I2-1 :L(I)=L(I) OR NS :NEXT I :I2=IY
310   FOR I=0 TO N1-1 :JX=IP(0,I) :JY=IP(1,I)
320     FOR J=I+1 TO N1
330       IF IS THEN L=ABS(I-J) :IF L=1 OR L=N1 GOTO 450
340       KX=IP(0,J) :KY=IP(1,J)
350       IF Y<JY-1 AND Y<KY-1 OR Y>JY+1 AND Y>KY+1 GOTO 450
360       IF ABS(JY-KY)>1 GOTO 400
370       IF ABS(Y-JY)>1 OR ABS(Y-KY)>1 GOTO 400
380       IF JF=Y+2 THEN 450 ELSE JF=Y
390       FOR L=IA TO IY-1 :L(L)=L(L) OR NS :NEXT L :GOTO 450
400       F=(JX-KX)/(JY-KY) :LX=JX-(JY-Y-1)*F :LZ=JX-(JY-Y+1)*F
410       IF LX>LZ THEN I1=LZ+M :I2=LX+M ELSE I1=LX+M :I2=LZ+M
420       IF I1<IA THEN I1=IA
430       IF I2>IY THEN I2=IY
440       FOR L=I1 TO I2-1 :L(L)=L(L) OR NS :NEXT L
450       NEXT J
460     NEXT I :K=K-1 :IF K<0 GOSUB 640
470     IF JF=Y+2 THEN JF=0
480   NEXT LN :IF K<7 GOSUB 640
490 PR=NC*(M+M)/256 :M=(1-(PR-INT(PR)))*128
500 IF M AND ID GOSUB 640
510 IF ID=0 LPRINT CHR$(27); "@"; STRING$(5,13)
520 OUT 254,0
530 PRINT :PRINT"Finally Done!!!"
540 PRINT:PRINT:PRINT"Do you want to make another one (Y/N)? ";
550 GOSUB 590 :IF A$="Y" GOTO 10 ELSE IF A$<>"N" GOTO 550
560 PRINT :PRINT :PRINT"Program End"
570 END
580 ' Get one character from keyboard
590 PRINT CHR$(95); CHR$(24);
600 A$=INKEY$ :IF A$="" GOTO 600
610 A=ASC(A$) :IF A>95 THEN A=A-32 :A$=CHR$(A)
620 PRINT A$; CHR$(24); :RETURN
630 ' Is figure to be saved on printer or on disk?
640 IF ID=0 GOTO 720
650 ' Save bit-mapped graphics characters onto disk
660 OUT 254,0
670 FOR J=1 TO M+M
680   PRINT #1, CHR$(L(J)); :L(J)=0
690   NEXT J :OUT 254,1 :PRINT :K=7 :NC=NC+1
700 RETURN
710 ' Print bit-mapped graphics characters on MX-80
720 LPRINT CHR$(27); "L"; CHR$(192); CHR$(3);
730 FOR J=1 TO M+M
740   IF PEEK(14312)>127 GOTO 740
750   POKE 14312,L(J) :L(J)=0
760   NEXT J :K=7 :PRINT :LPRINT
770 RETURN
780 ' For Model III TRS-80s, in line 750 change:
790 '     POKE 14312,L(J)    to:    OUT 248,L(J)
```


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40K Color Basic

by Richard E. Esposito
Ralph E. Ramhoff
Raymond W. Rowe

Should you be content with 32K RAM on your Color Computer when you could have 40K?

After shelling out a wad of cash for Extended Color Basic and another tidy sum for Disk Basic, why would anyone want to revert to Color Basic? Probably no one would, especially since some Color Computer programs are already hard to squeeze into the unit's standard 32K memory.

But here's a utility that gives you an extra 8K of Basic RAM to play with. In addition to this extra memory, there are a number of side benefits with 40K Basic. for instance, the text buffer of the Telewriter 1.0 word processor is increased from 18,500 characters to 26,692 characters. This puts Telewriter in a league with 32K Scripsit's 31,518, which doesn't use high-resolution graphics.

Other examples abound, but in general any cassette-based processor that does not use ROM routines from Extended Basic benefits from the additional 8K of RAM. Some ROM-based processors also benefit, so long as you perform EXEC 49152 while the cartridge-select pin is taped over (SDS80C meets this criterion).

Why It Works

If you study the disassembly of Color Basic 1.1 very carefully, you'll note that Basic checks locations $8000 and $8001 for the number $4558 (this is the hex value for the ASCII characters EX). With Basic in RAM, change this number so that Basic is unaffected when Extended Basic is installed. Just clear location $8000.

You must patch Basic so it does not reprogram the SAM for memory map #0. This is easily accomplished by installing a jump instruction at $A051. Instead of having Basic decide how much free memory is available, a patch at $A084 tells it that 40K is available. If this is not done, Basic would eat itself.

In addition, location $71 is cleared to force Basic to do a hard start. As a final touch I reprogrammed the section of Basic that prints "Color Basic 1.1" so that it prints "40K Custom Color Basic 1.1".

In Program Listing 1 is an Assembly-language routine to bring the machine up in 40K Custom Color Basic.

If you do not have an assembler, you can still enter the patch into memory by running the Basic program in Listing 2. Then save it to tape by typing CSAVEM "40KBASIC",&H7E50, &H7ECB,&H7E7E.

To use the new Basic, just insert the tape and type: CLOADM "40KBASIC":EXEC.

40K Custom Color Basic

If you type ?MEM when you first bring up 40K Basic, the machine responds −26329. Your computer is not broken!

Basic uses the 16-bit X register to count free memory. Since the high-order bit for a number greater than 32767 is 1, the MEM routine recognizes it as negative. If you prefer a positive number, type: ?MEM + 65536. You will have 39207 bytes free.

This is only necessary until you use the first 8K bytes with a program. After that, the high-order bit is zero.

Bells and Whistles

There is one problem with 40K Basic. When you hit the reset button with a D or earlier board, the computer returns to 32K Extended Basic and you lose your program. The VDG and SAM chips are reset along with the MC6809. To reset 40K Basic properly, only the MC6809 need be reset. The newer E and F boards only reset the MC6809.

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diode CR2. With this switch in the closed position, you get the usual reset. If, however, this switch is open in 40K Basic, you achieve a reset without losing your program and going back to 32K Extended Basic. However, I don't recommend that you install the switch. The wires connected to the switch must be brought out from the diode (CR2) which is located inside the shielded enclosure. On some computers this may cause an interference problem.

It is also possible to automatically start your routine. An auto-start routine automatically initiates execution following the CLOADM command. Just about any machine-language program residing below the 32K boundary can be started automatically.

Basic maintains its stack at the top of memory. When a CLOADM command is executed, Basic generates a JSR instruction to its CLOADM routine, and its return address is saved on the stack.

When Basic finishes with CLOADM, it executes an RTS instruction, which takes the address of the next instruction from the stack. Normally this is the address of the Ready routine, which prints "OK" followed by the blinking cursor. If, however, a machine-language routine is loaded from tape, it may overwrite the stack area and the CLOADM routine can be fooled into returning to a different address. This is done in one of two ways.

If you have an assembler, assemble to the addresses from the end of your routine through $7FFD with the symmetric EXEC address of the machine-language routine. I use $7E7E as an EXEC address.

Some processors may have problems with this. For example, SDS80C also takes the starting address of available RAM from the stack. Normally, this is $0600, so an auto-start 40K Basic starting at $7E7E sacrifices a large chunk of SS80C's buffer. In the case of SDS80C, my auto-start routine executes from $0606, losing only six bytes. (Note that I am referring to the EXEC address and not the starting address—they are not necessarily the same.)

If you do not have an assembler but do have a processor with its own CSAVEM routine (CBUG is one), the following procedure also works: While in 40K Custom Color Basic, load your machine-language tape. Then POKE the addresses from the end of your routine to $7FFD with your symmetric EXEC address. Finally, save the whole thing to tape.

Machine-Language Advice

If a machine-language program would be enhanced with additional free RAM, don't use Basic ROM routines in your code. To keep owners of 64K machines happy, make your programs relocatable or write them so that they are out of the way of contiguous free RAM. If your routines can write over Basic, Extended Basic, and Disk Basic, this frees up almost 32K of contiguous RAM. Don't sacrifice this RAM for the convenience of using a routine in ROM. ■

Richard Esposito can be reached at the University of Baltimore, Baltimore, MD 21201.

Ralph Ramhoff can be reached at 5015-1 Green Mountain Circle, Colombia, MD 21044.

Raymond Rowe can be reached at 6536 Woodbridge Circle, Catonsville, MD 21228.

```
            NAM   40KBASIC
            ORG   $7E50
MAP0        EQU   $FFDE
MAP1        EQU   $FFDF
BANNER      FCC   8,COLOR CO
            FCC   6,MPUTER
            FCB   $0D
            FCC   8,CUSTOM 4
            FCC   8,0K BASIC
            FCC   4, 1.1
            FCB   $0D
            FCB   $00
            ORG   $7E7E
START       ORCC  #$50          INHIBIT INTERRUPTS
            LDX   #$8000        ENTER 64K ROUTINE
LOOP        LDA   0,X
            STA   MAP1
            STA   0,X+
            STA   MAP0
            CMPX  #$FF00
            BLT   LOOP
            STA   MAP1
            LDA   #$7E          SKIP SAM
            STA   $A051
            LDD   #$A072
            STD   $A052
            LDD   #$8E9F        SKIP MEMORY CHECK
            STD   $A084
            LDD   #$FE7E
            STD   $A086
            LDD   #$A093
            STD   $A088
            CLR   $8000         INHIBIT EXT BASIC
            CLR   $71           FORCE HARD START
            LDX   #BANNER       NEW HEADING ROUTINE
            LDY   #$A147
            LDA   #$25
LOOP2       LDB   0,X+
            STB   0,Y+
            DECA
            BNE   LOOP2
            ANDC  #$AF          RESTORE INTERRUPTS
            JMP   $A027         GO TO BASIC
            END   START
```

Program Listing 1

```
10 FOR I=&H7E50 TO &H7ECB
20 READ A$
30 POKE I,VAL("&H"+A$)
40 NEXT I
50 DATA 43,4F,4C,4F,52,20,43,4F
60 DATA 4D,50,55,54,45,52,0D,43
70 DATA 55,53,54,4F,4D,20,34,30
80 DATA 4B,20,42,41,53,49,43,20
90 DATA 31,2E,31,0D,00,60,64,41
100 DATA 70,78,78,00,60,43,1A,50
110 DATA 8E,80,00,A6,84,B7,FF,DF
120 DATA A7,80,B7,FF,DE,8C,FF,00
130 DATA 2D,F1,B7,FF,DF,86,7E,B7
140 DATA A0,51,CC,A0,72,FD,A0,52
150 DATA CC,8E,9F,FD,A0,84,CC,FE
160 DATA 7E,FD,A0,86,CC,A0,93,FD
170 DATA A0,88,7F,80,00,0F,71,8E
180 DATA 7E,50,10,8E,A1,47,86,25
190 DATA E6,80,E7,A0,4A,26,F9,1C
200 DATA AF,7E,A0,27
```

Program Listing 2

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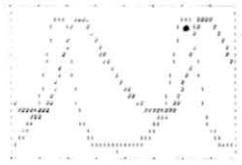

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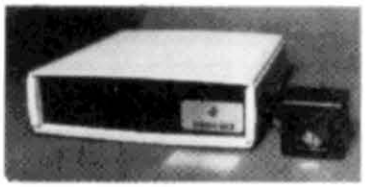

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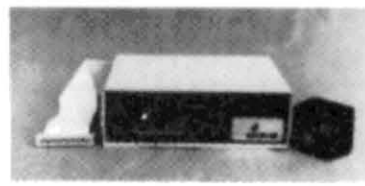

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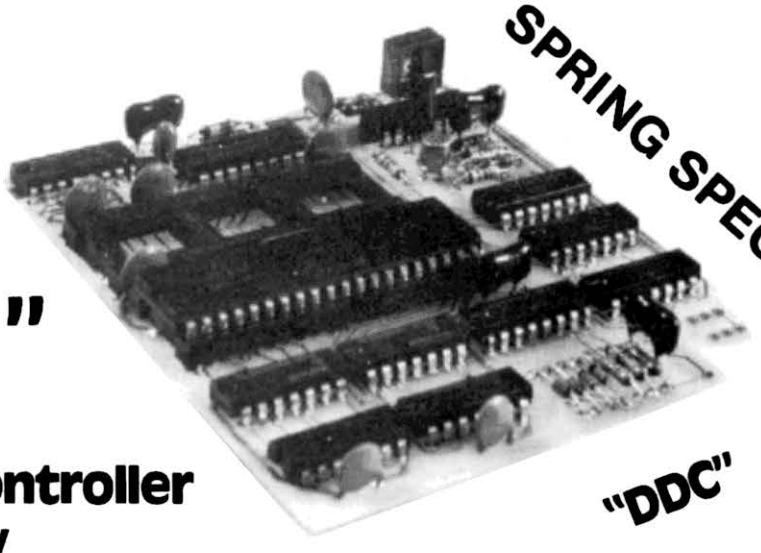

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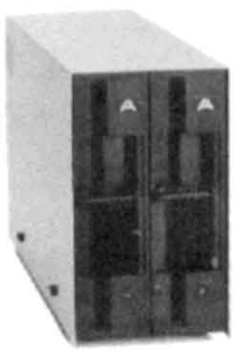

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Learn to use dot-addressable graphics.

The Printer as a Paintbrush—Part I

Mike Keller
13423 Desert Hills NE
Albuquerque, NM 87111

Dot-addressable graphics are commonplace on new dot-matrix printers. When you see an ad for a printer with a sample printout that looks almost like a photograph, you are looking at what dot-addressable graphics can do. Unfortunately, results like those in the ads generally require several thousand dollars of digitizing hardware; the alternative, digitizing by hand, seems a monumental task. For those of us who can't afford special equipment but would like to draw with a printer, I have devised some aids to make the manual process easier.

This month I will cover some techniques for converting simple black and white block characters and line drawings into printed images like those in Fig. 5. In Part II I'll describe a method for digitizing a photograph. You don't need any artistic talent; only the ability to distinguish various levels of shading. Part II will also contain a short Basic program that prints the TRS-80's 6144 screen pixels as single dots on paper, creating a mini screen-print.

The Key Box

Model I
32K RAM
1 Disk Drive
Dot-matrix printer with dot-addressable graphics

System Requirements

To reproduce the accompanying printouts, you need a printer with dot-addressable graphics. If you have been reluctant to try this feature because of its complexity, don't worry—we will tackle it one step at a time. Your printer must be capable of printing at least eight dots at a time in a single vertical column in order to use most of the routines shown here.

These routines were all written in Disk Basic on a Model I, and versions of each listing are shown for two popular printers. The routines should work on a Model III, but they have not been tested for that. Model III owners will have to replace POKE statements with OUT statements.

The digitizing process will go much more smoothly if your TRS-80 has the following utilities:

- Repeating keys
- An audible "beep" or "click" as a key is pressed
- The ability to duplicate a line of Basic elsewhere in the program.

You also need semi-transparent paper (tracing paper is ideal), and you should be comfortable with Basic.

Terminology

I have been casually tossing around a couple of terms that should be clarified before we go on. *Digitizing*, as we use it here, is the process of converting a visual

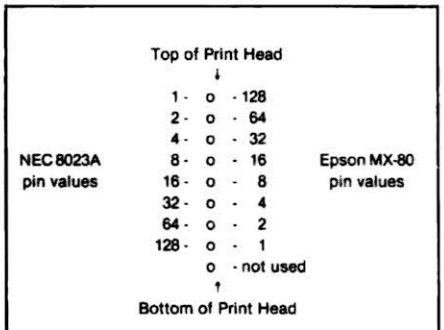

Fig. 1. Print head pin values in graphics mode.

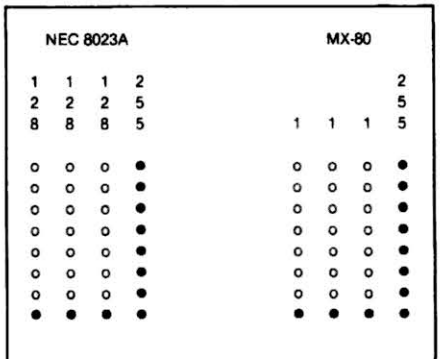

Fig. 2. Decimal codes to print a backwards "L".

image into a set of numbers that the computer can use to reconstruct that image (or some representation of it). Sophisticated digitizing equipment is capable of electronically scanning an image and generating its own data. We poor folks have to scan the image and generate the data manually. In both cases, the process is essentially the same; the cheap way just takes longer.

Here's how it works: First, the image is divided into small blocks, each having distinct X and Y coordinates. Each block is then "digitized," or assigned a value that tells the computer whether that block is filled or empty. Take, for example, the character in Photo 2. Starting at the top left block and working to the right, the first 2 blocks are white (off), the next 25 blocks are dark (on), and the remaining blocks in the top row are white (off). This pattern could be represented as a Basic string "00111111111 11111111111111111000000000". We have just digitized the top row of the image by expressing that row's visual information in a numerical form. This same process can be applied to more complex images.

The term *dot-addressable*, as it applies to printers, simply means that each pin of the print head can be individually controlled to either strike or not strike the ribbon at a given carriage position. The typical dot-matrix print head has nine (or seven) pins arranged in a vertical column. These pins are represented by the circles shown in Fig. 1. When printing normal characters, each pin is controlled by the printer's internal programming as the print head moves across the page. When using dot image graphics, the programmer must specify which pins are to strike for each possible dot position along the print head's path. With this kind of control, you can put a dot at virtually any point on a page.

TO GRAPH A 4 INCH IMAGE ON THE NEC 8023 PRINTER, USE LINE SPACING OF **12.0**/144ths INCH
EACH BLOCK'S WIDTH SHOULD BE:
13.3 DOTS IN PROPORT'NL (HS$ = 'P')
or 11.3 DOTS IN COMPRESSED (HS$ = 'Q')
or **8.0 DOTS** IN ELITE (HS$ = 'E')
or 6.7 DOTS IN PICA (HS$ = 'N')

TO GRAPH A 4 INCH IMAGE ON THE MX-80 PRINTER, USE LINE SPACING OF **18.0**/216ths INCH
EACH BLOCK'S WIDTH SHOULD BE:
5.0 DOTS IN 480 MODE (HS$ = 'K')
or 10.0 DOTS IN 960 MODE (HS$ = 'L')

Fig. 3. Sample printout from Listing 3.

```
450   'DATA LINES CAN BE ADDED HERE OR MERGED FROM ANOTHER FILE.
1000  --------DATA FOR LETTER "T"--------
1001  DATA"     MMMMMMMMMMMMMMMMMMMMMMM     "
1002  DATA"     MMMMMMMMMMMMMMMMMMMMMMM     "
1003  DATA"     MMMMMMMMMMMMMMMMMMMMMMM     "
1004  DATA"     MMMMMMMMMMMMMMMMMMMMMMM     "
1005  DATA"     MMMMMMMMMMMMMMMMMMMMMMM     "
1006  DATA"     MMMMMMMMMMMMMMMMMMMMMMM     "
1007  DATA"               MMMMMM            "
1008  DATA"               MMMMMM            "
1009  DATA"               MMMMMM            "
1010  DATA"               MMMMMM            "
1011  DATA"               MMMMMM            "
1012  DATA"               MMMMMM            "
1013  DATA"               MMMMMM            "
1014  DATA"               MMMMMM            "
1015  DATA"               MMMMMM            "
1016  DATA"               MMMMMM            "
5000  DATA"DONE"
```

Fig. 4. LLIST with small line spacing.

```
10 'LISTING 1a     ******** FOR NEC 8023 PRINTER ********
20 'SENDS A BACKWARDS "L" TO PRINTER WITH LPRINT
30 '
40 BL$=CHR$(128)+CHR$(128)+CHR$(128)+CHR$(255)   'BACKWARDS "L"
50 LPRINT CHR$(27)+"T14"    'SELECT 14/144ths INCH LINE SPACING
60 LPRINT CHR$(27);"S";     'SELECT DOT-GRAPHICS MODE
70 LPRINT"0004";            '4 GRAPHICS BYTES WILL FOLLOW
80 LPRINT BL$;               'SEND THE 4 BYTES
90 END
```

Program Listing 1a

```
10 'LISTING 1b    ******** FOR MX-80 PRINTER ********
20 'SENDS A BACKWARDS "L" TO PRINTER WITH LPRINT
30 '
40 BL$=CHR$(1)+CHR$(1)+CHR$(1)+CHR$(255)     'BACKWARDS "L"
50 LPRINT CHR$(27)+"A"+CHR$(7)   'SELECT 7/72nds LINE SPACING
60 LPRINT CHR$(27);"K";          'SELECT 480 DOT-GRAPHICS MODE
70 LPRINT CHR$(4)+CHR$(255);   '4 GRAPHICS BYTES WILL FOLLOW
80 LPRINT BL$;                   'SEND THE 4 BYTES
90 END
```

Program Listing 1b

Artistic Printers

From here on, we'll confine our discussion to two specific printers with dot-addressable graphics: the NEC 8023 and the Epson MX-80 with Graftrax 80 installed (all routines written for the NEC printer should work unmodified on the C.ITOH 8510 and the ADS 8001). If you are using the NEC, setting the DIP switch to unidirectional print will produce better graphics.

Both printers use the upper eight pins of the print head in the graphics mode. When programming for dot graphics, these eight pins are treated exactly as an 8-bit binary number, or byte. Figure 1 shows an important difference between the two printers in this respect. On the 8023, the top pin of the print head is equivalent to bit zero of a binary number. That is, it has a value of one. The MX-80's pins are treated in the reverse by the programmer. Its top pin is equivalent to bit seven and has a value of 128. If you are not familiar with binary numbering, just refer to the figure to find the value for each pin that you want to strike. The sum of these values is the byte you will send to the printer to draw that pattern of dots. For example, if you want to produce a short vertical line by striking the upper three pins, you will send a decimal seven to the NEC (one plus two plus four), or a decimal 224 to the MX-80 (32 plus 64 plus 128). The programs account for

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this and other differences between the two printers. When keying in the listings, be especially careful to include trailing semicolons where they are shown in LPRINT statements. Save each listing after you enter it, since most are used more than once.

A Byte-sized Letter

Now let's paint our first creation—a backwards "L" (it'll come in handy later). Suppose we want the "L" to be eight dots tall, and four dots wide, as illustrated in Fig. 2. On the NEC printer, we would send four bytes 128,128,128,255; on the Epson we would send 1,1,1,255. Program Listings 1a and 1b provide a method for sending this information to the printer. Try the appropriate version for your printer and take a look at the results. It may not be a masterpiece, but it's certainly a character not in the printer's normal character set. The vertical part of the "L" was sent as a value of 255 (1 plus 2 plus 4 plus 8 plus 16 plus 32 plus 64 plus 128) because we wanted all eight pins to strike at that point.

In the above example, we sent the four bytes of data to the printer by printing them as a string. This is fast and neat, and lets Basic check the printer's status before sending each of the four bytes. We can't use LPRINT in every case, though. It turns out the LPRINT command is snoopy enough to examine each byte before sending it to the printer, and certain values (specifically zero, 10, 11 and 12) will never get there. We need a more reliable (if slower) method of outputting most graphics data. On the Model I, we can POKE the data to the printer's address, and on the Model III, the OUT statement can be used.

The first few times I tried the POKE approach, some very strange and unexpected patterns were printed. It finally dawned on me that a POKE statement doesn't check to see if the printer is ready for each byte. The following line takes care of this problem:

```
XXX IF PEEK(14312<>63 THEN XXX ELSE POKE 14312,BYTE
```

14312 is the address of the printer on a Model I, and will contain a decimal 63 if the printer is ready to accept the next byte of data. Remember, LPRINT does this status check for you, but you will have to do it yourself when POKEing a series of data bytes to the printer. Program Listings 2a and 2b show how to send the backwards "L" on the Model I using the POKE method. Because of its greater speed, we will be using LPRINT whenever possible.

Graphic Demonstration

Ready for fancier things? Add these lines to your printer's version of Listing 1 and Run it.

```
58  FOR ROW = 1 TO 3
59  FOR BLOK = 1 TO 20
81  NEXT BLOK: LPRINT
82  NEXT ROW
```

There. You have a graph made of backward L's. Such a graph will make it easier to digitize an image for reproduction on the printer. We have to get into a few more numbers here, so bear with me. It won't be too painful.

We will define a graph to fit an already existing image. Then we'll print this graph on a sheet of trace paper, and use it as a guide during the digitizing process. The digital information will be entered into a series of Basic data statements. Finally, we'll read

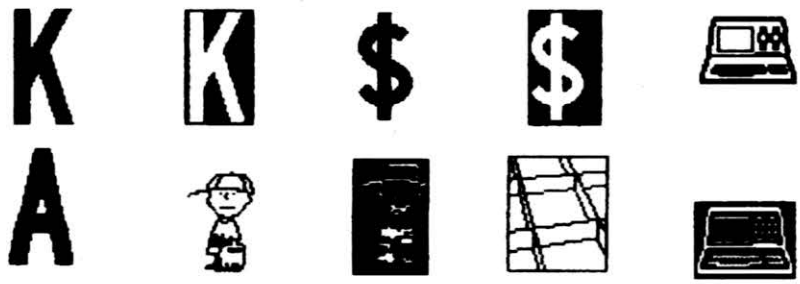

Fig. 5. Sample digitized image.

```
10 'LISTING 2a     *******  FOR NEC 8023 PRINTER  *******
20 'SENDS A BACKWARDS "L" TO PRINTER BY POKEing
30 '
40 LPRINT CHR$(27);"S";     'SELECT DOT-GRAPHICS MODE
50 LPRINT"0004";            '4 GRAPHICS BYTES WILL FOLLOW
60 FOR X=1 TO 4: READ BYTE
70   IF PEEK(14312) <> 63 THEN 70 ELSE POKE 14312,BYTE
80 NEXT X
90 DATA 128,128,128,255
100 END
```

Program Listing 2a

```
10 'LISTING 2b     *******  FOR MX-80 PRINTER  *******
20 'SENDS A BACKWARDS "L" TO PRINTER BY POKEing
30 '
40 LPRINT CHR$(27);"K";        'SELECT 480 DOT-GRAPHICS MODE
50 LPRINT CHR$(4)+CHR$(255);   '4 GRAPHICS BYTES WILL FOLLOW
60 FOR X=1 TO 4: READ BYTE
70   IF PEEK(14312) <> 63 THEN 70 ELSE POKE 14312,BYTE
80 NEXT X
90 DATA 1,1,1,255
100 END
```

Program Listing 2b

```
10 'LISTING 3       CALCULATES SPACING OPTIONS FOR GENERATING A
20 'SCALED GRAPH. THE GRAPH CAN THEN BE USED TO DIGITIZE A
30 'MINIATURE VERSION OF ANY BLOCK LETTER OR LINE DRAWING.
40 'PRINTED IMAGE WILL BE SCALED DOWN TO A HEIGHT OF 2/3 INCH.
50 'ORIGINAL IMAGE CAN BE ANY SIZE UP TO 8 INCHES.
60 CLS
70 PRINT: INPUT"ENTER HEIGHT OF THE ORIGINAL IMAGE (INCHES) ";H
80 '============== CALCULATIONS FOR NEC 8023 ================
90 LPRINT"TO GRAPH A";H;"INCH IMAGE ON THE NEC 8023 PRINTER,"
100 LPRINT USING"USE LINE SPACING OF ##.#/144ths INCH";H/48*144
110 LPRINT"EACH BLOCK'S WIDTH SHOULD BE:"
120 LPRINT USING"   ##.# DOTS IN PROPORT'NL (HS$='P')";H/48*160
130 LPRINT USING"or ##.# DOTS IN COMPRESSED (HS$='Q')";H/48*136
140 LPRINT USING"or ##.# DOTS IN ELITE (HS$='E')";H/48*96
150 LPRINT USING"or ##.# DOTS IN PICA (HS$='N')";H/48*80
160 LPRINT
170 '=============== CALCULATIONS FOR MX-80 ================
180 LPRINT"TO GRAPH A";H;"INCH IMAGE ON THE MX-80 PRINTER,"
190 LPRINT USING"USE LINE SPACING OF ##.#/216ths INCH";H/48*216
200 LPRINT"EACH BLOCK'S WIDTH SHOULD BE:"
210 LPRINT USING"   ##.# DOTS IN 480 MODE (HS$='K')";H/48*60
220 LPRINT USING"or ##.# DOTS IN 960 MODE (HS$='L')";H/48*120
230 END
```

Program Listing 3

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*Michael Tannenbaum, the "80 Accountant"

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the data and recreate on the printer a scaled-down copy of the original image, with each "on" block of the graph represented by a corresponding dot on the paper.

Setting the Stage

First we need to decide on a height for the final printed image. As an example, I have selected 2/3 inch. On both printers, the print head pins are spaced 1/72 of an inch apart. Two-thirds of 72 is 48, so a 2/3 inch image is 48 dots tall. Since eight pins are available during the printing of each line, the final image requires six lines of print.

The height of 48 dots allows us to display the image on the TRS-80 screen during the inevitable touch-up process, saving lots of paper and some wear on the printer.

Now we need a scaling factor for drawing the graph. This will allow flexibility in our selection of an original image for reproduction on the printer. Our printout will always be 2/3 inch tall, regardless of the size of the original, because the graph itself will be automatically scaled up to match the original. For a relatively large original the blocks will be large, and for a small original the blocks will be smaller. It's a lot easier than trying to scale down the printed image after it has been digitized.

Program Listing 3 takes care of this scaling for you. When you run the program, you are asked the height, in inches, of the original image. The program then shows various options for printing the graph. It tells you what line spacing to use, and how many dots wide the backward L's should be for each of your printer's horizontal dot-spacing possibilities. These two things determine the size of the blocks that will make up the graph.

If some of these concepts are a little fuzzy to you, hang in there. They will become clearer as we make our first printer drawing.

Selecting an Image

For our first drawing, I will be using a

```
10 'LISTING 4a   ******* FOR NEC 8023 PRINTER *******
20 'DRAWS A SCALED GRAPH TO AID IN MANUAL DIGITIZING
30 '
40 CLEAR 200: DEFINT A-Z
50 LS=12        'USED TO SET NO. OF 144ths INCH LINE SPACING
60 HS$="E"      'USED TO SELECT PRINT STYLE (HORIZ. DOT-SPACING)
70 ND=8         'USED TO SET DOT WIDTH OF BACKWARDS "L"
80 '
90 BL$=STRING$(ND-1,128)+CHR$(255)  'CREATE THE BACKWARDS  L
100 'NEXT LINE BUILDS STRING FOR INITIALIZING GRAPHICS MODE
110 GR$=CHR$(27)+"S"+STRING$(5-LEN(STR$(ND)),"0")+RIGHT$(STR$(ND
),LEN(STR$(ND))-1)
120 'NEXT LINE BUILDS STRING FOR SETTING PRINTER LINE SPACING
130 LS$="T"+STRING$(3-LEN(STR$(LS)),"0")+RIGHT$(STR$(LS),LEN(STR
$(LS))-1)
140 '
150 CLS: INPUT"READY PRINTER AND PRESS <ENTER> ";A$
160 LPRINTCHR$(27);LS$;     'SET LINE SPACING
170 LPRINT CHR$(27);HS$;    'SET HORIZONTAL DOT-SPACING
180 '
190 'PRINT THE GRAPH....
200 FOR ROW = 1 TO 49
210   FOR BLOK = 1 TO 48
220     LPRINT GR$;   'SELECT GRAPHICS & SEND BYTE COUNT
230     LPRINT BL$;   'SEND THE BACKWARDS "L"
240   NEXT BLOK: LPRINT
250 NEXT ROW
260 END
```

Program Listing 4a

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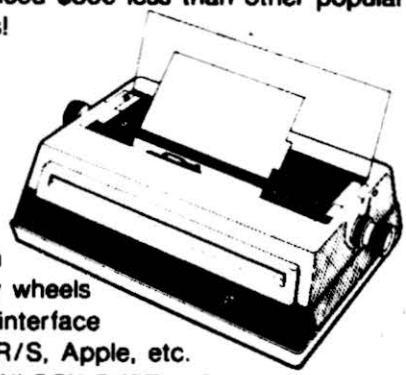

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4-inch block letter "T." The letter "T" is particularly easy to digitize, since it is made up of horizontal and vertical edges and most of the data statements can be duplicates. If you don't have a "T" handy, sketch one and follow along, or use any other image you like. The original image should be clear enough to be easily identified through a sheet of tracing paper, and should be at least 4 inches in height. Don't use an image larger than 8 inches, because your square graph will not fit on a standard sheet of paper. For this exercise, avoid complex shapes and images with a lot of diagonal lines or curves.

Tailor-made Squares

We are now ready to generate a properly scaled graph. Run the program in Listing 3 (you can omit the lines that don't apply to your printer), and answer the height question with the measured height of your image. If you happen to be using a 4-inch image, you will get the printout shown in Fig. 3. It shows several options for generating a 4-inch square graph on either printer. Circle any dot width choice that is a whole number, as we have done in Fig. 3 (you can't print a backwards "L" that is 6.7 dots wide). If there are no whole number choices, circle the one that comes closest and round this number up to the nearest whole dot. Do the same with the line spacing number if necessary. Also circle the "HS$=" character located next to your dot width choice. These marked values will be used in the next listing to ensure a square graph.

Program Listings 4a and 4b are more flexible versions of the graph-drawing program we experimented with earlier. Key in the version appropriate for your printer, and we'll use the graphing options we circled to make it generate the right sized graph. In line 50, the variable LS is used to set line spacing; change it to the value you circled. In line 60, the variable HS$ is used to set horizontal dot spacing; change it to the

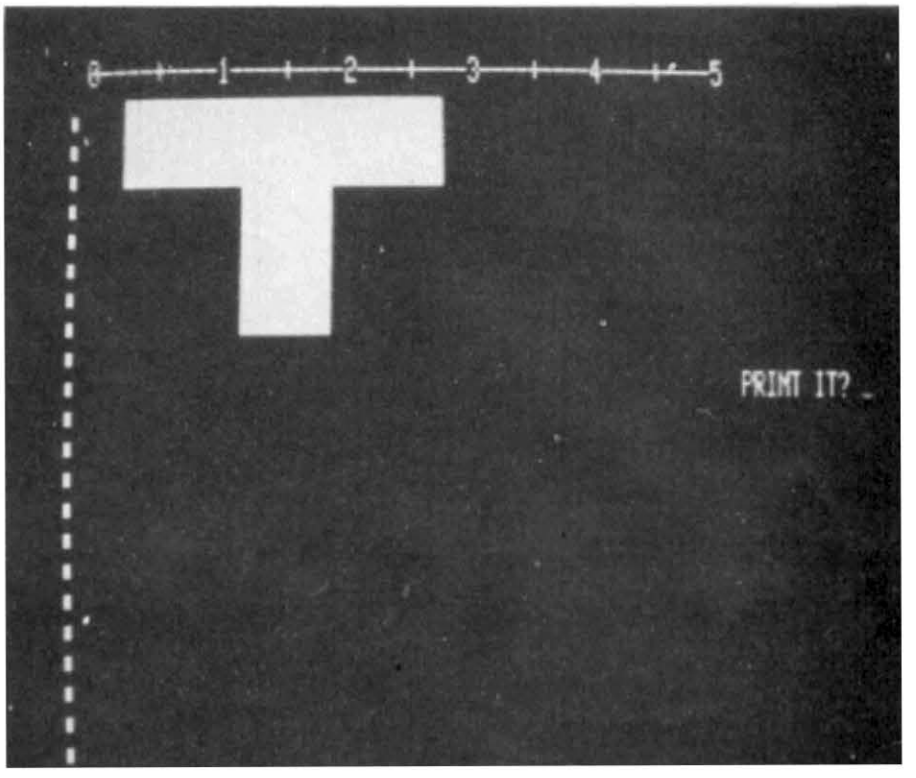

Photo 1. A partially completed "T".

Program Listing 4b

```
10 'LISTING 4b   *******  FOR MX-80 PRINTER  *******
20 'DRAWS A SCALED GRAPH TO AID IN MANUAL DIGITIZING
30 '
40 CLEAR 200: DEFINT A-Z
50 LS=18        'USED TO SET NO. OF 216ths INCH LINE SPACING
60 HS$="K"      'USED TO SELECT HORIZ. DOT-SPACING (480 OR 960)
70 ND=5         'USED TO SET DOT WIDTH OF BACKWARDS "L"
80 '
90 BL$=STRING$(ND-1,1)+CHR$(255)  'CREATE THE BACKWARDS  L
100 'NEXT FOUR LINES SET BYTE COUNT CODES FOR MX-80
```

Listing 4b continues

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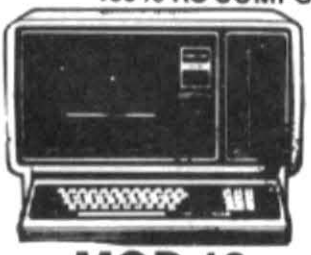

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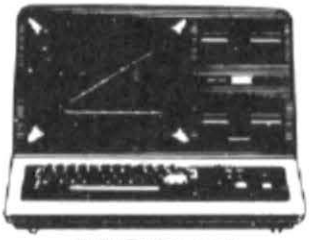

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Listing 4b continued

```
110 IF ND*48 <= 255 THEN BC=ND*48: BC$=CHR$(255): GOTO 160
120 IF ND*48 > 767 THEN BC=ND*48-768: BC$=CHR$(3): GOTO 160
130 IF ND*48 > 511 THEN BC=ND*48-512: BC$=CHR$(2): GOTO 160
140 IF ND*48 > 255 THEN BC=ND*48-256: BC$=CHR$(1): GOTO 160
150 '
160 CLS: INPUT"READY PRINTER AND PRESS <ENTER> ";A$
170 LPRINTCHR$(27)+"3";:POKE 14312,LS     'SET LINE SPACING
180 '
190 'PRINT THE GRAPH....
200 FOR ROW = 1 TO 49
210   LPRINT CHR$(27)+HS$;    'SET HORIZONTAL DOT-SPACING
220   POKE 14312,BC           'SEND THE 1st BYTE COUNT CODE
230   LPRINT BC$;             'SEND THE 2nd COUNT CODE
240     FOR BLOK = 1 TO 48
250       LPRINT BL$;             'SEND THE BACKWARDS "L"
260     NEXT BLOK: LPRINT
270 NEXT ROW
280 END
```

```
10 'LISTING 5a  *******  FOR NEC 8023 PRINTER  *******
20 'PROGRAM SHELL TO READ, DISPLAY, AND PRINT A DIGITIZED IMAGE
30 '  M. KELLER        ALBUQUERQUE, NM        (505) 294-4966
40 '
50 '================== INITIALIZE ======================
60 CLEAR 200: DEFINT A-Z: PR=14312: DIM A(48,48), BYTE(384)
70 HS$="N"        'N=PICA, E=ELITE, P=PROPORTIONAL, Q=COMPRESSED
80 'FUNCTION TO CONVERT 8 VERTICAL BLOCKS INTO A DECIMAL BYTE
90 DEF FN F1(X)=A(ROW,COL)+A(ROW+1,COL)*2+A(ROW+2,COL)*4+A(ROW+3
,COL)*8+A(ROW+4,COL)*16+A(ROW+5,COL)*32+A(ROW+6,COL)*64+A(ROW+7,
COL)*128
100 '=================== DISPLAY RASTER ==================
110 CLS: PRINT" 0";
120 FORX=1 TO 5: PRINT "----+----"+MID$(STR$(X),2,1);: NEXT X
130 FOR Y=4 TO 46 STEP 2: SET(0,Y): NEXT Y     'VERT. RASTER
140 '================ READ AND DISPLAY DATA ==============
150 READ TG$: ND=LEN(TG$): ON ERROR GOTO 210
160 FOR COL=0 TO ND-1 : A(ROW,COL)=0
170   IF MID$(TG$,COL+1,1)=" "THEN 190
180   A(ROW,COL)=1: SET(COL*2+4,ROW+3): SET(COL*2+5,ROW+3)
190 NEXT COL
200 READ TG$: IF TG$="DONE" THEN 230 ELSE ROW=ROW+1: GOTO 160
210 IF ERL = 180 THEN RESUME NEXT ELSE STOP
220 '================ PRINT THE GRAPHIC IMAGE ============
230 NR=ROW+1: ON ERROR GOTO 0
240 PRINT@501,"PRINT IT";: INPUT A$
250 'NEXT LINE BUILDS STRING FOR INITIALIZING GRAPHICS MODE
260 GR$=CHR$(27)+"S"+STRING$(5-LEN(STR$(ND)),"0")+RIGHT$(STR$(ND
),LEN(STR$(ND))-1)
270 LPRINT CHR$(27)+HS$;            'SET HORIZONTAL DOT-SPACING
280 LPRINT CHR$(27)+"T16"           'SET 16/144ths LINE SPACING
290 FOR ROW=0 TO NR-8 STEP 8
300 LPRINT GR$;      'SELECT GRAPHICS & SEND BYTE COUNT
310  FOR COL=0 TO ND-1
320    BN=BN+1: BYTE(BN)=FN F1(X)   'CONVERT 8 BLOCKS TO BYTE
330    IF PEEK(PR) <> 63 THEN 330 ELSE POKE PR,BYTE(BN)
340  NEXT COL: LPRINT
350 NEXT ROW
360 '================ PRINT DECIMAL DATA =================
370 INPUT"PRESS <ENTER> TO PRINT THE DECIMAL DATA ";A$
380 LPRINT CHR$(27)+"A";          'RESTORE NORMAL LINE SPACING
390 LPRINT CHR$(27)+"Q"           'SELECT COMPRESSED CHARACTERS
400 BN=0
410 FOR LN=1 TO NR/8: LPRINT USING"LINE #:  ";LN;
420  FOR B=1 TO ND: BN=BN+1
430    LPRINT USING"### ";BYTE(BN);
440  NEXT B: LPRINT
450 NEXT LN
460 'DATA LINES CAN BE ADDED HERE OR MERGED FROM ANOTHER FILE.
5000 DATA"DONE"
```

Program Listing 5a

Program Listing 5b

```
10 'LISTING 5b  **********  FOR MX-80 PRINTER  **********
20 'PROGRAM SHELL TO READ, DISPLAY, AND PRINT A DIGITIZED IMAGE
30 '  M. KELLER         ALBUQUERQUE, NM        (505) 294-4966
40 '
50 '================== INITIALIZE ======================
```

Listing 5b continues

character you circled. Finally, in line 70, the variable ND determines the width of each backwards "L" in the graph. Change this to the number of dots you circled.

Run this modifed version of Listing 4 using a plain sheet of paper, and examine the graph. It should be approximately square, and about the height of your original image. If you used a large original, the individual squares will not be completely formed, but this is not a problem. Now run the program once again with a sheet of tracing paper in the printer, then place this graph over the original image and secure it with paper clips (see Photo 2) to prevent it from shifting. You are ready to digitize your image.

A Program That Draws

There is one more program to key in: Listing 5 (a or b). This program, used to produce the final printout, contains everything necessary for developing, modifying, touching-up, displaying and printing the image. The only thing missing is, of course, the series of data strings at the end which will define your image. Typing these in is the digitizing process.

In our earlier example of digitizing, I used zeros and ones to represent the "off" and "on" squares. Actually, we can use any two characters, so long as the program knows how to interpret them. Program 5 treats a space as "off" and any other character as "on." The data statements themselves will take on the appearance of the image, a distinct advantage if any touching-up is necessary. Before adding any data statements to the program, save it so you can use it as a shell for other images.

Number your data statements starting with 1001, and use an increment of one. This way, each row of the graph will have a corresponding line number in the program. For example, row 12 of the graph will be represented by the data in line 1012. Line 5000 is a terminating string to tell the program there is no further information.

Palettes Ready?

Here's the easiest and fastest way I have found to build the data statements: With a pencil pointing to the appropriate square, press the space bar for each "off" block, and press the "M" key for each "on" block. Try to do this without looking at the keyboard, so you won't lose your place on the graph. (This is where a key "beep" comes in handy.) When you reach the end of a row in the graph, start the next data statement. It will be obvious in some cases that the next line of data matches the previous line. Repeating keys and some kind of line duplicating utility are worth their weight in postage stamps here.

The program will assume that the number of characters you enter into the first data line are the width of the image, so the remaining data statements should contain the same number of characters. Data lines should be entered in groups of eight, and you can generate a printout any time after

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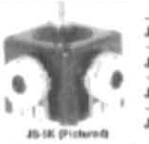

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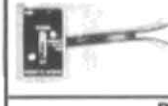

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Features are 8-position decimal select switch, one 3-position switch, and two 2-position switches, mechanical SPST switching, 22-pin edge card connector. Pin-out included.
Part No. KB29704D (Fits DTE-11 Enclosure) . . . . . $4.95 each

POWER SUPPLY +5VDC @ 1 AMP REGULATED *Transaction Tech*
Output +5VDC @ 1A (also +30VDC) reg. Input 115VAC 60Hz. 3-Wire (black/beige/green) enclosed cord, 6 ft. 2-wire black power cord. 5"L"W x 7"D x 2¼"H, wt. 3 lbs. Data sheet incl.
Part No. PS31194 . . . . . **$19.95 each**

POWER SUPPLY +5VDC @ 3 AMP REGULATED *Deltron*
Input 115VAC, 47-440Hz. Output: 5VDC Adjustable @ 3 amp, 5VDC @ 2.5 amp. Adjustable current limit. Ripple & Noise: 10MV rms, 50MV p-p — 2 mounting surfaces. UL recognized. Size 4"W x 4½"L x 2-7/16"H. wt. 2 lbs. Data sheet included.
Part No. DPS-1 . . . . . **$79.95 each**

POWER SUPPLY +5VDC @ 7.5 AMP, 12VDC @ 1.5 AMP SWITCHING
Input: 115VAC, 50-60Hz @ 3 amp/230VAC, 50Hz @ 1.5 amp. Fan will power supply when switch is in 230VAC. Output: 5VDC @ 7.5 amp, 12VDC @ 1.5 amp. 5% line, load, & 10% for 5V, 8% for 12V. Ripple & Noise: 50mV p-p. Size: 5"W x 8"L x 4"H. Wt. 6 lbs.
Part No. PS94VD . . . . . **$49.95 each**

POWER SUPPLY 4-Channel Switching - Apple Compatible
Microprocessor, semiconductor, terminal, medical equipment and process control applications. Input: 88-132VAC 47-440Hz. Output: +5VDC @ 8A, -5VDC @ 1A, +12VDC @ 1A, -12VDC @ 1A. Line reg.: ±0.2%, Ripple: 30mV p-p. Load reg.: ±1%. Overcurrent protection. Eff.: 70% min. adjust to ±10%. 5-3-7/8"L x 1-3/8"W x 4-15/16"H. Wt. 1½ lbs.
Part No. FCS-604A . . . . . **$69.95 each**

POWER SUPPLY Adjustable Switching 4-24VDC to 5 Amps
A4, 4-5VDC @ 5A, 6VDC @ 4.4A, 9VDC @ 3.3A, 12VDC @ 2.5A, 15VDC @ 1.5A, 24VDC @ 0.8A. Overload protection. Input: 115VAC 50/60Hz. Output variations within 2Watts. 6.25"L x 4.25"W x 2.25"H. wt. 3.25 lbs.
JE224 Kit . . . . . **$79.95 each**
JE224A Assembled & Tested . . . . . **$99.95 each**

JUMPER AND CABLE ASSEMBLIES

Custom Jumpers!

STANDARD DIP JUMPERS

All jumpers use low profile dip plugs with heavy duty pins for repeated disconnect applications.

DMC#	DIP Socket Reference	No. Pins	Wire Description	Wire Length	Price
DJ14-1	926102-1	14	single end	12"	$1.79
DJ14-2	926102-2	14	single end	24"	2.05
DJ14-3	926102-3	14	single end	36"	2.35
DJ14-1-14	926106-1	14	double end	12"	2.05
DJ14-2-14	926106-2	14	double end	24"	3.19
DJ14-3-14	926106-3	14	double end	36"	3.49
DJ16-1	926112-1	16	single end	12"	2.09
DJ16-2	926112-2	16	single end	24"	2.59
DJ16-3	926112-3	16	single end	36"	2.59
DJ16-1-16	926116-1	16	double end	12"	2.35
DJ16-2-16	926116-2	16	double end	24"	3.29
DJ16-3-16	926116-3	16	double end	36"	3.59
DJ18-1	926118-1	18	single end	12"	2.09
DJ18-2	926118-2	18	single end	24"	3.19
DJ18-3	926118-3	18	single end	36"	3.59
DJ18-1-18	926120-1	18	double end	12"	4.05
DJ18-2-18	926120-2	18	double end	24"	4.05
DJ18-3-18	926120-3	18	double end	36"	5.39

STANDARD DB25 SERIES CABLES

Now you can order DB25 P or S connectors with the cable necessary to fit your application. Choose from our standard flat cable in 4-foot lengths. **Call today.**

STANDARD CABLES

Part No.	Cable Length	Connectors	Price
DB25P-6	6 feet	1-DB25P	$7.95
DB25S-6	6 feet	1-DB25S	8.49
DB25P-6-P	6 feet	2-DB25P	13.49
DB25P-6-S	6 feet	1-DB25P/1-DB25S	13.75
DB25S-6-S	6 feet	2-DB25S	13.95

BUG BOX™ — 30 individual compartments • Stores 60 6-pin or 30 14- or 16-pin DIPs • Bug rugs not included • Clear plastic cover slides & locks • Cover marked w/numbers 1-30 • Compartment size: 1" x 3.25" x .5" deep • Box size: 4.9" x 3.3" x .6" • Weight: 1.25 oz.

BUG BOX™
Please specify color code (B: Blue, (R) Red, (W) White, (Y) Yellow

Part No./Color Code		QTY	PRICE
BGX-001-( )		1	$ 2.29
BGX-010-( )		10	19.99
	ANTI-STATIC		
BGX-001-( )	AS	1	$ 3.29
BGX-010-( )	AS	10	28.99

BUG CAGE™ — 12 locations store Bug Boxes, Big Bug Boxes or Bug Trays. • Modular and interlocking • Heavy duty, electrostatic molded plastic • Each cage has 6 slip-on locations • 2 cages per pkg. • Cage size: 5-1/8" x 5.1" x 3-7/8" • 4 cages available — please specify color code: (B) Blue, (R) Red, (W) White, (Y) Yellow

Part No./Color Code	Price
BGC-001-( ) (2 Cages of like col. ea.)	$11.95/pkg.

BUG TRAY™ — Stores in Bug Cage • Molded plastic • Three styles: Open (1 compartment) 3.25" x 4.6" x 6"L; Vertical (5 compartments 5" x 4.5" x 6"); and Horizontal (3 compartments 4" x 3.25" x 6") • Ideal for tools, hardware, components, etc. • Tray size: 3.35" x 5.05" x 6" • Black color only.

PART NO.	DESCRIPTION	PRICE
BTH-001	Horizontal Bug Tray	$1.95
BTV-001	Vertical Bug Tray	1.95
BTO-001	Open Bug Tray	1.95
BTX-003	1 of each Bug Tray (3)	4.50

BUG RUG™ — Static discharge protection for CMOS and MOSFET devices • Pre-cut to dimensions of BUG BOX (1" x .35")

Part No.	Description	Price
BRG-020	20 foam rectangles for Bug Box	$1.50
BRR-036	6 foam rec. for LSI Big Bug Box	1.00

CAGE KEEPER™ — Pins columns of Bug Boxes in Bug Cage

		Price
CKP-006	6 inch	$4.95/pkg.
CKP-010	10 inch	6.95/pkg.

BUG BOX™ STORAGE SYSTEMS

BUG CAGE™ (BGC-001-( )) with Bug Boxes

LSI BIG BUG BOX™ — Designed to store large IC's, Resistors, Capacitors and Diodes • Divided into three compartments measuring 1" x 4.15" x 5" deep • Three vertical and three horizontal dividers (removable) • Bug Rugs not included • Box size: 4.9" x 3.3" x 6" • Weight: 1.75 oz.

LSI BIG BUG BOX™
Please specify color code (B: Blue, (R) Red, (W) White, (Y) Yellow

PART NO./COLOR CODE		QTY	PRICE
BLK-001-( )		1	$ 3.29
BLK-010-( )		10	28.79
	ANTI-STATIC		
BLK-001-( )	AS	1	$ 4.29
BLK-010-( )	AS	10	37.99

BACK PACK™ — Self-adhesive labels for the backs of ICs • Shows board insertion location for IC (one) • 560 labels in 8 each packages (including several blank labels) • Each package for 8, 14, 16, 24, 28 and 40-pin ICs • Combo package includes 1,008 labels for TTL and CMOS ICs • Microprocessor package contains 744 labels

Part No.	Description	Price
BPT-012	TTL	$7.95
BPC-012	CMOS	8.95
BPM-012	Combo	14.95
BPU-013	Microprocessor	9.95

BUG TAGS™ — Self-adhesive, easy-to-read labels for marking Bug Box and LSI Big Bug Box • Most popular IC components

PART NO.	DESCRIPTION	QTY.	PRICE
BTT-200	TTL	200	$4.00
BTC-200	CMOS	200	4.00
BTK-200	LS Schottky	200	4.00
BTL-200	Special	200	4.00
BTM-500	Mixer	500	13.95

MORE BUG TAGS AVAILABLE!

★ ★ ★ **BUG BOX SYSTEMS INTRODUCTORY SPECIAL** ★ ★ ★

Your choice: regular or anti-static. Includes 2-Bug Cages (12 locations), 6-Bug Boxes: 04-30 Big Bug Boxes: 1 customized Bug Tray; 1-type Bug Tray: 1-vertical Bug Tray, 1 package Bug Rug for regular Bug Boxes: 1 package Bug Rug for LSI Big Bug Boxes: 1 package Mixer Labels (800 each). Color: Bug Boxes and Cages - Blue, Bug Trays - Black

SP-BUG	Regular (Retail value $69.40)	Sale Price $49.95
SP-BUG-AS	Anti-Static (Retail value $87.46)	Sale Price $59.95

$10.00 Minimum Order — U.S. Funds Only
California Residents Add 6½% Sales Tax
Shipping — Add 5% plus $1.50 Insurance
Send S.A.S.E. for Monthly Sales Flyer!

Spec Sheets — 30c each
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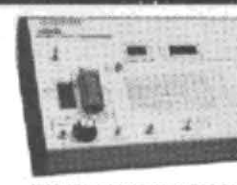
8K, 16K, 32K, 64K EPROM Programmer



2708,2716,2732 & 2764 EPROM Programmer

JE664 EPROM PROGRAMMER

8K TO 64K EPROMS — 24 AND 28 PIN PACKAGES
Self-Contained — Requires No Additional Systems for Operation

• Programs, validates and checks for properly erased EPROMs • Emulates PROMs or EPROMs • RS232C Computer interface for reading/programming • Loads data into RAM by keyboard • Changes data in RAM or keyboard • Loads RAM from an EPROM • Compares EPROMs for content differences • Copies EPROMs • Power is 115VAC, 50Hz, 4.10W power consumption • Enclosure: Color-coordinated, light tan panels w/smoked matte brown end pieces • Size: 10-5/8"L x 8½"D x 3¾"H • Wt.: 5½ lbs.

JE664-A EPROM Programmer **$995.00**
Assembled & Tested (includes JM16K Module)

JE665 — RS232C INTERFACE OPTION — The JE665 RS232C Interface Option implements complete access to the JE664's RAM. Sample software written in BASIC provided for TRS-80™ Model I, Level II Computer. Baud rate: 300 Light: 8 bits - odd parity. Stop bits: 2. Option may be added to other versions.

JE664-ARS EPROM Prog. w/JE665 Option **$1195.00**
Assembled and Tested (includes JM16K Module)

EPROM JUMPER MODULES — The JE664's JUMPER MODULE (Pictured) fits the JE664's 24-pin ZIF socket and has pin-outs JE664 can program. Also available is the EPROM 8 configures EPROM socket connections for that particular EPROM.

Part No.	EPROM	EPROM MANUFACTURER	PRICE
JM16A	2708	AMD, Mostek, National, Intel, TI	$14.95
JM16B	2716 TMS2516	Intel, Motorola, National, NEC, TI	$14.95
JM16C	TMS2716	Motorola, TI (+5,-42, +12)	$14.95
JM16D	TMS2532	Motorola, TI	$14.95
JM16E	2732	AMD, Fujitsu, NEC, Hitachi, Intel	$14.95
JM16F	2732 (24V)	Fujitsu, Intel	$14.95
JM16A-1	MCM68764, MCM68L764	Motorola	$14.95
JM16B	2764	Intel	$14.95
JM16C	TMS2564	TI	$14.95

8" Floppy Disk Drive

- Shugart 801R compatible
- Single-Sided
- 77 Tracks
- 400/800K Bytes Capacity
- Industry Standard

The **FDD100-8** 8" **Floppy Disk Drive** (Industry Standard) features single or double density. Recording mode: FM single, MFM double density. Transfer rate: 250K bits/sec. single density; 500K bits/sec. double density. The FDD100-8 is designed to work with the single sided, soft sectored IBM Diskette 1 or equiv. disk cartridge. Power: 115VAC @ 50-60Hz, + 24VDC @ 1.2 amps max., + 5VDC @ 1.2 amps max. Unit as pictured above does not include case, power supply, or cables). Size: 8.05"W x 14"L x 4.5"H. Weight: 12 lbs. incl. 36-pg manual.

Part No.		Price
FDD100-8	Buy 1 for	$299.95 each
FDD100-8	Buy 2 for	$259.95 each
FDD100-8	*Buy 10 for*	*$249.95 each*

5¼" Mini-Floppy Disk Drive

FOR TRS-80 MODEL I (Industry Standard)
Features single or double density. Recording mode: FM single, MFM double density. Power: + 12VDC (±0.5V) 1.6A max., +5VDC (±0.25V) 0.8A max. Unit as pic. at right does not incl. case, power supply, cables). 35 tpi, data book incl. Wt. 5½ lbs. Size: 5¼"W x 8"D x 3¼"H.

Part No.	Limited Density	Price
FD200		$179.95
Single-sided, 40 tracks, 250K bytes capacity		
FD250		$199.95
Double-sided, 35 tracks, 438K bytes capacity		

EXPAND YOUR MEMORY

TRS-80 to 16K, 32K, or 48K

**Model 1 =	From 4K to 16K Requires (1) One Kit
**Model 3 =	From 4K to 48K Requires (3) Three Kits
Color =	From 4K to 16K Requires (1) One Kit

**Model 1 equipped with Expansion Board up to 48K Two Kits Required — One Kit Required for each 16K of Expansion —

TRS-16K3 *200ns for Color & Model III $12.95
TRS-16K4 *250ns for Model I $10.95

TRS-80 Color 32K or 64K Conversion Kit

Kit comes complete with 8 each 4164-2 (200ns) 64K dynamic RAMs and conversion documentation. Converts TRS-80 color computers with D and E circuit boards, and all new color computers to 32K. Minor modifications of 32K memory will allow the use of all 64K of the dynamic RAM providing you have a FLEX DOS operating system.

TRS-64K2 . . . . . $54.95

Sprite-style Fan

- 36cfm free air delivery
- 3.125" sq. x 1.665" depth
- 10 yrs. cont. duty at 20°C
- 115V 50/60Hz

Metal Frame

PWS2107U	Cleaned & tested (used)	$ 9.95 ea.
*PWS2107F	New	$14.95 ea.

Muffin-style Fan

- 106cfm free air delivery
- 4.68" sq. x 1.90" depth
- 10 yrs. cont. duty at 20°C
- Impedance protected, ambients to 70°C
- 115V 50/60Hz 14W Wt. 17 oz.

Metal Frame

MU2A1-U	Cleaned & tested (used)	$9.95 ea.
*MU2A-1N	New	$14.95 ea.

Mostek DC/DC Converter +5 VOLTS TO -9 VOLTS

Input: +5V. Output: -9V regulated @ 30mA. Printed circuit mounting. Specifications incl.

DC10 . . . . . $2.95 ea. or 2/$4.95

See List of Advertisers on Page 371

Listing 5b continued

```
60 CLEAR 200: DEFINT A-Z: PR=14312: DIM A(48,48), BYTE(384)
70 HS$="K"  'HORIZ. SPACING (USE "K" FOR 480 MODE, "L" FOR 960)
80 'FUNCTION TO CONVERT 8 VERTICAL BLOCKS INTO A DECIMAL BYTE
90 DEF FN F1(X)=A(ROW+7,COL)+A(ROW+6,COL)*2+A(ROW+5,COL)*4+A(ROW
+4,COL)*8+A(ROW+3,COL)*16+A(ROW+2,COL)*32+A(ROW+1,COL)*64+A(ROW,
COL)*128
100 '==================== DISPLAY RASTER ====================
110 CLS: PRINT" 0";
120 FORX=1 TO 5: PRINT "----+----"+MID$(STR$(X),2,1);: NEXT X
130 FOR Y=4 TO 46 STEP 2: SET(0,Y): NEXT Y     'VERT. RASTER
140 '================ READ AND DISPLAY DATA ==================
150 READ TG$: ND=LEN(TG$): ON ERROR GOTO 210
160 FOR COL=0 TO ND-1 : A(ROW,COL)=0
170   IF MID$(TG$,COL+1,1)=" "THEN 190
180   A(ROW,COL)=1: SET(COL*2+4,ROW+3): SET(COL*2+5,ROW+3)
190 NEXT COL
200 READ TG$: IF TG$="DONE" THEN 230 ELSE ROW=ROW+1: GOTO 160
210 IF ERL = 180 THEN RESUME NEXT: ELSE STOP
220 '================ PRINT THE GRAPHIC IMAGE ================
230 NR=ROW+1: ON ERROR GOTO 0
240 PRINT@501,"PRINT IT";: INPUT A$
250 LPRINT CHR$(27)+"A"+CHR$(8)        'SET 8/72nds LINE SPACING
260 FOR ROW=0 TO NR-8 STEP 8
270 LPRINT CHR$(27)+HS$;      'SET HORIZONTAL DOT-SPACING
280 POKE PR,ND: LPRINT CHR$(255);      'SEND BYTE COUNT
290  FOR COL=0 TO ND-1
300    BN=BN+1: BYTE(BN)=FN F1(X)    'CONVERT 8 BLOCKS TO BYTE
310    IF PEEK(PR) <> 63 THEN 310 ELSE POKE PR,BYTE(BN)
320  NEXT COL: LPRINT
330 NEXT ROW
340 '================ PRINT DECIMAL DATA ====================
350 INPUT"PRESS <ENTER> TO PRINT THE DECIMAL DATA ";A$
360 LPRINT CHR$(27)+CHR$(64);      'RESET PRINTER
370 LPRINT CHR$(15)                'SELECT COMPRESSED CHARACTERS
380 BN=0
390 FOR LN=1 TO NR/8: LPRINT USING"LINE #:  ";LN;
400  FOR B=1 TO ND: BN=BN+1
410    LPRINT USING"### ";BYTE(BN);
420  NEXT B: LPRINT
430 NEXT LN
440 'DATA LINES CAN BE ADDED HERE OR MERGED FROM ANOTHER FILE.
5000 DATA"DONE"
```

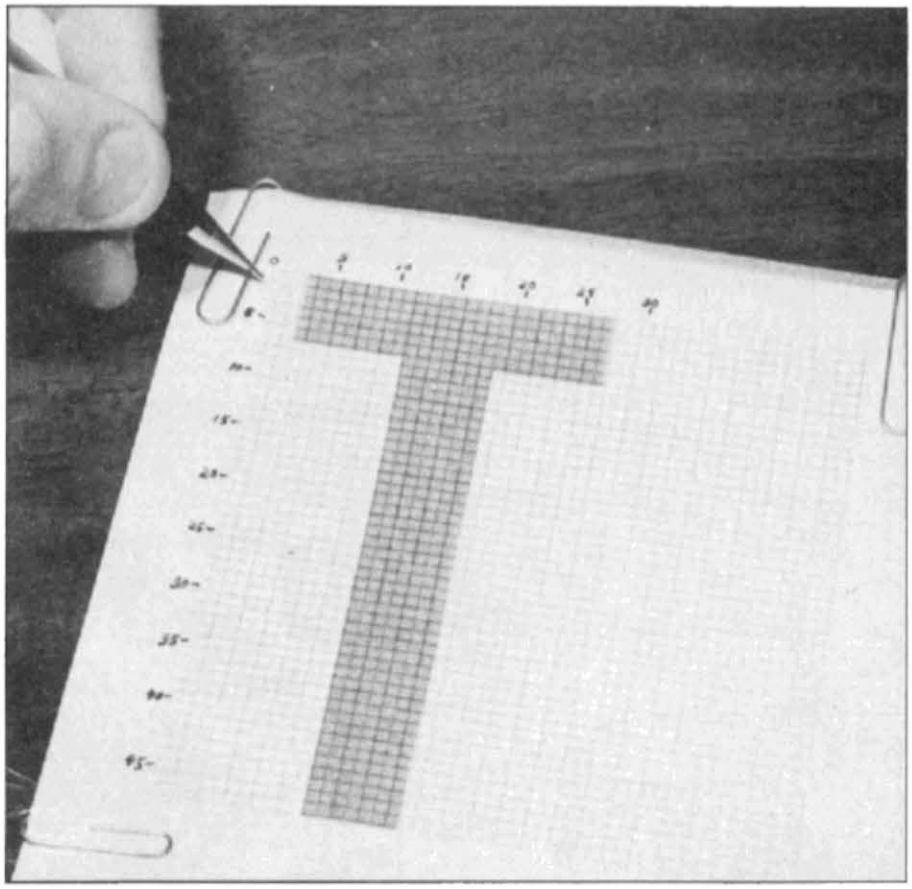


Photo 2. Graphing the letter "T".

entering the first eight lines. The aspect ratio (ratio of height to width) of the printed image will depend on the character assigned as HS$ in line 60.

Fine Tuning

Photo 1 shows the screen display after entering the first 16 lines of data for the block letter "T." Notice the "Print It?" prompt on the right side of the screen. If you want a printout of the image at this point, press enter. If you were running the program only to inspect the screen display, press break to stop the program.

As part of the display, there is a raster at the top of the screen, and a column of reference blocks along the left side. These aid you in determining which character of a data line may need to be changed (sooner or later you will enter something wrong). Since the raster uses the top 3 pixels of the screen, only the first 45 data statements are displayable below it as graphics.

There is another way to correct errors in data statements. Simply set your printer's line spacing to 14/144ths (7/72nds on the MX-80) and list the data statements. The small line spacing will compress the lines together in the listing, as in Fig. 4, and you will see right away which line contains the offending character.

Storing the Image

When you have finished entering the data lines and are satisfied with the image, save the data statements as you would save any Basic program. Whenever you want a printout of a stored image, merge the appropriate data file with the shell program and run it.

The printout includes the decimal values generated by the program in producing the image. To save disk space, you might want to store these values in a disk file instead of storing the data lines themselves. Properly read from the file and sent to the printer, these decimal values will produce the same image.

New Horizons

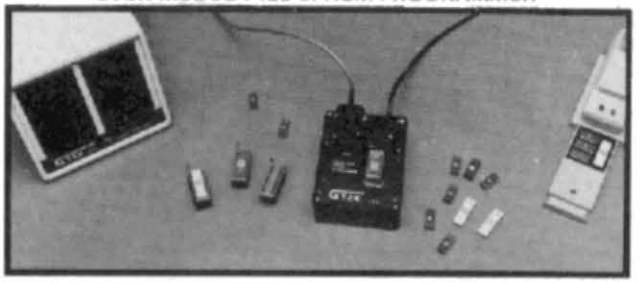
Having successfully completed your first digitizing project, you should now be able to build your own library of images—even a whole character set of block letters if you like that sort of thing. Figure 5 shows some sample images digitized this way. As you can see, you don't have to limit your images to block letters.

Some of the examples are inverse images. That is, they are drawn as white on a dark background. This is a good way to see the orientation of an image within its field. You don't have to enter a whole new set of data lines to get this effect. Just change the "=" sign in line 170 of Listing 5 to "<>". The image will appear inverted on the screen as well as on the printout.

Next month we will explore some additional digitizing techniques. Until then, have fun with your new electronic paintbrush! ■

Mike Keller is a self employed pilot, writer and programmer.

DEVELOPMENT HARDWARE/SOFTWARE
GTEK MODEL 7128 EPROM PROGRAMMER



- Microprocessor based intelligence for ease of use and interface. You send the data, the 7128 takes care of the rest.
- RS-232 interface and ASCII data formats make the 7128 compatible with virtually any computer with an RS-232 serial interface port.
- Auto-select baud rate.
- Use with or without handshaking. Bidirectional Xon/Xoff supported. CTS/DTR supported.
- Devices supported as of DEC 82.

NMOS	NMOS	CMOS	EEPROM	MPU'S
2758	2508	27C16	5213	8748
2716	2516	27C32	K2816	8749
2732	2532	C6716	48016	8741
2732A	2564	27C64		8742
2764	68766			8751
27128	8755			8755

- Read pin compatible ROMS also.
- Automatic use of proper program voltage based on type selected.
- Menu driven eprom type selection, no personality modules required. (40 pin devices require adapter)
- INTEL, Motorola and MOS-tec Hex formats. Split facility for 16 bit data-paths. Read, program, and formatted list commands also.
- Interupt driven type ahead, program and verify real time while sending data.
- Program single byte, block, or whole eprom.
- Intelligent diagnostics discern between eprom which is bad and one which merely needs erasing.
- Verify erasure and compare commands.
- Busy light indicates when power is being applies to program socket.
- Complete with TEXTOOL zero insertion force socket and integral 120 VAC power supply. (240 VAC/50HZ available also)
- High Performance/Cost ratio.

*** Model 7128 PRICE $389.00 ***

MODEL 7128 SOCKET ADAPTERS
MODEL 481 allows programming of 8748, 8749, 8741, 8742 single chip processors. **Price $98.00**

MODEL 511 allows programming the 8751, Intel's high powered single chip processor. **Price $174.00**

MODEL 755 allows programming the 8755 EPROM/IO chip **Price $135.00**

MODEL 7128/24 - budget version of the 7128. Supports 24 pin parts thru 32K only. Upgradable to full 7128 capacity. **Price $289.00**

Non-expandable, very low cost models available for specific devices.
MODEL 7128-L1 for 2716 only **$149.00**
MODEL 7128-L2 for 2732 only **$179.00**

Also available from stock:

Eprom Erasers UVP model QE-4	$78.00
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- **ISOLATOR (ISO-2) 2 filter isolated 3-rpong socket banks; (6 sockets total); integral Spike/Surge Suppression; 1875 W Max load, 1 KW either bank** $76.95
- **SUPER ISOLATOR (ISO-3) similar to ISO-1 except double isolation & Suppression** $115.95
- **SUPER ISOLATOR (ISO-11) similar to ISO-2 except double isolation & Suppression** $115.95
- **MAGNUM ISOLATOR (ISO-17) 4 Quad isolated sockets; For ULTRA-SENSITIVE Systems** $200.95
- **CIRCUIT BREAKER, any model (Add-CB)** ..... Add $10.00
- **REMOTE SWITCH, any model (Add-RS)** ..... Add $18.00

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Products for the TRS-80*
Models I & III

TSHARE 2.0 MULTI-USER SYSTEM TRS-80®

MODELS I & III

SPECIFICATIONS:
TSHARE is a **multi-tasking** operating system patch for two users. TSHARE requires the **NEWDOS80** V2 operating system. It allows simultaneous and separate operations within a single computer.

AVAILABLE USER MEMORY ABOVE 7F80 HEX
- 32K TRS-80: 16K FREE
- 48K TRS-80: 32K FREE

TIMESHARING MODES
- BULLETIN BOARD—One **split-screen** operator screen & 2 serial port users. (#TS-2C Only)
- STANDARD MODE—With all Systems. One console user & one serial port user.

SUPPORT EQUIPMENT
- One + Disk Drive
- 32K + Memory

• BULLETIN BOARD	STANDARD MODE
• NEWDOS80	• NEWDOS80 V2
• Two RS-232's	• One RS-232
• Two Modems	• One Terminal

FEATURES
- Type-ahead during Disk I/O
- Communications between users
- Concurrent execution of single program
- Reconfigure memory without restart
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Profile II Modified

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Have you ever wished the Model II Profile program would let you select records using Segments 2, 3, or 4? Or, worse, have you ever needed to change records in Profile II by hand? Here are two routines that may help. Even if you do not have Profile II but need help reading disk data files, this article may be useful.

Making Global Changes

As our example, use the practice Members file in the Profile II manual. Set the file up according to the instructions. Then, from the Main Menu select "1" for Define Data Formats. Type in the file name Members, choose Segment 1, and press H for Hardcopy. Go to the next Segment and get Hardcopy for that too. This will give us an easy-to-use map of records on the disk.

Profile II puts all Segment 1 data in a file with the extension /KEY, and all Segment 2 data in a file with the extension /DAT. We are not using Segments 3 or 4, but their information would be in files with extensions /DA2 and /DA3, respectively. Our file name is MEMBERS, and as we can see from the directory, there are several files with this name. The purpose of each is described in the manual.

When you make a selection (for Inquiry, Printout, or whatever), the program searches through the /KEY file (Seg. 1) to find a match. If it finds one, it gets the appropriate data from the other segments and displays the data as instructed. Although Profile II cannot, we humans can search the other Segments using a Basic program and find or change whatever we wish.

Using the sample files in the manual, let's say we need to charge everyone 10 percent more in fees next year. Program Listing 1 shows how such a

```
10 '  Search Segment 2 Data -- by J.B.Ford
20  CLEAR600: DEFINT I, J, N
210 INPUT "WHICH CITY ARE YOU LOOKING FOR"; CY$
220 CLS: PRINT "THESE ARE ALL THE RECORDS IN "; CY$
230 OPEN "R",1,"MEMBERS0/KEY": OPEN "R",2,"MEMBERS0/DAT"
235 '  Start Sub-record Field Loop
240 FOR J=0 TO 2
250   FIELD 1,(85*J)AS START$,10 AS LN$(J),10 AS F$(J),8 AS MN$(J),57 AS Y$(J)
260 NEXT J
270 FIELD 2, 25 AS AD$, 15 AS TY$, 216 AS X$
280 FOR I=1 TO LOF(2)
290   GET 2,I
300   IF LEFT$(TY$,LEN(CY$))=CY$ THEN GOSUB 400
310 NEXT I
320 CLOSE: PRINT: PRINT "ALL FINISHED."
330 END
400 N=INT((I+2)/3)
410 GET1, N
420 R=((I+2)/3-N)*3 +.001            '  Note Rounding Error Correction Here
430 PRINT I, F$(R); LN$(R); MN$(R)
440 RETURN
```

Program Listing 1

```
10 '  Global Change Program for PROFILE II by J.B.Ford
20  CLEAR 300: DEFINT I,J: CLS
30  INPUT "ENTER A DECIMAL VALUE FOR PERCENTAGE INCREASE (OR DECREASE)";P
40  IF ABS(P)<1 THEN 60
50  PRINT"THIS FIGURE MUST BE A DECIMAL FRACTION BETWEEN 0 AND 1": GOTO30
60  PRINT: PRINT"THE CHANGE WILL BE ";P*100;"% ACROSS THE BOARD."
70  OPEN "R",1,"MEMBERS0/KEY"
80  FOR I=0 TO 2
90    FIELD 1, (I*85) AS START$, 37 AS X$(I), 6 AS V$(I),42 AS X1$(I)
100 NEXT I
105 '  Start File-Reading loop
110 FOR I=1 TO LOF(1)
120   GET1,I
125 '  Change each Record in the Buffer
130   FOR J=0 TO 2
140     F(J)=VAL(V$(J))
150     F(J)=F(J) * (1+P)
160     LSET V$(J)=STR$(F(J))
170   NEXT J
180   PUT1,I
190 NEXT I
200 PRINT "MISSION ACCOMPLISHED"
210 CLOSE: END
```

Program Listing 2

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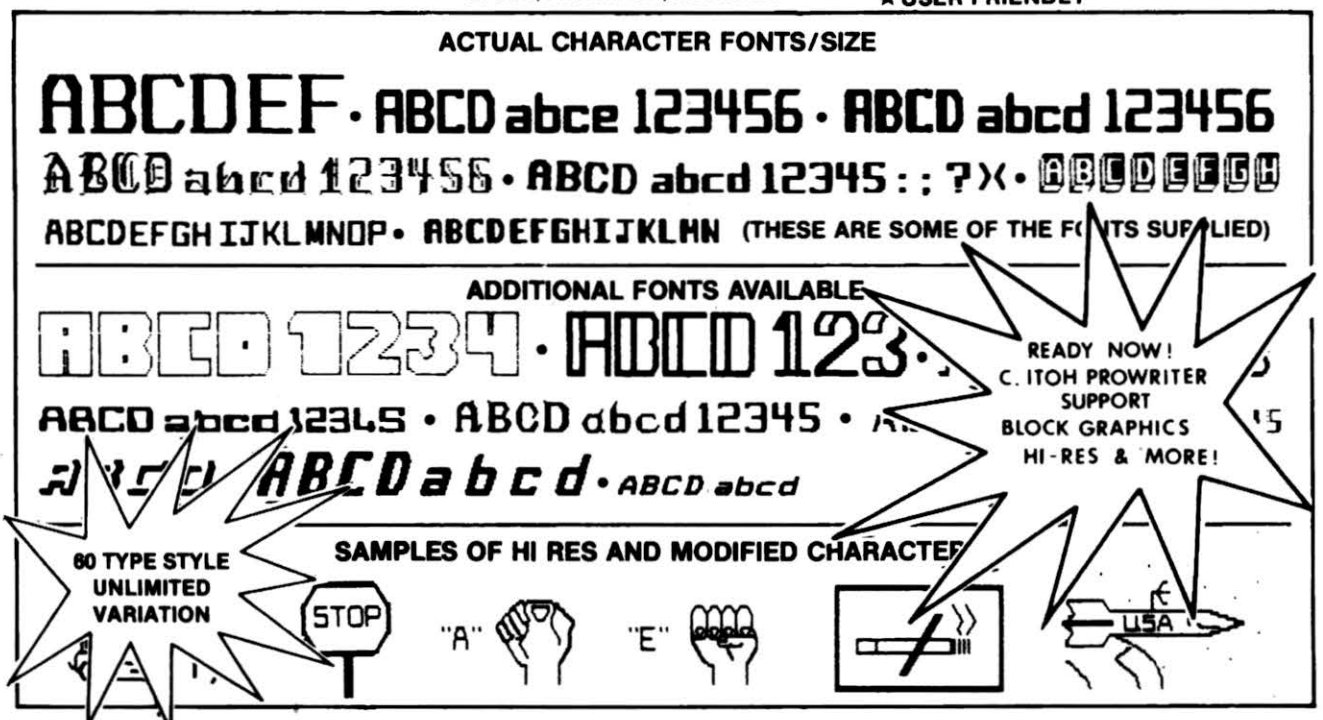

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global change is made. Although the file in the manual lists everyone at $500 per year, the program works with any yearly fee. Remember to specify two files when you go into Basic from TRSDOS.

Reading Profile II Data Files

Program lines 30-50 are only used in the percentage increase application. The real meat of the program begins at line 60. Segment 1 has 85 characters (bytes) of data. The reason for this inconsiderate limitation is that if you crowd three 85-byte Logical Records together in a file, you get 255 bytes of data. A null byte at the end totals 256 bytes, the length of one Physical Record in TRSDOS. The routine in lines 70-90 divides the buffer into three identical sections.

The Field statement corresponds roughly to the hardcopy we made back at Define File Format. Since we are chiefly interested in field 6 (FEE) we can skip all other fields and lump them together as X$(I), 37 bytes long. V$ is the value we want to change, so we specify its length (again from the Hardcopy) as six bytes and lump the remaining 42 bytes into X1$(I). This is done three times to fill the buffer, preparing it for the first record. Lines 100-180 take us from the first record (1) to the last (LOF(1)), using buffer 1.

Now when we Get a record (line 110), we will actually have three records in the buffer and can use a For...Next loop (lines 120-160) to manipulate information. The loop takes each subrecord, converts the six bytes of V$ into the single-precision value F, multiplies that value by the percentage factor input at line 30, changes it back to a string, and sets it back into the buffer, until all three subrecords are done.

Finally, line 170 puts the changed record back into the file, loops back to do the next record, and so on until the task is accomplished.

To get a total for FEES after making these changes add these two lines:

```
145 T = T + F(J)
185 PRINT "TOTAL = "; T
```

This shorter operation is preferable to setting up a printer format and wasting paper, ribbons and time making the Profile II program print a listing of each member. If only a total is needed, delete lines 30-50, 140, 150 and 170.

We can compute a total Balance Due figure (field 8) by editing the Field statement in line 80. Assume the annual fees have not yet been changed. Change the 37 to 49 and the 42 to 30 in line 80. Now, when we read the file, V$(I) represents the balance. Delete lines 30-50, 140, 150 and 170 to get a total Balance Due figure, again without using the line printer.

Segment 2

The other datafile Profile II created was the Segment 2 file, MEMBERS0/DAT. One problem with Profile II is its inability to select records using Segment 2 data as selection criteria. Suppose you have several hundred members in your file and want to find those in Boston. You could use the zip code from Segment 1, but you burned your zip code directory in protest over the new nine-digit system. Program Listing 2 shows how to do it.

Lines 240-260 are familiar from Listing 1. This time, we will print the first three fields and ignore the rest. The Field statement in line 270 is taken again from the Define File Format Hardcopy. The variable AD$ represents the address, for which we may also need to search sometime. Again, we search from the first record to the last; note, however, that we're using buffer 2 for the datafile, so we search through LOF(2). Any good comparison made in line 300 will send the computer scooting off to the 400 region to get the appropriate accompanying data to be printed. Because each record in Segment 2 is three times the size of a Segment 1 record, we need to divide the Segment 2 record number (I) by three. This enables us to get the right record from Segment 1. We still need to know which of the three sub-records to use. That is where line 420 comes in. If I is evenly divisible by three, the remainder (R) will be zero, so line 430 will print the first subrecord's data. (Remember, in Basic we count from zero up.) If I is not an even multiple of three, R will be one or two, which will give us the second or third subrecord in the buffer. The result is a list of members' names, membership numbers and Profile II record numbers of all those members living in the specified city.

On The Street Where You Live

This same program could search for all people living on the same street. Change lines 210 and 220 to say Street rather than City, but leave the CY$ variable. Change line 300 to IF INSTR (AD$,CY$) > 0 THEN GOSUB 400. Any record with the street you specified will be listed. We could not use the original line 300 because two addresses on the same street would have different numbers. The strings would not be equal and the computer would chug away until finishing the file. The new statement 300 examines AD$ to see if CY$ shows up anywhere. If it is there, INSTR returns a one, which sends us to the subroutine at line 400. If CY$ is not contained in AD$, INSTR returns a zero, and we drop down to line 310, and so on until we finish reading the file.

All we are doing here is reading the file. We could read it, change it and save the changes if we wanted. This would be especially helpful if we needed to total or change numeric data in Segments 2, 3 or 4. Just use the first program with an appropriate Field statement.

I based these two framework programs on the data in the Profile II manual, but they should work for your own data as well. Remember to change the Field statements to correspond to your data file structure and change the string variables to fit your own needs. With your own ingenuity (or someone else's cleverly written sort routine), you may never feel boxed in by 85 bytes again. ■

John Ford is an MBA student at the University of Virginia.

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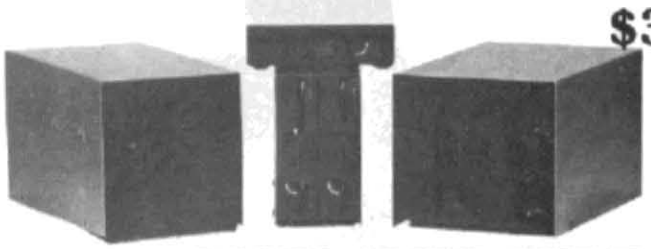

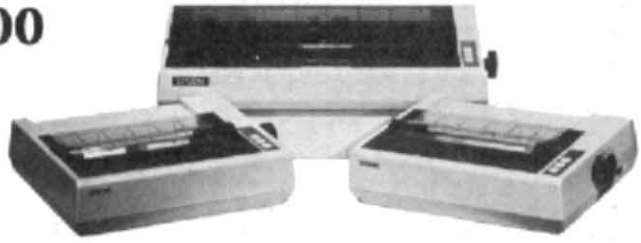

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3-D Printer Graphics

by Delmer D. Hinrichs

Do you have a dot-matrix printer that can plot bit-mapped graphics? These fancy peaks and waves will make it jump through hoops.

How many times have you looked at those computer-plotted surfaces and wished you could make similar plots? If you have a dot-matrix printer with the ability to plot bit-mapped graphics, you can!

The programs given here follow the method given by Bob Boothe (*80 Micro*, April 1981). They allow a variety of surfaces to be plotted, and although written for the Epson MX-80 printer with the Graftrax addition, they are easily modified for other bit-mapped dot-matrix printers. For added speed, Fortran versions of the programs are given.

Plotted figures can be saved as a disk data file. Plotting a figure from a disk data file takes only a few minutes, compared to the several hours required to calculate the position of each of the 125,000 dots making up a full-sized figure.

Programs

The Fortran program in Program Listing 1 will either print or save a surface figure onto disk. Why use Fortran? It's faster than even compiled Basic, and the ready-to-run CMD file is smaller than the equivalent Microsoft compiled Basic CMD file. If you do not have a Fortran compiler, the Basic program in Program Listing 2 may be used. It is written to be compiled with the Microsoft Basic compiler without program alterations.

To make multiple copies of a surface figure, it is most practical to save a disk data file, and then print copies from the disk file. Listing 1 or 2 will save to disk, and Program Listing 3 (in Fortran) or Program Listing 4 (in Basic) will read the file from disk and print it.

Program Listing 1. Fortran program to print a three-dimensional surface figure or to save it on disk as a disk data file.

```
00010   C                *****     Surface     *****
00020   C
00030   C        Written by:      Delmer D. Hinrichs
00040   C                         2116 S. E. 377th Ave.
00050   C                         Washougal, Wash.  98671
00060   C
00070   C        A program to plot a 3-D surface using bit-mapped graphics
00080   C        with the Epson MX-80 printer and Graftrax.
00090   C
00100   C        Concept by Bob Boothe, 80-Micro, April 1981, p. 122
00110   C
00120   C
00130            DIMENSION LL(960), HM(7), XP(7), YP(7), WX(7), WY(7)
00140            LOGICAL UI, YU, YL, NU, NL, DU, DL, PU, PL, B(256)
00150            DATA YU /'Y'/, YL /'y'/, NU /'N'/, NL /'n'/,
00160           1     DU /'D'/, DL /'d'/, PU /'P'/, PL /'p'/
00170     99     IC=0
00180            ID=0
00190   C
00200   C        Get user inputs
00210   C
00220            WRITE (5, 1)
00230     1      FORMAT ('  ', 19X, '*****     Surface     *****'/
00240           1         23X, 'by Delmer D. Hinrichs'//
00250           2         ' Save figure on Printer or Disk (P/D)? _¬')
00260            READ (1, 2) UI
00270     2      FORMAT (A1)
00280            IF (UI .EQ. DU .OR. UI .EQ. DL) ID=1
00290            IF (ID .EQ. 0 .AND. UI .NE. PU .AND. UI .NE. PL) GOTO 99
00300            WRITE (5, 3)
00310     3      FORMAT (' Choose plotting parameters',
00320           1         ' (suggested values in parenthesis)'//
00330           2         ' No. of lines of dots to print (750)? _¬')
00340            READ (1, 4) LN
00350     4      FORMAT (I4)
00360            MF=LN*2/3
00370    100     WRITE (5, 5) MF, MF
00380     5      FORMAT (' Then surface is a ', I3, ' x ', I3, ' square field'//
00390           1         ' Number of peaks in field (1 to 7)? _¬')
00400            READ (1, 4) NP
00410            IF (NP .LT. 1 .OR. NP .GT. 7) GOTO 100
```

Listing 1 continues

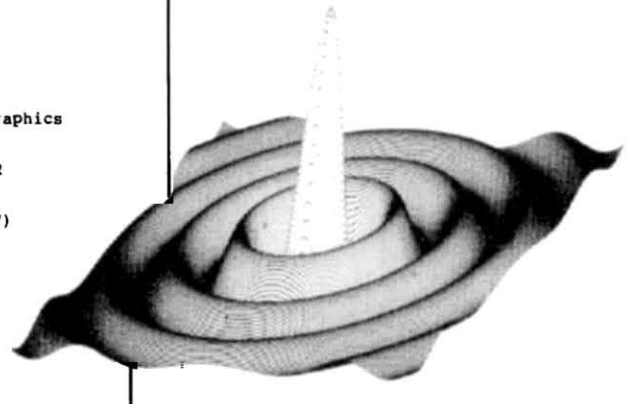

Fig. 1. A single peak with circular surrounding waves.

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Listing 1 continued

```
00420           WRITE (5, 6)
00430     6     FORMAT (' Left margin offset (300)? _¬')
00440           READ (1, 4) LM
00450           DO 13 I=1,NP
00460    101      WRITE (5, 7) I
00470     7       FORMAT (' Peak No.', I2, ',  Circular form waves (Y/N)? _¬')
00480             READ (1, 2) UI
00490             IF (UI .EQ. YU .OR. UI .EQ. YL) IC=1
00500             IF (IC .EQ. 0 .AND. UI .NE. NU .AND. UI .NE. NL) GOTO 101
00510             WRITE (5, 8) I, MF
00520     8       FORMAT (' Peak No.', I2, ',  X position (0 to', I4, ')? _¬')
00530             READ (1, 4) IP
00540             XP(I)=FLOAT(IP)
00550             WRITE (5, 9) I, MF
00560     9       FORMAT (' Peak No.', I2, ',  Y Position (0 to', I4, ')? _¬')
00570             READ (1, 4) IP
00580             YP(I)=FLOAT(IP)
00590             M=MF/7
00600             IF (IC .NE. 1) M=IFIX(FLOAT(MF)/4.5)
00610             WRITE (5, 10) I, M
00620    10       FORMAT (' Peak No.', I2, ',  X wave length (', I3, ')? _¬')
00630             READ (1, 4) IP
00640             WX(I)=6.28319/FLOAT(IP)
00650             WRITE (5, 11) I, M
00660    11       FORMAT (' Peak No.', I2, ',  Y wave length (', I3, ')? _¬')
00670             READ (1, 4) IP
00680             WY(I)=6.28319/FLOAT(IP)
00690             M=LM+IFIX(XP(I))-20
00700             WRITE (5, 12) I, M
00710    12       FORMAT(' Peak No.',I2,',  Height multiplier',
00720         1          ' (50 to', I4, ')? _¬')
00730             READ (1, 4) IP
00740             HM(I)=FLOAT(IP)
00750    13       CONTINUE
00760   C
00770   C       Initialize
00780   C
00790           MM=960
00800           DO 14 I=1,MM
00810             LL(I)=0
00820    14       CONTINUE
00830           DI=1.0/8192.0
00840           K=7
00850           NC=0
00860           N=1
00870           M=1
00880           IF (ID .EQ. 0) GOTO 15
00890   C
00900   C       Open disk file to save figure on disk
00910   C
00920           CALL OPEN (6, 'SURFACE/DAT ', 256)
00930           GOTO 20
00940   C
00950   C       Set MX-80 with Graftrax for bit-mapped graphics
00960   C
00970    15     IF (PEEK(14312) .GT. 127) GOTO 15
00980           CALL POKE (14312, 27)
00990    16     IF (PEEK(14312) .GT. 127) GOTO 16
01000           CALL POKE (14312, 64)
01010    17     IF (PEEK(14312) .GT. 127) GOTO 17
01020           CALL POKE (14312, 27)
01030    18     IF (PEEK(14312) .GT. 127) GOTO 18
01040           CALL POKE (14312, 65)
01050    19     IF (PEEK(14312) .GT. 127) GOTO 19
01060           CALL POKE (14312, 8)
01070    20     CALL OUT (254, 1)
01080   C
01090   C       Calculate graphics dots for each line of surface
01100   C
01110           DO 90 I=1,LN
01120             WRITE (5, 21) I
01130    21       FORMAT (' Line #', I4)
01140   C
01150   C         Power of 2 for dot line being calculated
01160   C
01170             NS=1
01180             IF (K .EQ. 0) GOTO 22
01190             DO 22 J=1,K
01200               NS=NS+NS
01210    22         CONTINUE
01220   C
01230   C         Calculate X Y Z position of each dot on surface
01240   C
01250             IL=2000
01260             IH=-IL
01270             DO 80 J=1,MF
01280               IF (J .GT. I) GOTO 80
01290               IX=(I-J)*2
01300               IF (IX .GT. MF) GOTO 80
01310               X=FLOAT(IX)
01320               Y=FLOAT(J)
01330               Z=FLOAT(IX+LM)
01340   C
01350   C             Add effects of each peak
01360   C
01370               DO 70 L=1,NP
01380                 X1=(X-XP(L))*WX(L)+DI
01390                 Y1=(Y-YP(L))*WY(L)+DI
01400                 IF (IC .EQ. 1) GOTO 30
01410   C
01420   C               Four-way bumps around this peak
01430   C
01440                 Z=Z-SIN(X1)/X1*SIN(Y1)/Y1*HM(L)
01450                 GOTO 70
01460   C
01470   C               Circular waves around this peak
01480   C
01490    30           W=SQRT(X1*X1+Y1*Y1)+DI
01500                 Z=Z-SIN(W)/W*HM(L)
```

Listing 1 continues

Sample Surfaces

The simplest surface is shown in Fig. 1, one peak with circular waves surrounding it. A slightly more complex surface is shown in Fig. 2, still only one peak, but with alternate bumpy waves instead of circular form waves.

Two peaks with different height and wavelength and interacting circular waves make a more complicated surface in Fig. 3.

Finally, Figs. 4 and 5 give two different views of a still more complex surface. The two perspectives are obtained by rotating one figure by 90 degrees or flipping it over. Although it seems to have four peaks (two poking out from the underside), this figure was formed from just two peaks. They were identical, each surrounded by elliptical waves, but one was rotated by 90 degrees and its peak went down in the center of the field, while the other went up in the center of the field. Thus the pri-

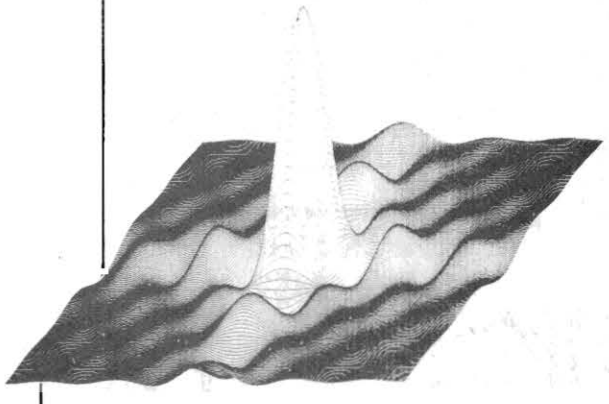

Fig. 2. A single peak with bumpy waves surrounding it.

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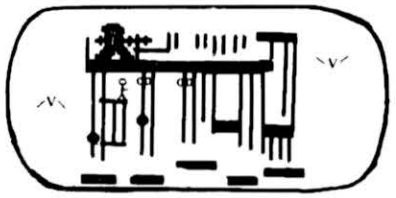

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mary peaks cancel.

Choosing Plotting Parameters

Several values must be entered before the program plots a figure. To avoid confusion, the program suggests suitable values (but you are free to choose other values). Some trial and error may be needed to get that "perfect" figure.

The program first asks whether you want to print the figure as calculated, or save it as a disk data file. If you save a disk data file, be sure to have enough disk space available. A full-sized figure with 750 lines of dots that nearly fill an 8½-by-11-inch sheet of paper requires 71 grans of disk space.

Next, the program asks how many lines of dots you wish to print. The MX-80 prints 72 lines per inch, so the 750 lines suggested will print a figure that is about 10.4 inches long. Since the program always plots a square surface, the time required to calculate a figure is proportional to the square of the number of lines of dots you select.

After displaying the size of the field to be plotted (calculated from the number of lines of dots you entered), you are asked to enter the number of peaks de-

Listing 1 continued

```
01510    70           CONTINUE
01520               IZ=IFIX(Z)
01530  C
01540  C            Check if this dot is offscale or hidden
01550  C
01560                IF (IZ .LT. 1 .OR. IZ .GT. 960) GOTO 80
01570                IF (IZ .GT. IL .AND. IZ .LT. IH) GOTO 80
01580  C
01590  C            Reset hidden area of this dot line
01600  C
01610                IF (IZ .LT. IL) IL=IZ
01620                IF (IZ .GT. IH) IH=IZ
01630  C
01640  C            Set dot
01650  C
01660                LL(IZ)=LL(IZ) .OR. NS
01670    80          CONTINUE
01680              K=K-1
01690              IF (K .LT. 0) GOTO 200
01700    90        CONTINUE
01710            IF (K .LT. 7) GOTO 200
01720  C
01730  C         Figure completed
01740  C
01750            IF (ID .EQ. 0) GOTO 92
01760  C
01770  C         Calculate number of bytes to fill disk sector
01780  C
01790            PR=FLOAT(NC)*960.0/256.0
01800            MM=IFIX(AMOD(PR,256.0))
01810            NC=-1
01820            IF (MM .GT. 0) GOTO 200
01830            ENDFILE 6
01840            GOTO 95
01850  C
01860  C         Reset printer for normal print
01870  C
01880    92      IF (PEEK(14312) .GT. 127) GOTO 92
01890            CALL POKE (14312, 27)
01900    93      IF (PEEK(14312) .GT. 127) GOTO 93
01910            CALL POKE (14312, 64)
01920            WRITE (2, 94)
01930    94      FORMAT (//)
01940  C
01950  C         Program end
01960  C
01970    95      CALL OUT (254, 0)
01980            WRITE (5, 96)
01990    96      FORMAT (//// ' Finally Done!!!!' //
02000         1          ' Do you want to do another one (Y/N)? _¬')
02010            READ (1, 2) UI
02020            IF (UI .EQ. YU .OR. UI .EQ. YL) GOTO 99
02030            GOTO 999
02040  C
02050  C         Save figure on printer or disk?
02060  C
02070    200     IF (ID .EQ. 0) GOTO 210
02080  C
02090  C         Save bit-mapped graphics characters onto Disk
02100  C
02110            DO 202 J=1,MM
02120              IB=LL(J)
02130              LL(J)=0
02140              IF (IB .GT. 127) IB=IB-256
02150              B(N)=IB
02160              N=N+1
02170              IF (N .LT. 257) GOTO 202
02180              CALL OUT (254, 0)
02190              WRITE (6, REC=M, END=900) B
02200              CALL OUT (254, 1)
02210              M=M+1
02220              N=1
02230    202       CONTINUE
02240            WRITE (5, 204)
02250    204     FORMAT (' ')
02260            NC=NC+1
02270            K=7
02280            GOTO 90
02290  C
02300  C         Routine to print bit-mapped graphics characters
02310  C
02320    210     IF (PEEK(14312) .GT. 127) GOTO 210
02330            CALL POKE (14312, 27)
02340    212     IF (PEEK(14312) .GT. 127) GOTO 212
02350            CALL POKE (14312, 76)
02360    214     IF (PEEK(14312) .GT. 127) GOTO 214
02370            CALL POKE (14312, 192)
02380    216     IF (PEEK(14312) .GT. 127) GOTO 216
02390            CALL POKE (14312, 3)
02400            DO 220 J=1,MM
02410    218       IF (PEEK(14312) .GT. 127) GOTO 218
02420              CALL POKE (14312, LL(J))
02430              LL(J)=0
02440    220       CONTINUE
02450            K=7
02460            WRITE (5, 204)
02470            WRITE (2, 204)
02480            GOTO 90
02490  C
02500    900     WRITE (5, 910)
02510    910     FORMAT (/// ' ***   DISK ERROR   ***' ///)
02520            ENDFILE 6
02530  C
02540  C         For Model III TRS-80s, change all statements of:
02550  C
02560  C         CALL POKE (14312, n)   to:   CALL OUT (248, n)
02570  C
02580    999     END
```

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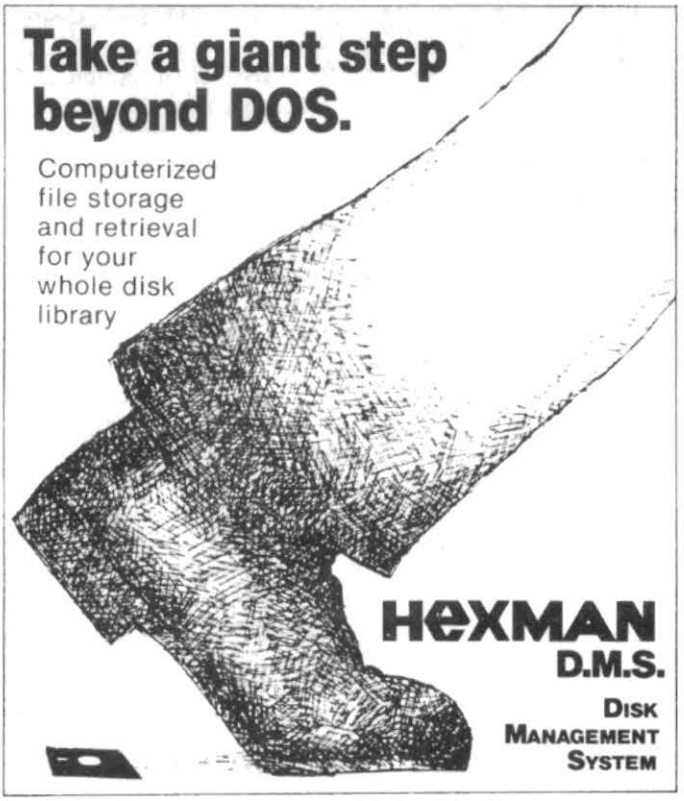

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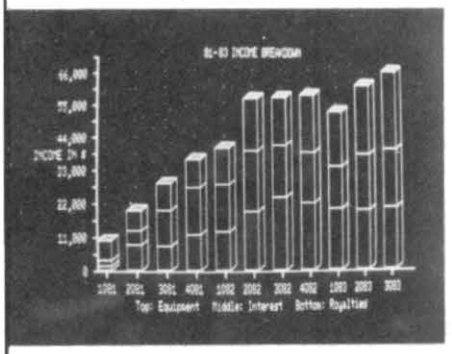

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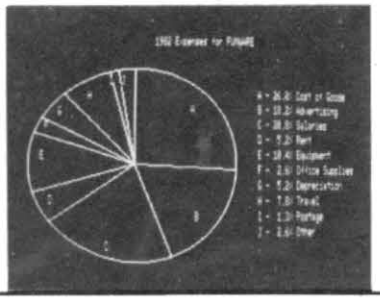

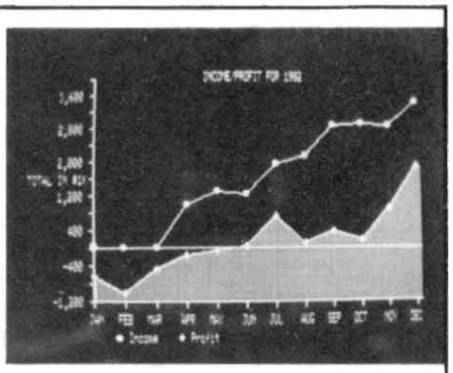

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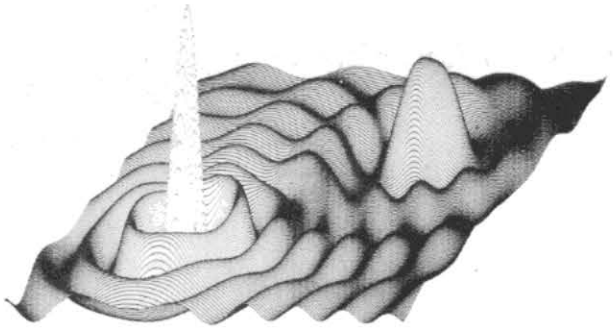

Fig. 3. Two peaks with different height and wave-length and the interactions of their surrounding waves.

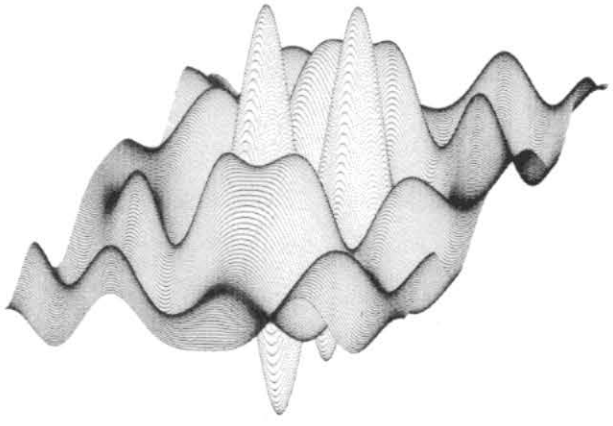

Fig. 4. The complex surface formed from the interactions between two identical peaks and their elliptical surrounding waves. The peaks are both at the center of the field, one up and one down, so the primary peaks cancel.

sired. One to seven peaks can be plotted for each figure. The more complex the surface, the greater the calculation time.

The left margin offset is in the same units as the size of the field. It determines how far across the paper the plot starts. Adjustments may be needed to keep tall peaks from going off-scale.

Setting Parameters

Circular form waves give a figure like the one shown in Fig. 1, while the alternate bumpy waves are shown in Fig. 2.

Set the position of each peak. The X axis is crosswise of the sheet, while the Y axis is lengthwise of the sheet. While the suggested limits place the peak within the plotted surface, the peak may actually be placed off the plotted surface, so that only its waves affect the surface that is plotted.

The wavelengths selected for each peak determine how broad or narrow the peaks and waves are. Identical X and Y wavelengths produce circular waves, while different wavelength values produce elliptical waves.

The height multiplier for each peak is in the same units as the size of the field. A positive multiplier gives an upwards peak, while a negative multiplier results

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Program Listing 2. Basic program to print a three-dimensional surface figure or to save it on disk as a disk data file.

```
10 CLS :PRINTTAB(20)"*****   Surface   *****"
20 ' 3-D bit-mapped graphics program for Epson MX-80 w/Graftrax
30 ' by Delmer D. Hinrichs, 2116 SE 377th, Washougal, Wn. 98671
40 DEFINT I-N :DIM L(960), HM(7), XP(7), YP(7), WX(7), WY(7)
50 IC=0 :ID=0
60 PRINT :PRINT"Save figure on Printer or Disk (P/D)? ";
70 GOSUB 620 :IF A$="D" THEN ID=1 ELSE IF A$<>"P" GOTO 70
80 PRINT :PRINT"Choose plotting parameters";
   " (suggested values in parenthesis)" :PRINT
90 INPUT"No. of lines of dots to print (750)"; A$ :LN=VAL(A$)
100 MF=LN*2/3 :IF LN<1 OR LN>750 GOTO 90
110 PRINT"Then surface is a"; MF; "x"; MF; "square field"
120 INPUT"Number of peaks in field (1 to 7)"; A$ :NP=VAL(A$)
130 IF NP<1 OR NP>7 GOTO 120
140 INPUT"Left margin offset (300)"; A$ :LM=VAL(A$)
150 IF LM<0 OR LM>900 GOTO 140
160 FOR I=1 TO NP :PRINT
170   PRINT"Peak No."; I; ",  Circular form waves (Y/N)? ";
180   GOSUB 620 :IF A$="Y" THEN IC=1 ELSE IF A$<>"N" GOTO 180
190   PRINT:PRINT"Peak No."; I; ",  X position (0 to"; MF; ")";
200   INPUT A$ :XP(I)=VAL(A$)
210   PRINT"Peak No."; I; ",  Y position (0 to"; MF; ")";
220   INPUT A$ :YP(I)=VAL(A$)
230   IF IC THEN M=MF/7 ELSE M=MF/4.5
240   PRINT"Peak No."; I; ",  X wave length ("; M; ")";
250   INPUT A$ :WX(I)=6.28319/VAL(A$)
260   PRINT"Peak No."; I; ",  Y wave length ("; M; ")";
270   INPUT A$ :WY(I)=6.28319/VAL(A$)
280   M=LM+XP(I)-20
290   PRINT"Peak No."; I;",  Height multiplier (50 to"; M; ")";
300   INPUT A$ :HM(I)=VAL(A$)
310   NEXT I :PRINT
320 DI=1/8192 :K=7 :NC=0 :MM=960
330 IF ID OPEN"O",1,"SURFACE/DAT"
340 IF ID=0 LPRINT CHR$(27); "@"; CHR$(27); "A"; CHR$(8)
350 OUT 254,1
360 FOR I=1 TO LN :PRINT"Line #";I,
370   NS=1 :IF K FOR J=1 TO K :NS=NS+NS :NEXT J
380   IL=2000 :IH=-IL
390   FOR J=1 TO MF
400     IF J>I THEN J=MF :GOTO 500
410     IX=(I-J)*2 :IF IX>MF GOTO 500
420     X=IX :Y=J :Z=IX+LM
```

Listing 2 continues

in a downwards peak.

Selection of these parameters allows you to plot any number of different surfaces. When trying to choose good values, it's smart to try them on a small figure first. When the proportions look right, expand the figure to full size.

The Fortran versions take nearly two hours to calculate a one-peak, full-sized figure with 750 lines of dots, but will print such a figure from a disk file in just over six minutes. This is almost full printer speed in the high-resolution graphics mode. Uncompiled Basic versions will take eight to 10 times as long.

During calculation, the programs display the dot line numbers that they are working on, in groups of eight, to assure you that the program is still operating.

Program Details

For TRS-80 systems with an Archbold clock control board, the CALL OUT (254,1) statement in Fortran, or the similar OUT 254,1 statement in Basic, increases speed. To slow the clock back to normal for disk operation or for the end of the program, the CALL OUT (254,0) statement is used. These statements have no effect without the board.

Listing 2 continued

```
430      FOR N=1 TO NP
440        X1=(X-XP(N))*WX(N)+DI :Y1=(Y-YP(N))*WY(N)+DI
450        IF IC THEN W=SQR(X1*X1+Y1*Y1)+DI :Z=Z-SIN(W)/W*HM(N)
           ELSE Z=Z-SIN(X1)/X1*SIN(Y1)/Y1*HM(N)
460        NEXT N :IZ=Z
470      IF IZ<0 OR IZ>MM GOTO 500
480      IF IZ>IH THEN IH=IZ :L(IZ)=L(IZ) OR NS
490      IF IZ<IL THEN IL=IZ :L(IZ)=L(IZ) OR NS
500      NEXT J :K=K-1 :IF K<0 GOSUB 670
510    NEXT I :IF K<7 GOSUB 670
520 PR=NC*MM/256 :MM=(1-(PR-INT(PR)))*256
530 IF MM AND ID GOSUB 670
540 IF ID=0 LPRINT CHR$(27); "@"; STRING$(2,13)
550 OUT 254,0
560 PRINT :PRINT"Finally Done!!!"
570 PRINT :PRINT"Do you want to do another one (Y/N)? ";
580 GOSUB 620 :IF A$="Y" GOTO 10 ELSE IF A$<>"N" GOTO 580
590 CLS :PRINT"That's all, then" :PRINT :PRINT
600 END
610 ' Get one character from keyboard
620 PRINT CHR$(95); CHR$(24);
630 A$=INKEY$ :IF A$="" GOTO 630
640 A=ASC(A$) :IF A>95 THEN A=A-32 :A$=CHR$(A)
650 PRINT A$; CHR$(24); :RETURN
660 ' Save figure on printer or disk?
670 IF ID=0 GOTO 750
680 ' Save bit-mapped graphics characters onto Disk
690 OUT 254,0
700 FOR J=1 TO MM
710   PRINT #1, CHR$(L(J)); :L(J)=0
720   NEXT J :OUT 254,1 :PRINT :K=7 :NC=NC+1
730 RETURN
740 ' Print bit-mapped graphics characters on MX-80
750 LPRINT CHR$(27); "L"; CHR$(192); CHR$(3);
760 FOR J=1 TO MM
770   IF PEEK(14312)>127 GOTO 770
780   POKE 14312,L(J) :L(J)=0
790   NEXT J :K=7 :PRINT :LPRINT
800 RETURN
810 ' For Model III TRS-80s, in line 780 change:
820 '    POKE 14312,L(J)    to    OUT 248,L(J)
```


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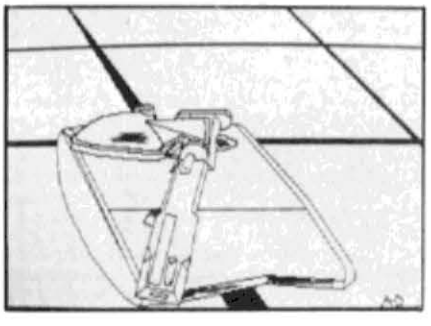

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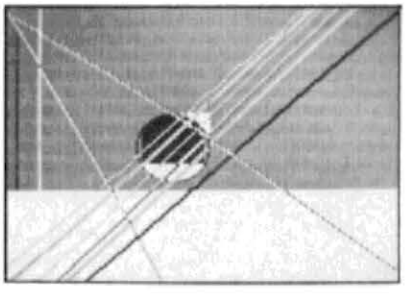

application. Businessmen and scientist can use DRAW to add text labels or other refinements to previously generated graphs. Once the picture is centered, labeled and refined, it can be saved on disk/tape or printed on any of 20 popular printers. All of this is done with single letter commands without ever leaving the DRAW program.

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Line 230 of Listing 1 contains the characters ' [\[__'. These represent the two ASCII characters 28 and 31 (Control \ and Control __) and are the equivalent of CLS in Basic. I entered them with the Superzap utility of NEWDOS80, but they may be left out without affecting program operation.

Also, the ' __[X' in program lines 250, 330, 390, 430, 470, 520, 560, 620, 660, 720, and 2000 represent ASCII 95 and 24 (underline and backspace, or Control X) to simulate the input prompt of Basic.

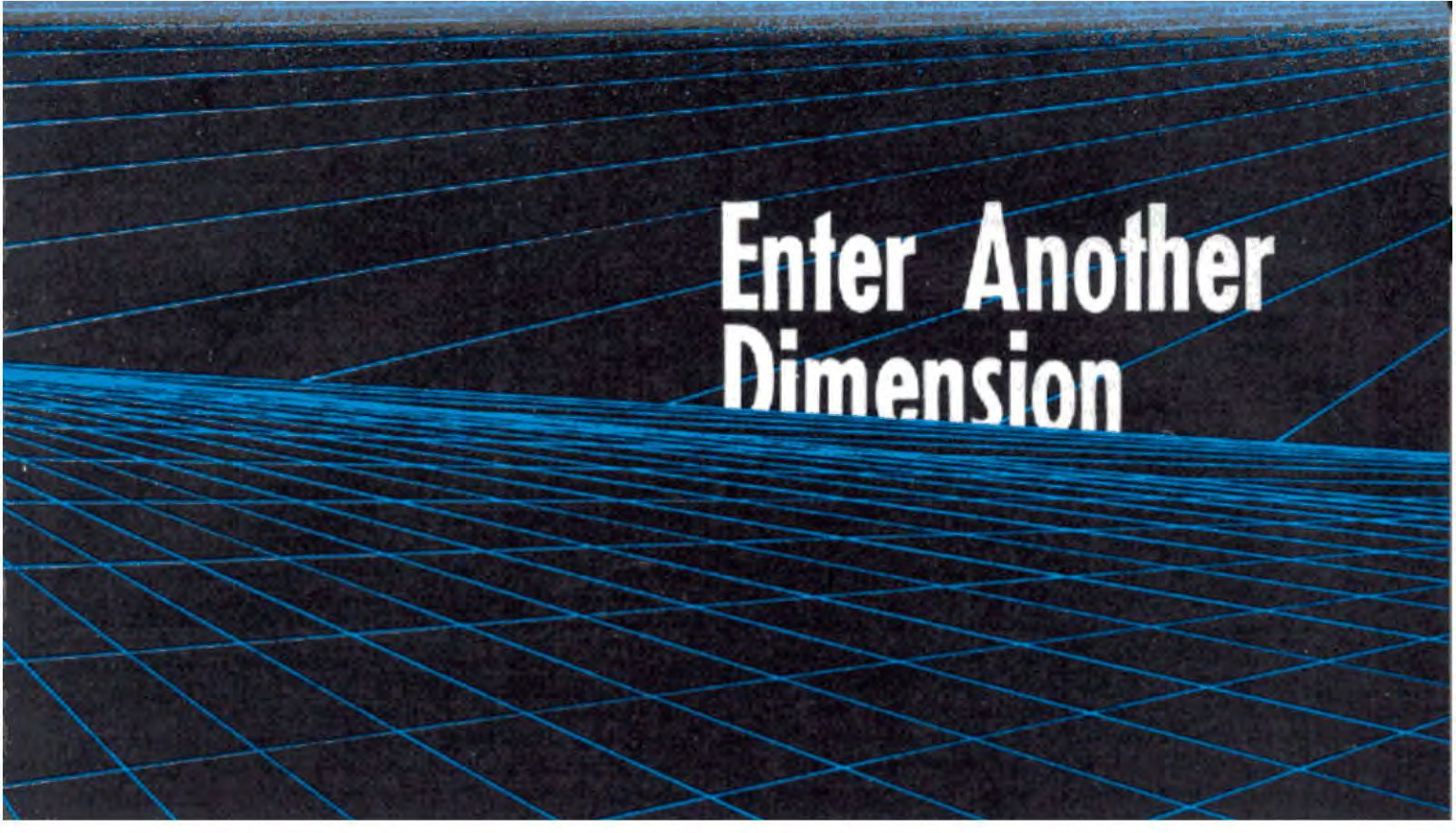
The Model III handles characters sent to the printer differently from the Model I, and so requires the changes given at the end of each program.

Other Printers

Though they were written for the Epson MX-80 printer with the Graf-

```
00010   C       ***   Loader for Surface Data   ***
00020   C
00030   C       Based on program by Bob Boothe
00040   C       80 Microcomputing, March 1982, p. 116
00050   C
00060   C       This FORTRAN version by Delmer D. Hinrichs
00070   C
00080   C
00090           LOGICAL UI, YU, YL, B(256)
00100           DIMENSION L(960)
00110           DATA YU /'Y'/, YL /'y'/
00120   C
00130    1      WRITE (5, 2)
00140    2      FORMAT ('  ', 15X, '***   Loader for Surface Data   ***' ///
00150       1           ' Press <ENTER> to load "SURFACE/DAT" file from disk',
00160       2           ' and print it' //)
00170           PAUSE
00180           CALL OPEN (6, 'SURFACE/DAT ', 256)
00190           CALL OUT (254, 1)
00200    6      IF (PEEK(14312) .GT. 127) GOTO 6
00210           CALL POKE (14312, 27)
00220    7      IF (PEEK(14312) .GT. 127) GOTO 7
00230           CALL POKE (14312, 64)
00240    8      IF (PEEK(14312) .GT. 127) GOTO 8
00250           CALL POKE (14312, 27)
00260    9      IF (PEEK(14312) .GT. 127) GOTO 9
00270           CALL POKE (14312, 65)
00280    10     IF (PEEK(14312) .GT. 127) GOTO 10
00290           CALL POKE (14312, 8)
00300           J=257
00310           K=1
00320    11     IF (PEEK(14312) .GT. 127) GOTO 11
00330           CALL POKE (14312, 27)
00340    12     IF (PEEK(14312) .GT. 127) GOTO 12
00350           CALL POKE (14312, 76)
00360    13     IF (PEEK(14312) .GT. 127) GOTO 13
00370           CALL POKE (14312, 192)
00380    14     IF (PEEK(14312) .GT. 127) GOTO 14
00390           CALL POKE (14312, 3)
00400           DO 20 I=1,960
00410             IF (J .LT. 257) GOTO 15
00420             CALL OUT (254, 0)
00430             READ (6, REC=K, END=500) B
00440             CALL OUT (254, 1)
00450             K=K+1
00460             J=1
00470    15       N=B(J)
00480             IF (N .LT. 0) N=N+256
00490             L(I)=N
00500             J=J+1
00510    20       CONTINUE
00520           DO 25 I=1,960
00530    22       IF (PEEK(14312) .GT. 127) GOTO 22
00540             CALL POKE (14312, L(I))
00550             L(I)=0
00560    25       CONTINUE
00570           WRITE (2, 27)
00580    27     FORMAT (' ')
00590           GOTO 11
00600   C
00610   C       Final Cleanup
00620   C
00630    500    CALL OUT (254, 0)
00640           ENDFILE 6
00650           DO 550 I=1,960
00660    510      IF (PEEK(14312) .GT. 127) GOTO 510
00670             CALL POKE (14312, L(I))
00680    550      CONTINUE
00690    555    IF (PEEK(14312) .GT. 127) GOTO 555
00700           CALL POKE (14312, 27)
00710    557    IF (PEEK(14312) .GT. 127) GOTO 557
00720           CALL POKE (14312, 64)
00730           WRITE (2, 560)
00740    560    FORMAT (//)
00750   C
00760           WRITE (5, 600)
00770    600    FORMAT (//// ' Completed!!' //
00780       1           ' Do you want to print another one (Y/N)? _¬')
00790           READ (1, 602) UI
00800    602    FORMAT (A1)
00810           IF (UI .EQ. YU .OR. UI .EQ. YL) GOTO 1
00820   C
00830   C       For Model III TRS-80s, change all statements of:
00840   C       CALL POKE (14312, n)      to:     CALL OUT (248, n)
00850   C
00860           END
```

Program Listing 3. Fortran program to read a surface data file from disk and print it.



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trax addition, these programs should be easily modified to work with any dot-matrix printer that can print bit-mapped graphics.

The MX-80, in the bit-mapped graphics mode, prints eight dots in a vertical line for each character that it receives. Any ASCII character from 0 to 255 prints dots that correspond to which bits are "on." Since there are no excluded control codes, the printer must be told in advance how many characters it is to interpret as graphics characters. These programs print 960 graphics characters per line for a resolution of 120 dots per inch horizontally. The highest bit, corresponding to ASCII 128, prints the highest dot while the lowest bit, corresponding to ASCII 1, prints the lowest dot.

Eight horizontal lines of dots are calculated and are saved in the "Line" array before printing or saving to disk. For each dot line, the variable NS is set to the ASCII value for that line. If a dot is to be set, NS is ORed with the correct integer from the 960-element "Line" array.

If your printer prints fewer than eight dots at a time, the variable K should have fewer than the eight levels it has in these programs. If the low bit is printed at the top, then K should be initially set to 0 (instead of 7) and incremented (instead of decremented) for each new dot line.

For other than 960 dots per horizontal line, reset the value of the variable MM in these programs. With a little trial and error, any printer that supports bit-mapped graphics may be accommodated.

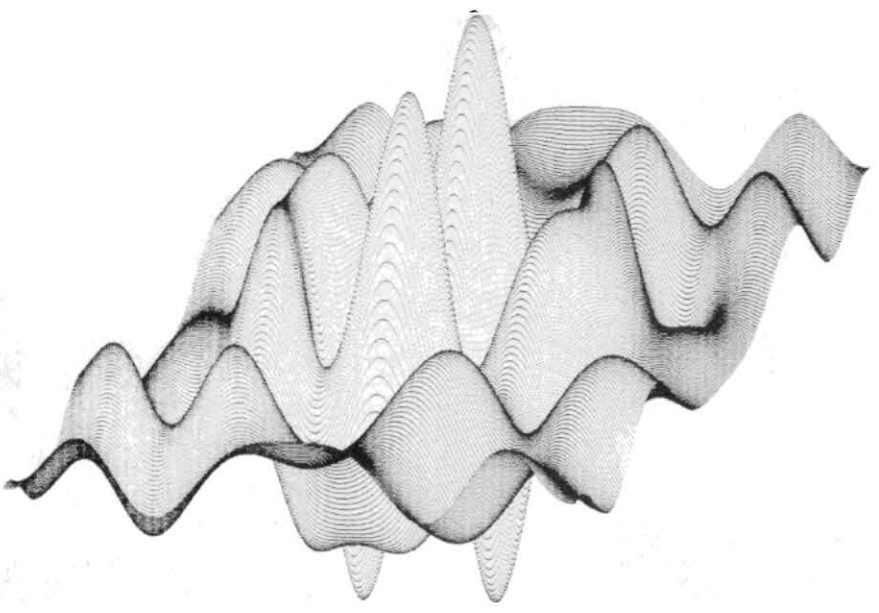
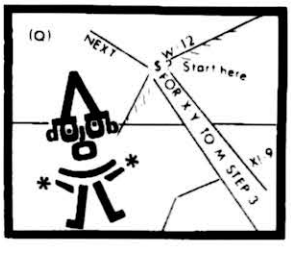


Fig. 5. Different view of the same surface as in Fig. 4, rotated by 90 degrees (or flipped over).

Compiling

Since these programs benefit so much from the added speed that compiling can give, a few comments about Microsoft compilers for Fortran and Basic are in order. There have been some mis-

Lost in the Line Edit Jungle?



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leading reports about their use. True, they do require a disk system. But if you have two or more disk drives, they are very easy to use. When a program is ready to be compiled, it requires only two commands, one to compile and one to link the program into a run-time module. If only one disk drive is available, disks must be shifted, but this is not necessary if two disk drives are used.

Fortran and Basic compilers are used in much the same way. Unlike other Basic compilers, the Microsoft compiler requires little or no change to a normal Basic program before compilation.

Math

The surfaces depicted by these programs are defined by variations of damped sine waves. The equations use the form: sine(x)/x.

For circular form waves (Fig. 1), x is the distance from the center. For bumpy waves (Fig. 2), waves in the x and y directions are multiplied together.

The hidden-dot algorithm to give the simulated three-dimensional perspective is explained in *Scientific and Engineering Problem-Solving with the Computer*, by William Ralph Bennett Jr. (Prentice-Hall, 1976), pp. 86–90.

While it is not difficult to plot three-dimensional figures with a bit-mapped, dot-matrix printer, it is time-consuming. There are too many possible variations to examine all of them. If anyone finds an especially interesting surface, I'd like to see a copy.

For those without compilers, compiled versions of the programs discussed here are available from the author. ■

Delmer D. Hinrichs lives at 2116 S.E. 377th Ave., Washougal, WA 98671.

```
10 CLS :PRINT TAB(14)"***   Loader for Surface Data   ***"
20 '        (c)   by  Delmer D. Hinrichs   1982
30 CLEAR 300 :DEFINT I-N :DIM J, B$(255), L(960)
40 PRINT :PRINT :INPUT"Get disk ready, then press any key"; A$
50 OPEN"R",1,"SURFACE/DAT" :OUT 254,1
60 LPRINT CHR$(27); "@"; CHR$(27); "A"; CHR$(8)
70 FOR I=0 TO 255 :FIELD 1, I*1 AS P$, 1 AS B$(I) :NEXT I
80 J=256 :PRINT :PRINT :PRINT"Loading Data";
90 LPRINT CHR$(27); "L"; CHR$(192); CHR$(3);
100 FOR I=1 TO 960
110   IF J=256 OUT 254,0 :GET 1
     :IF EOF(1) THEN 140 ELSE OUT 254,1 :J=0
120   L(I)=ASC(B$(J)) :J=J+1
130   NEXT I
140 FOR I=1 TO 960
150   IF PEEK(14312)>127 GOTO 150
160   POKE 14312,L(I) :L(I)=0
170   NEXT I :LPRINT :IF EOF(1)=0 GOTO 90
180 CLOSE
190 LPRINT CHR$(27); "@"; STRING$(2,13)
200 PRINT" Completed"
210 PRINT:PRINT:PRINT"Do you want to load another one (Y/N)? ";
220 A$=INKEY$ :IF A$="" GOTO 220
230 IF A$="Y" OR A$="y" GOTO 10
240 CLS :PRINT"Program End"
250 END
260 ' For Model III TRS-80s, in line 160 change:
270 '  POKE 14312,L(I)      to:     OUT 248,L(I)
```

Program Listing 4. Basic program to read a surface data file from disk and print it.

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A Turn of the Screw Revisited

by Lynn Davis

Can you find your copy of the April 1981 issue of *80 Micro*? Some of those fancy graphics programs will run on your Color Computer!

```
1 REM ORIGINAL WORK BY BOB BOOTHE
2 REM 80 MICROCOMPUTING, APRIL 1981
3 REM PROGRAM NO. 1  SINE WAVE
4 REM
5 REM MODIFIED FOR THE TRS-80 COLOR COMPUTER
6 REM 16K EXTENDED BASIC
7 REM BY LYNN H. DAVIS
8 REM
20 X=X+.4
30 Y=SIN(X)
40 Y=(Y*25+30)/2
50 PRINTTAB(Y)"X"
60 GOTO 20
```

Program Listing 1

```
1 REM ORIGINAL WORK BY BOB BOOTHE
2 REM 80 MICROCOMPUTING, APRIL 1981
3 REM PROGRAM NO. 2  MULTIPLE SINE WAVES
4 REM
5 REM MODIFIED FOR THE TRS-80 COLOR COMPUTER
6 REM 16K EXTENDED BASIC
7 REM BY LYNN H. DAVIS
8 REM
20 CLEAR 100
30 DIM P$(63)
40 D=2*3.14/3
50 FOR Q=1TO31: P$(Q)=" ":NEXT
60 X=X+.3
70 Y1=(SIN(X)*25+30)/2
80 Y2=(SIN(X+D)*25+30)/2
90 Y3=(SIN(X+2*D)*25+30)/2
100 P$(Y1)="1":P$(Y2)="2":P$(Y3)="3"
110 FORQ=1TO31:PRINTP$(Q);:NEXT:PRINT
120 GOTO50
```

Program Listing 2

Despite being the proud owner of a Color Computer, I often find myself in an unenviable position—I am unable to use many of the Level II programs published in *80 Micro* without first modifying them. One set of programs I modified were the first four programs in Bob Boothe's article, "A Turn of the Screw," *80 Micro*, April 1981. Since I do not wish to rewrite Mr. Boothe's article, I suggest you pull out your April issue and review it. His explanations add valuable insight into how these programs operate.

The Modifications

The first three programs only need modifications to fit the display on the screen. The Color Computer screen offers approximately half the number of horizontal print locations than the Model I or Model III offer. Therefore, the print variables are divided by two in all programs.

Program 1

Program Listing 1, which produces a single continuous sine wave, needs modification in line 40, where the original Y variable should be divided in half. This Y variable establishes the horizontal size of the sine wave. Eventually, in line 50, the computer is going to

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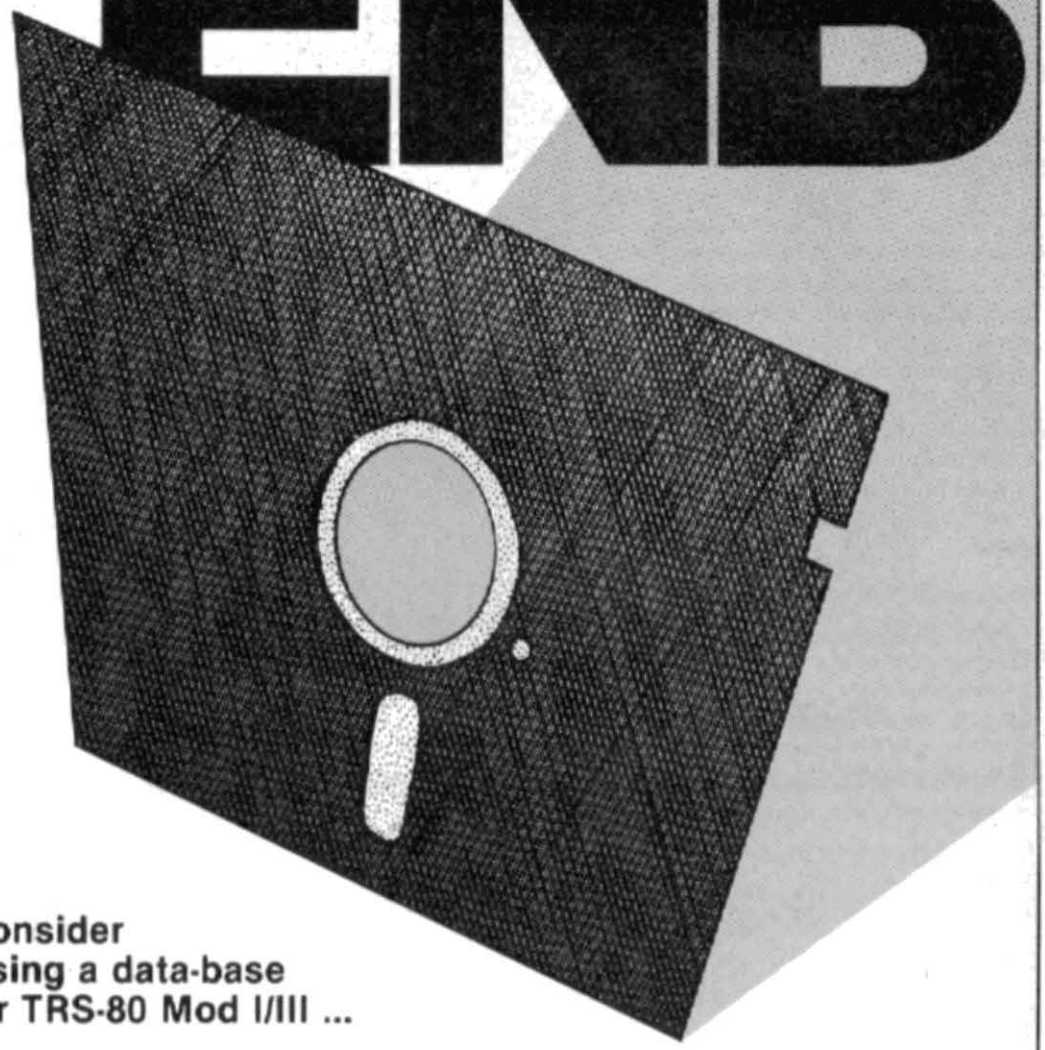

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PRINTTAB(Y). On the Model I, the maximum Y value is 63; for the Color Computer, it is approximately half that, or 30.

Photo 1 shows the sine wave generated. This program is a loop, as are the next two. Consequently, the sine waves scroll continuously up the screen.

Program 2

Program Listing 2 produces three sine waves and needs modification in lines 50, 70, 80, 90, and 110.

Line 50 now puts 31 spaces in the array. Lines 70, 80, and 90 compute where the symbols go in the array. Since only 31 of the 63 elements in the array are used, each value is divided in half. Finally, in line 110, where the array of spaces and characters is printed, the Q variable, or array size, also has to be divided in half. Line 30 isn't changed in order to protect the integrity of the original program.

Photo 2 shows part of these three sine waves.

Program 3

Program Listing 3 produces three different sine waves using a string of words or symbols. Only two modifications are necessary here. First, the string length in line 80 must be changed from 63 to 34. Second, in line 100, the Y variable (horizontal size of the sine wave) must be reduced by half.

You should like the effects of these changes if you type in interesting three-

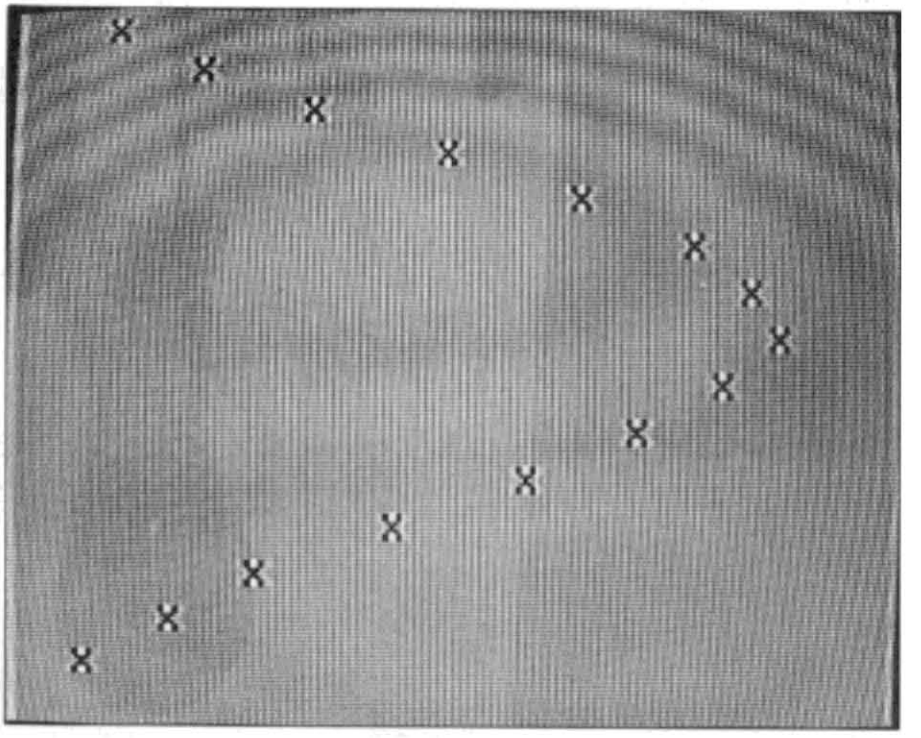

Photo 1. A single sine wave produced by Program Listing 1.

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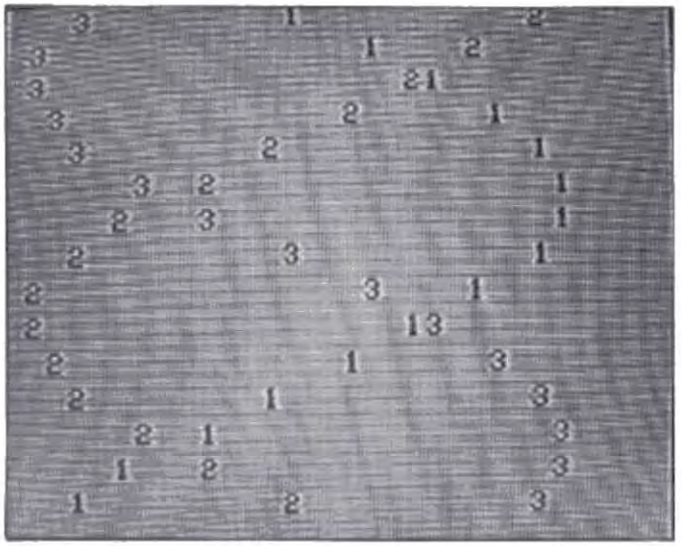

Photo 2. Three sine waves, shown as the numbers 1, 2, and 3, produced by Program Listing 2.

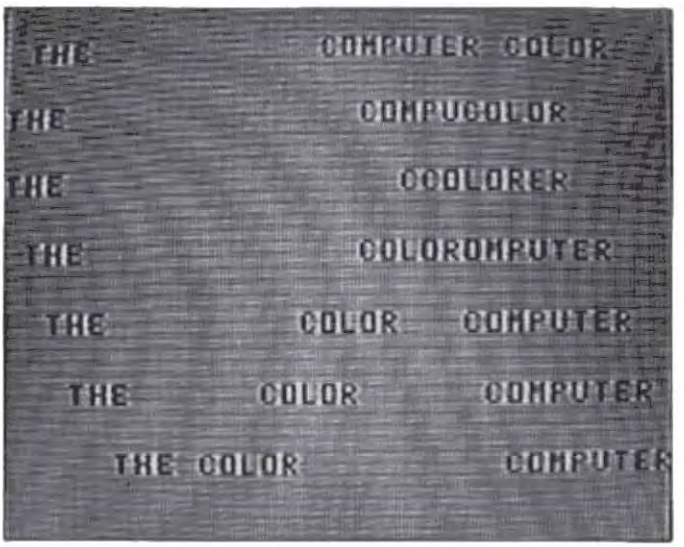

Photo 3. Three sine waves produced by Program Listing 3. The program allows you to input whatever letters, symbols or words you wish.

word combinations (see Photo 3).

Program 4

By far the most spectacular of the lot, Program Listing 4 produces a three-dimensional image of eight sine waves. Four of the sine waves are horizontal, and four are vertical. The result is four "hills" (or, using Mr. Boothe's term, "lamps") on the screen.

Although the original program's integrity is maintained, the Color Computer executes the program differently in the graphics mode than does the Model I or Model III. The checkered appearance of the surface is gone, and four "hills" fit on the screen rather than just one.

Modifications are needed in four sections of the program. First, lines 10, 15, 20, and 25 must be added. These invoke the extended graphics mode of the Color Computer. Second, lines 40 and 50, which regulate where the display is printed, have to be changed to fit the graphics on the screen. Third, in line 90, RESET and SET have to be changed to PRESET and PSET. Fourth, in line 90 again, the PRESET and PSET variables have a color code added, which enhances the display over the conventional black and white.

Photo 4 shows the end result of this program.

As Mr. Boothe pointed out, "these programs are short, not simple." It takes approximately 40 minutes for Program Listing 4 to run, but I think you'll find it fascinating.

Further Modifications for Program 4

On some Color Computers, POKE 65495,0 will double the clock speed of the CPU, resulting in a 20-minute runtime. Type POKE 65495,1 to set the

Photo 4. This photograph shows a three-dimensional view of eight sine waves. Four of the waves are in the horizontal direction and four are in the vertical direction. The end result is four "hills" on what appears to be a flat surface.

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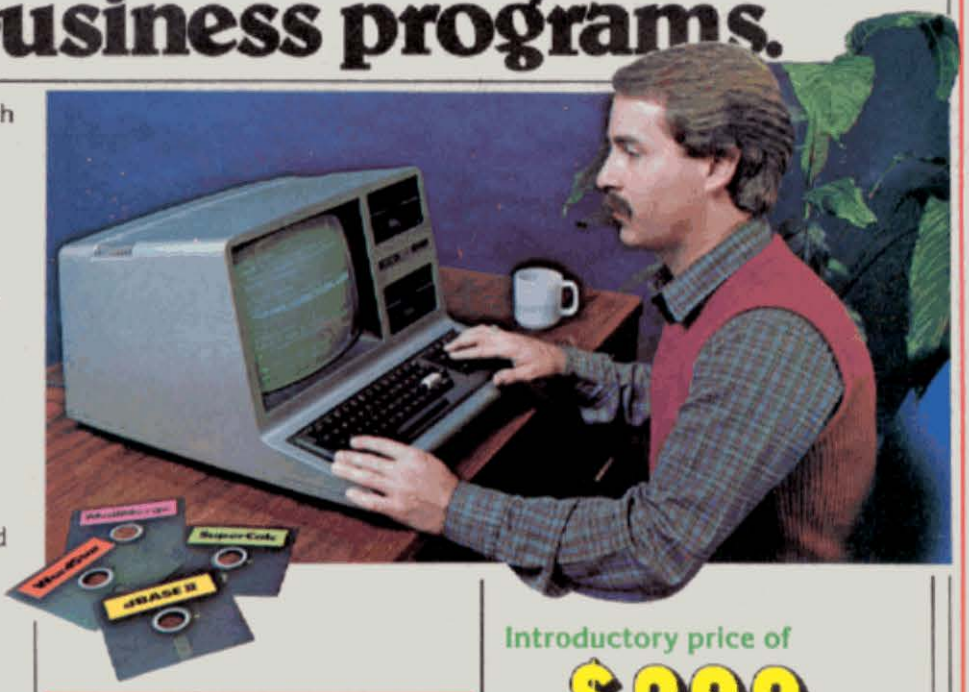

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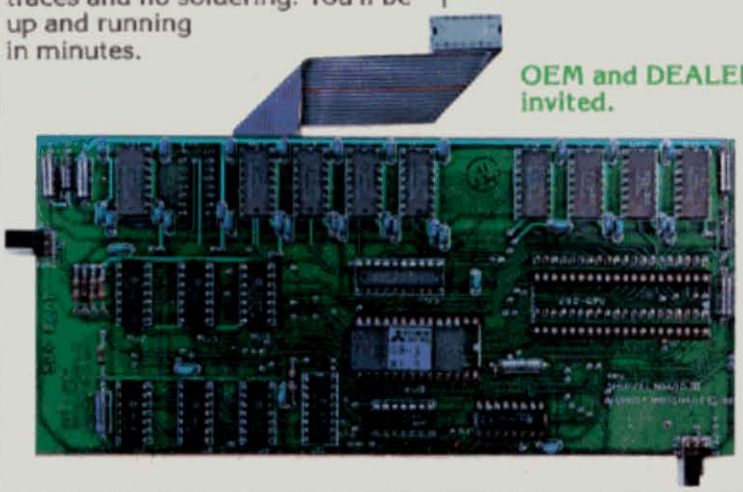

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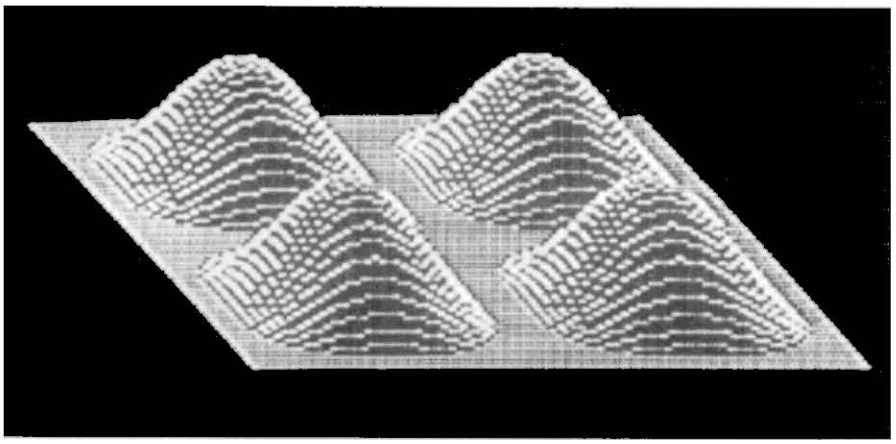

Photo 5. A three-dimensional view of eight sine waves in PMODE 4, SCREEN 1,0. It is the highest resolution of graphics available for the Color Computer.

```
1 REM ORIGINAL WORK BY BOB BOOTHE
2 REM 80 MICROCOMPUTING, APRIL 1981
3 REM PROGRAM NO. 3  USING WORDS
4 REM
5 REM MODIFIED FOR THE TRS-80 COLOR COMPUTER
6 REM 16K EXTENDED BASIC
7 REM BY LYNN H. DAVIS
8 REM
20 CLEAR 1000
30 DIMS$(3)
40 D=2*3.14/3
50 FOR Q=1 TO 3:PRINT"ENTER STRING NO.";Q:INPUT S$(Q):NEXT
60 FOR Q=1TO3:L(Q)=LEN(S$(Q)):NEXT
70 A=A+.2
80 T$=STRING$(34,32)
90 FOR Q=1TO3
100 Y=(SIN(A+D*Q)*(30-L(Q)/2)+31-L(Q)/2)/2
120 T$=LEFT$(T$,Y)+S$(Q)+RIGHT$(T$,63-Y-L(Q))
130 NEXT Q
140 PRINTT$
150 GOTO70
```

Program Listing 3

```
1 REM ORIGINAL WORK BY BOB BOOTHE
2 REM 80 MICROCOMPUTING, APRIL 1981
3 REM PROGRAM NO. 4  3-D SURFACE
4 REM
5 REM MODIFIED FOR THE TRS-80 COLOR COMPUTER
6 REM 16K EXTENDED BASIC
7 REM BY LYNN H. DAVIS
8 REM
10 PCLS
15 PMODE 3
20 PCLS
25 SCREEN 1,0
30 PI=3.14
40 FOR Y=29 TO 87
50 FOR X=0 TO 160
60 H1=SIN(Y/29 *2*PI-PI/2)+1
70 H2=SIN(X/80 *2*PI-PI/2)+1
80 H=H1*H2*7.7
90 FOR Q= 1 TO H:PRESET(X+Y,Y+18-Q,4):NEXT Q: IF X/2=
                    INT (X/2) THEN PSET (X+Y,Y+18-Q,3)
100 NEXT X
110 NEXT Y
120 GOTO 120
```

Program Listing 4

speed low.

If you don't want to spend 40 minutes watching Program 4 run, make the following line changes:

```
40 FOR Y = 29 TO 58
50 FOR X = 0 TO 80
```

Instead of getting four "hills" you'll get only one, but the run time is reduced to about ten minutes.

If you wish to experiment with other color combinations, here are a few suggestions:

(A) For PMODE 3, SCREEN 1,0: the PRESET and PSET color variables available for line 90 are yellow, color number (2), blue (3), and red (4). The color green (1) can be used, but it results in the same color as the background. It works fine as a PSET color, but a little strange as a PRESET color.

(B) For PMODE 3, SCREEN 1,1: the PRESET and PSET variables for line 90 are cyan (6), magenta (7), and orange (8). The background color is buff (5).

(C) To see this program in the highest graphic resolution possible, just make the following line change:

```
15 PMODE 4
```

For PMODE 4 try SCREEN 1,0 and then SCREEN 1,1. SCREEN 1,0 results in green on a black background. SCREEN 1,1 should result in buff on a black background, but you may get some blue and red color because of signal drift with this PMODE and SCREEN combination.

Although the results are not as colorful in PMODE 4, the graphics ability of the Color Computer are spectacular (see Photo 5).

Programs 5 and 6

Program Listings 5 and 6 both require a printer, with Program 6 specifically needing a Base 2 printer. Hmm...well...maybe next year.

The Challenge

I can already hear you asking, "What about Program Listing 7? Where's the turning screw?" I've left that one as a challenge. Sit down at your keyboard and work it out, then share it with us through *80 Micro*. I know I would like to see that turning screw, in brilliant red, on my color screen. ■

Lynn Davis is employed by the West Genessee Central School District, Camillus, NY. Contact him at 4316 Amblewood Lane, Clay, NY 13041.

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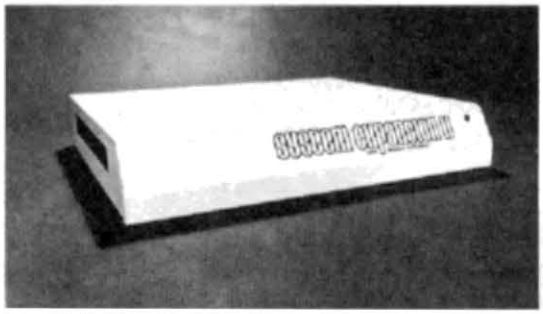

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by Stephen E. Sutton

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Program Listing

```
1 '****COLOR CODE COMBO****
3 'ADAPTED FOR TRS80 COLOR COMPUTER FEB. 1982 BY STEPHEN E. SUTT
ON
4 DIMB$(7,1):A=RND(1)
5 GOTO100
10 'DELAY LOOP SUBROUTINE
15 FORI=1 TO 2000:NEXT:RETURN
60 'DISPLAY FORMATTING SUBROUTINE
65 CLS:PRINT" CHOICES  GUESS CORRECT CORRECT"
70 PRINT" ";B$(0,1);" ";B$(0,0)," COLOR   PLACE"
75 FOR I=1TO7:PRINT" ";B$(I,1);" ";B$(I,0)
76 NEXTI
80 RETURN
85 'OPTIONS LIST SUBROUTINE
90 PRINT@480,"PRESS X TO CHANGE OR E TO GRADE";
92 A$=INKEY$:IF A$="" THEN 92
93 PRINT@480,"                                ";:RETURN
95 'MAIN PROGRAM LISTING
100 CLS:PRINT:PRINT"     ** COLOR CODE COMBO **":PRINT:PRINT:PRI
NT" AS REVISED FOR COLOR COMPUTER":PRINT:PRINT"      BY STEPHEN
E. SUTTON":GOSUB15
104 CLS:PRINT:PRINT"    PLAYER OPTION SELECTION"
105 PRINT:PRINT"HOW MANY COLORS? (3-8)";
106 INPUT C
110 IFC<3 OR C>8 THEN 100
115 PRINT:PRINT"HOW MANY PLACES? (3-8)";
116 INPUT T
120 IF T<3 OR T>8 THEN 100
125 PRINT:PRINT"HOW MANY GUESSES?(4-12)";
127 INPUT G
130 IFG<4 OR G>12 THEN 100
135 'RANDOM PROBLEM GENERATOR
140 DATA R,191,B,175,Y,159,W,207,C,223,M,239,O,255,D,128
145 FOR I=0 TO 7:READ B$(I,0):READ B:B$(I,1)=CHR$(B):NEXT
150 RESTORE
155 R$="":RC$="":FORI=1TO T:A=RND(C)-1:R$=R$+B$(A,0):RC$=RC$+B$(
A,1):NEXT
160 'SET UP DISPLAY
165 GOSUB65
175 FORI=0TO G-1:PRINT@102+(32*I),"#";I+1;:NEXT
180 'OBTAIN PLAYERS GUESS
```

Listing continues

Games and puzzles fascinate me, and "Color Code Combo" by Daniel Bishop, in *Microcomputing* (February 1982, p. 108), gave me a worthy challenge. I immediately got down to converting the programs to my TRS-80 Color Computer. This presented problems, since the Color Computer has a smaller screen and a completely different graphics system.

The resulting program was well worth the effort. By using the graphics 4 mode, available in the standard alphanumeric mode by using the CHR$ function, the resulting game display is a full screen of alphanumerics and color graphics. This is an improvement over the black-and-white text displays of the TRS-80 Model I/III and the Apple. The correct color and place information is also easier to interpret than it is in the Apple color version.

In converting this program, I've tried to keep the line numbers the same as those in the original so you can compare them. The program will run on either the 16K Color Basic computer or on the 16K Extended Color Basic version. It should also run on a 4K Color Basic machine once the remark lines are removed.

Since Color Basic provides a flashing cursor, I've removed the cursor subroutine in the original program. For

The Key Box

Color Computer
16K RAM
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We've seen prices of spooler/despoolers as high as **$100!** We don't agree with this type of pricing philosophy. To prove it, NEWBASIC includes 3 commands to allow true, disk-based spooling and despooling from BASIC. The SPOOLON and SPOOLOFF commands are used to start and stop the spooling of printer output to a disk file. The DESPOOL command provides background **(interrupt-driven)** despooling of a previously spooled print file.

Graphics Commands Galore

Vector graphics, scaling, rotation, circles, ellipses, arcs, lines, boxes, solids . . . We don't know of any package available for the standard TRS-80 Model I/III that offers the wide **variety** and fantastic **power** of our graphics commands. With commands like **CIRCLE, DRAW, LINE, PAINT,** and **PLOT** you can easily draw any shape or figure possible on the TRS-80. Fast. And if it's not fast enough for you, TWO types of **GET/PUT** commands are included for incredible BASIC **animation.**

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- **Programming tools for editing and debugging.**
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Programming Tools

The LOC. command locates succeeding instances of a given string or BASIC token. It is an invaluable aid when editing a large program. A new trace command is provided which lists the line being executed, as well as the current value of any variable(s) you select. A calculator-like command is available which displays the answer in 5 different representations, including hex, ASCII, and lsb,msb.

Other Features

Restore the DATA pointer to any DATA statement. Execute a string as a BASIC program statement. Call assembly routines without using DEFUSR. Reference lines by label or the value of a variable. Block move memory to scroll the screen right or left, or copy an array to another array —FAST! All this and **much** more is possible and easy to do with NEWBASIC.

Documentation

We don't skimp. You'll receive a thorough, quality user's manual with plenty of examples. You'll also get a handy reference card with a command summary. And several sample programs which demonstrate the power and simplicity of NEWBASIC.

Compatibility

NEWBASIC runs on a 48K RAM, 2+ disk-drive, TRS-80 Model I/III computer. NEWBASIC is compatible with most major DOS's, including DOSPLUS, LDOS, NEWDOS, and TRSDOS. It loads in low memory, below BASIC programs, so it does not disturb any high memory routines you may use.

Who Are We?

MSA was formed in 1980, but you probably haven't heard of us unless you own an LNW80 computer (we wrote LNW's enhanced disk BASIC). Our goal is to offer computer users outstanding software value for their money. We feel NEWBASIC is an excellent realization of this goal.

Pricing and Ordering:

NEWBASIC Version 2.0 is $39.95 + $2.50 shipping (foreign orders + $5.00 shipping, US funds only). (California residents please add sales tax). Both Model I & III versions are supplied on the same diskette. To order, send check, money order, or credit card (Visa, M/C) information to:

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See List of Advertisers on Page 371

Listing continued

```
185 FOR K=1 TO G
190 G$=""
195 FOR L=1 TO T
200 CR=73+(32*K)+L
205 PRINT@480,"SELECT COLOR THEN PRESS ENTER";:PRINT@CR,"";
206 INPUTA$
207 FORI=0 TO 7:IFA$<>B$(I,0) THEN NEXT ELSE 209
208 PRINT@480,"        OOPS...TRY AGAIN        ";:FORI=1 TO 500:N
EXT:GOTO205
209 I=7:NEXT
210 G$=G$+A$
212 GOSUB350:PRINT@CR,A$;
213 PRINT"    ";
215 NEXTL
220 GOSUB90
225 IF A$="X" THEN 190 ELSE IF A$<>"E" THEN220
230 GOSUB260
235 PRINT@(83+32*K),CC;"    ";CP;
240 IF CP=T THEN 325
245 NEXTK
250 GOTO335
255 'EVALUATE GUESS SUBROUTINE
260 RT$=R$:G$=LEFT$(G$,T):CP=0
265 FORI=1 TO T
270 IF MID$(G$,I,1)=MID$(R$,I,1) THEN CP=CP+1
275 NEXT
280 J=0:CC=0
285 FORI=1 TO T
290 J=J+1
295 IF MID$(G$,I,1)=MID$(R$,J,1) THEN CC=CC+1: R$=LEFT$(R$,J-1)+
" "+RIGHT$(R$,T-J): GOTO305
300 IF J<T THEN 290
305 J=0
310 NEXT I
315 R$=RT$:RETURN
320 'CONCLUDING RESPONSES
325 PRINT@480,"  CONGRATULATIONS!! THAT'S IT";
330 GOSUB400:GOTO340
335 PRINT@480,"SORRY...YOU RAN OUT OF TURNS";:GOSUB410
337 PRINT@480,"THE ANSWER WAS: ";RC$;
338 GOSUB15
340 PRINT@480,"   PRESS ANY KEY TO CONTINUE   ";
342 A$=INKEY$:IF A$="" THEN 342
345 GOTO100
349 'GUESS DISPLAY SUBROUTINE
350 FORI=0 TO 7
355 IF A$<>B$(I,0) THEN NEXT ELSEA$=B$(I,1):I=7
360 NEXT:RETURN
390 'SOUND SUBROUTINES
399 'WIN
400 SOUND89,3:SOUND133,3:SOUND159,3:SOUND176,6:SOUND159,3:SOUND1
76,9:RETURN
409 'LOSE
410 SOUND133,6:SOUND125,6:SOUND108,6:SOUND89,6:SOUND69,6:SOUND58
,6:SOUND32,6:SOUND5,6:RETURN
```

keyboard response, I used the Input command, which lets you enter either string or numeric variables. All the display formatting had to be converted to the 16-by-32 screen of the Color Computer.

Most of the variables I used are the same as in the earlier version. I did not need most of the cursor variables, so I used B$ as an array for the color choices and the corresponding color string values. I also used two new variables: B for the CHR$-function color codes and RC$ for the graphics version of the correct answer.

"Subroutines add sound to the end of each game..."

Lines 206–209 are a short routine that I added to eliminate errors in the color-choice input. This will prevent the program from crashing if you push a key that does not correspond to a legitimate color choice. Lines 390–410 are subroutines that add sound to the end of each game to let you know if you won or lost.

Two players can compete at Color Code Combo to see who can be more logical. The players alternate guesses, and the one who guesses the correct code wins. The winner can select the options for the next game and the loser gets to go first. ■

Stephen Sutton can be reached at 6117 Gray St., Spring Grove, IL 60081.

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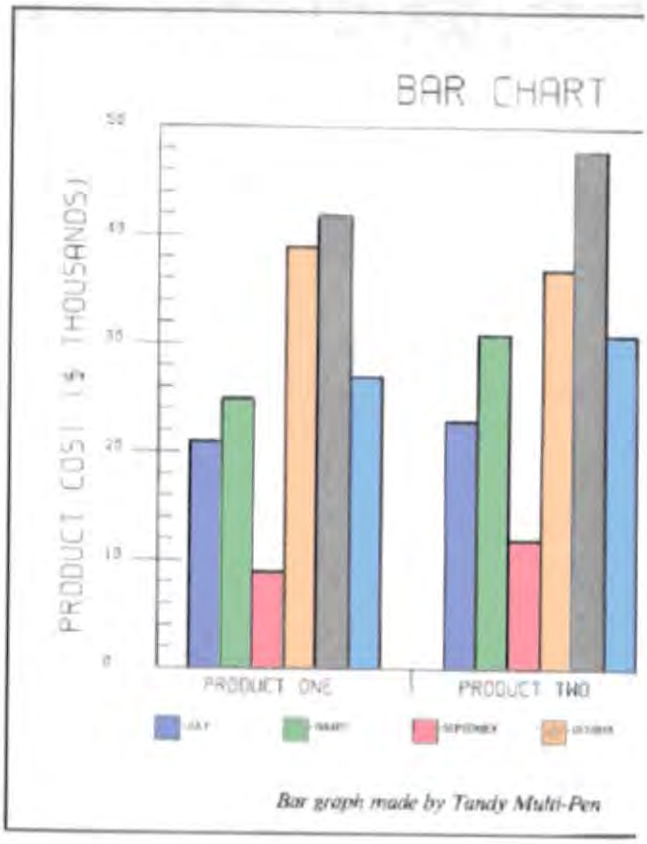
Data Impact Products' D-92

Buyer's Guide



Bar graph made by Tandy Multi-Pen

So you've decided to purchase a printer. It wasn't a particularly difficult decision to make—like many people, you've probably realized that your work requires more than a typewriter.

Now comes the hard part: choosing a printer best suited to your needs. To give you some basic guidelines, *80 Micro* presents its Buyer's Guide to Printers and Plotters.

The most important aspect of choosing a printer is accurately assessing your printing needs. Some users require high-speed printers, while others are more concerned with print quality. Even paper stock might be a consideration. For example, accountants need a printer capable of handling wide paper for financial statements and balance sheets.

There are two predominant kinds of printers available: dot-matrix and letter-quality printers.

Dot-matrix printers have a print head embedded with a grid of tiny electric elements. These elements are selectively activated and strike the ribbon to imprint a character on paper. If you look closely at these characters, you can see the dots comprising each character.

Dot-matrix printers are adequate for informal correspondence, memos, program listings, and first drafts of documents. Their main advantages over letter-quality printers are speed and lower price.

Letter-quality printers are usually more expensive and slower than dot-matrix printers. Their print quality is more professional and looks like high-quality typewriter print.

Most letter-quality printers are daisy-wheel and thimble printers. A daisy-wheel is a small plastic disk with stalks emanating from a central hub, much like petals on a daisy. At the end of each stalk is a preformed letter. In printing, the daisy wheel spins, stops at the appropriate letter and a hammer strikes the stalk, leaving a character imprinted on the paper.

Thimble printers have an inverted, thimble-shaped print head. Like a daisy wheel, the thimble rotates on a pin until the letter is in position. A hammer then strikes the letter against the ribbon and paper. Thimble printers are less common than daisy-wheel printers.

Considerations

Once you have decided between a dot-matrix and a letter-quality printer, other factors must be considered.

Some of these are practical: printer cost, ease of operation, and computer compatibility. What kind of cable is necessary? Is it included with the printer?

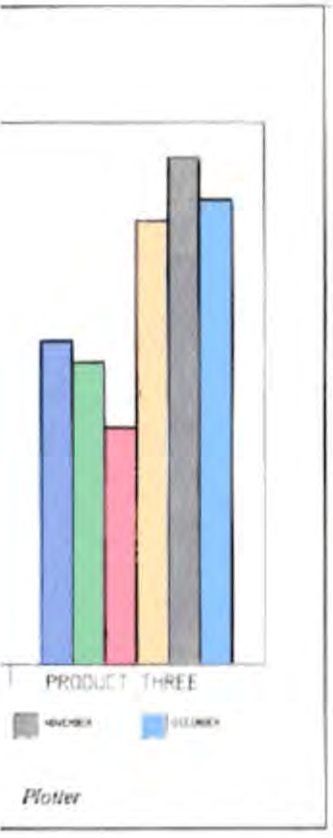
The type of paper the printer uses is also important; not all printers accept your single-sheet monogrammed stationery.

What about maintenance? Dot-matrix printers require that you change or re-ink the ribbon with relative frequency, and daisy wheels wear out and must be replaced.

Service is also important. What kind of warranty does the manufacturer offer? Is there a replacement policy? Can you receive service promptly? Is there a special phone number for emergencies?

The size of and noise created by a printer might be a consideration as well. A big, noisy printer could affect the efficiency of your office.

The following index of printers, their manufacturers, and characteristics should help you choose a printer. ■



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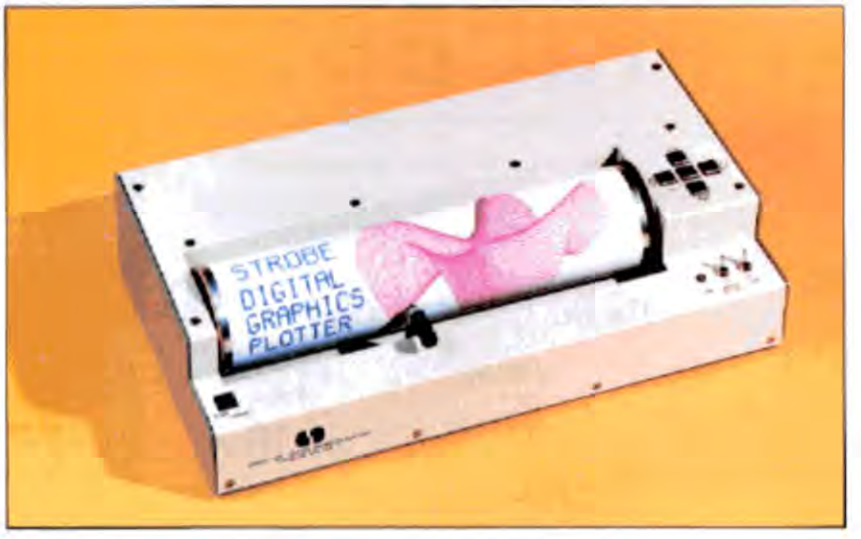

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(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

D-92 Dual Mode Modular Printer
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Dot Matrix
Data Impact Products Inc.

This correspondence-quality printer allows users to buy only those printer options needed, and upgrade later as printing requirements change. This dual-mode printer offers 100 cps bidirectional printing, short-line-seeking logic, friction paper feed, an 800-character buffer, six different character sizes with each printing mode, 100-million-character printhead, and a 5-million character, continuous-loop ribbon cartridge.

The printer uses a 7-by-9 matrix font for most printing and an 11-by-9 matrix font for correspondence-quality documents. With a complete ASCII character set, it is capable of upper- and lowercase printing at 40, 48, 66, 80, 96 or 132 characters per line on 8½-inch paper. This printer comes with a 90-day parts and labor warranty.
(Data Impact Products Inc., A Subsidiary of Advanced Electronics Inc., 745 Atlantic Ave., Boston, MA 02111, 617-482-4214.)

DMP-100
$399
Dot Matrix
Tandy/Radio Shack

This dot-matrix printer produces 5 or 10 characters per inch at up to 50 cps. It uses the 96-character ASCII set and uses both parallel and serial interfaces. The serial baud rate is selectable from 600–1200. The print buffer holds 480 characters. The printer uses 9.5-inch-wide paper, and comes with a 90-day warranty.
(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

Microline 80
$449
Dot Matrix
Okidata Corporation

This parallel printer is capable of printing up to 80 cps at 6, 10 or 16.5 characters per inch. It uses 8.5-inch friction-feed or 9.5-inch sprocket-feed paper. With a 9-by-7 matrix font, it has a full-character ASCII set and a one-line print buffer. Its print head has a life of 200 million characters and a one-year warranty. The printer has a 90 day parts and labor warranty with service performed at authorized centers.
(Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054, 609-235-2600.)

Model 100 Miniprinter
$460
Dot Matrix
Printer Products

This parallel, serial or 20mA current-loop interface miniprinter prints characters at either five or ten characters per inch at 65 cps on 2.6-inch-wide paper. With a 96-character ASCII set, its print head has a life of 30 million characters. Its print buffer holds one line (27 characters) and it comes with a 90-day parts and labor warranty.
(Printer Products, Division of Capitol Circuits, 24 Denby Road, Allston, MA 02134, 617-787-2030.)

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Dot Matrix
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a built-in graphics capability. With a 1K buffer (in parallel), it has a 7-by-9 dot-matrix head, incremental printing, and eight character sizes. Its built-in tractor feed and friction feed accept single sheets of paper. It is available in either parallel ($495) or serial RS-232C ($745) interfaces.
(C. Itoh/Leading Edge Products, 225 Turnpike St., Canton, MA 02021, 800-343-6857.)

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MX-80 F/T
$525
Dot Matrix
Epson America Inc.

This bidirectional, 9-by-9 dot-matrix printer produces 5, 8.5, 10, and 17 characters per inch at up to 80 cps. It is capable of high-resolution (120-by-216) graphics. Its character sets include the full ASCII set, italics and international symbols. The MX-80 is available with parallel, serial and IEEE interfaces. It has both friction and tractor feed, and uses paper that is 4–10 inches wide. The print head has a life of 100 million characters. The MX-80 comes with a 90-day warranty.
(Epson America Inc., 3415 Kashiwa St., Torrance, CA 90505, 213-539-9140.)

Microline 82A
$549
Dot Matrix
Okidata Corporation

This bidirectional 9-by-9 dot-matrix printer prints up to 120 cps at 5, 8.3, 10 and 16.5 characters per inch. It uses 8.5-inch friction-feed and 9.5-inch sprocket paper. The Microline 82A has a print buffer that holds one line and a baud rate of 1200. Its print head has a life of 200 million characters, and a one-year warranty. The unit itself comes with a 90-day parts and service warranty.
(Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054, 609-235-2600.)

Models 100T and 270 Miniprinters
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Dot Matrix
Printer Products

These 5-by-7 dot-matrix printers print up to 65 cps at five or 10 characters per inch on 2.6-inch-wide paper. They have parallel, serial and 20mA current loop interfaces. With a 96-character ASCII set, each has a baud rate of 110–9600 and a one-line print buffer. Their print heads have a life of 30 million characters. The units come with a 90-day parts and labor warranty.
(Printer Products, Division of Capitol Circuits, 24 Denby Road, Allston, MA 02134, 617-787-2030.)

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Dot Matrix
Micro Peripherals Inc.

This printer has 18 pins and is capable of high-resolution graphics (72 dots vertically by 50, 60, 75, or 85 dots horizontally). It prints up to 100 cps at 10, 12, or 17 characters per inch on 9.5-inch paper. It is bidirectional, and is available with parallel, serial and IEEE interfaces. Its front single-sheet feeder units accommodate both friction and tractor feeds. It has a baud rate of 9600 and a 1K character buffer. Its print head has a life of 100 million characters, and the unit comes with a 90-day warranty policy.
(Micro Peripherals Inc., 4426 South Century Drive, Salt Lake City, UT 84107, 800-821-8848.)

Selectone Micro-Typer 30
$695
Daisy Wheel
Selectone Corporation

This letter-quality printer prints 12 cps at 10, 12, or 15 characters per inch on paper up to 13 inches wide. The printer has a 12-character buffer, a baud rate of 75–9600, and comes with both parallel and serial interfaces. It has a 90-day warranty.
(Selectone Corporation, 28301 Industrial Blvd., Suite L, Hayward, CA 94545, 800-227-0376.)

Bytewriter Printer/Typewriter
$695
Daisy Wheel
Bytewriter

This letter-quality printer/typewriter produces 8 to 12 cps at 10, 12, or 15 characters per inch on 12.25-inch paper. It is available with a serial and a parallel interface; the serial model also has a 2K buffer. The printer/typewriter comes with a 90-day warranty.
(Bytewriter, 125 Northview Road, Ithaca, NY 14850, 607-272-1132.)

Microline 92
$699
Dot Matrix
Okidata Corporation

This bidirectional, parallel-interface printer uses a 9-by-9 dot matrix for data processing tasks, and a 13-by-17 dot matrix for correspondence-quality documents. It is capable of high-resolution graphics (72-by-72), and prints 160 characters per second. It will print characters at 5, 6, 8.5, 10, 12, and 17 characters per second on 8.5-inch fric-

See List of Advertisers on Page 371

tion-feed or 9.5-inch sprocket-feed paper. Its print buffer stores one line, and its print head has a life of 200 million characters. The print head comes with a one-year warranty, while the printer unit has a 90-day parts and service warranty.
(Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054, 609-235-2600.)

Model 122
$699 Parallel, $799 Serial
Dot Matrix
Centronics Data Computer Corporation

This bidirectional printer prints 120 cps at 5 or 10 characters per inch. It uses 15-inch paper and comes with a 96-character ASCII set. The parallel printer has a 256-character print buffer; the serial model has a 2K buffer. It comes with a 90-day parts and labor warranty.
(Centronics Data Computer Corporation, Hudson, NH 03051, 800-258-1952.)

MX-100
$749
Dot Matrix
Epson America Inc.

This bidirectional MX-100 prints 5, 8.5, 10, and 17 characters per inch at up to 80 cps. It is also capable of high-resolution (120-by-216) graphics. Its character sets include the full ASCII set, italics, and international symbols. The printer is available with parallel, serial, and IEEE interfaces. It uses both friction and tractor-feed paper up to 15.5 inches wide. The print head has a life of 100 million characters. The MX-100 comes with a 90-day warranty.
(Epson America Inc., 3415 Kashiwa St., Torrance, CA 90505, 213-539-9140.)

Models S400 and S400T Miniprinters
$775–$830
Dot Matrix
Printer Products

Each of these bidirectional printers has a 5-by-7 dot matrix (10-by-7 for elongated characters), and prints 12 (or 6 elongated) characters per inch at 150 cps. They use 3.31-inch paper, and have 96-character ASCII sets. They are available with parallel, serial, or 20mA current loop interfaces and have 110–9600 baud rates. Their print buffers hold 176 characters. Each printer has a 90-day parts and labor warranty.
(Printer Products, Division of Capitol Circuits, 24 Denby Road, Allston, MA 02134, 617-787-2030.)

Model S400L
$795–$850
Dot Matrix
Printer Products

This miniprinter has a 5-by-7 dot matrix (10-by-7 for elongated characters), and prints 12 (or 6 elongated) characters per inch at up to 48 cps on 3.31-inch paper. It is available with parallel, serial or 20mA current loop, with 110–9600 baud rates. Its print buffer holds up to 176 characters, and its print head has a life of 15 million characters.
(Printer Products, Division of Capitol Circuits, 24 Denby Road, Allston, MA 02134, 617-787-2030.)

Microprism
Color Printer
$799
Dot Matrix
Integral Data Systems

This bidirectional, correspondence-quality color printer has a nine-wire staggered dot matrix. It is capable of high-resolution (84-by-84) graphics, and prints 10, 12 or 16.8 characters per inch at up to 90 cps on 9.5-inch paper. It prints the full 96-character ASCII set and comes with a parallel or serial interface. Its baud rates include 300, 1200, and 9600, and it has a 1.4K character buffer. The print head has a life of up to 100 million characters. The printer comes with a 90-day warranty.
(Integral Data Systems, Milford, NH 03055, 603-673-9100.)

DMP-200
$799
Dot Matrix
Tandy/Radio Shack

This bidirectional, dot-matrix printer produces 10 characters per inch at up to 120 cps. It uses the 96-character ASCII set, and comes with parallel and serial interfaces. The serial baud rate is selectable from 600–1200. The print buffer holds 2K characters. The printer uses 9.5-inch-wide paper, and comes with a 90-day warranty.
(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

MT160I, MT160L
$845 and $990
Dot Matrix
Mannesmann Tally

These bidirectional, 7-by-9 dot-matrix printers are capable of high-resolution (64-by-100) graphics. They print 5, 6, 8.25, 10, 12, 16.5, or 20 characters per inch at up to 160 cps. They come with the full 96-character ASCII set, and are available in both parallel and serial models. Each printer has a baud rate of 9600, and a 2K character buffer. The print heads have a life of 150 million characters, and one-year warranties. The printers have a 90-day warranty.
(Mannesmann Tally, 8301 South 180th St., Kent, WA 98031, 800-225-0692.)

TP-1 Text Printer
$895
Daisy Wheel
Smith-Corona

This letter-quality printer produces 10 or 12 characters per inch at up to 12 characters per second. It comes with an 88-character ASCII set, and is available in parallel and serial models. The print wheel has a 2-million-character life. The printer comes with a 90-day parts and labor warranty.
(Smith-Corona, 65 Locust Ave., New Canaan, CT 06801, 800-448-1018; in NY, 800-962-3000.)

Microline 83A
$899
Dot Matrix
Okidata Corporation

This bidirectional, 9-by-9 dot-matrix printer is capable of producing high-resolution (up to 99-by-66) graphics. It prints 5, 8.3, 10, or 16.5 characters per inch on 15-inch friction-feed, or 16-inch sprocket-feed, paper at up to 120 cps. Its character sets include a full 96-character ASCII, TRS-80, and foreign fonts. The printer has a baud rate of 1200, and a one-line print buffer. Its print head has a life of 200 million characters and a one-year warranty. The unit itself comes with a 90-day warranty.
(Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054, 609-235-2600.)

Print Mate 150
$995
Dot Matrix
Micro Peripherals Inc.

There are eight models of this bidirectional, dot-matrix printer. The print head has 18 pins, and is capable of high-resolution (72 vertically by up to 85 horizontally) graphics. The printer produces 10, 12, 15, or 17 characters per inch at up to 150 cps on 15-inch paper. It comes with the full 96-character ASCII set and three foreign fonts, and

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is available with parallel or IEEE interfaces. It has a baud rate of 9600, and a print buffer that holds from 2K to 68K characters. Its print head has a life of 100 million characters. The printer comes with a 90-day warranty.
(Micro Peripherals Inc., 4426 South Century Drive, Salt Lake City, UT 84107, 800-821-8848.)

$1,000–$1,499

CR-1
$1,115
Daisy Wheel
Comrex International

This bidirectional, letter-quality printer comes in parallel or serial versions. It prints 10, 12, or 15 characters per inch at up to 17 cps. Its baud rates range from 300–9600, and it has a 2K print buffer. The printer comes with a 90-day warranty.
(Comrex International, 3701 Skypark Drive, Suite 120, Torrance, CA 90505, 213-373-0280.)

DMP-400
$1,195
Dot Matrix
Tandy/Radio Shack

The DMP-400 is a bidirectional, dot-matrix printer that produces 10 characters per inch at up to 140 cps. It uses the 96-character ASCII set and comes with parallel and serial interfaces. The serial baud rate is selectable from 600–1200. The print buffer holds 2K characters. The printer uses paper up to 15 inches wide, and comes with a 90-day warranty.
(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

Microline 93
$1,249
Dot Matrix
Okidata Corporation

This bidirectional, correspondence-quality printer uses a 9-by-9 dot matrix for data processing, and a 13-by-17 dot matrix for correspondence-quality documents. It has a parallel interface, and prints 5, 6, 8.5, 10, 12, or 17 characters per inch at up to 160 cps. It uses 15-inch friction-feed, or 16-inch sprocket paper. The character sets include the complete 96-character ASCII, TRS-80, and foreign fonts. Its print buffer holds one line of text. The print head has a life of 200 million characters, and comes with a one-year warranty. The printer has a 90-day parts and labor warranty.
(Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054, 609-235-2600.)

GE 2030 KSR
$1,250
Dot Matrix
General Electric Co.

This bidirectional, RS-232C printer produces 10, 13.2, or 16.5 characters per inch at 60 cps. It has a 9-by-7 dot matrix, and prints on paper ranging in width from 2.95 to 15.35 inches. It comes with a 94-character ASCII set, and has a baud rate of 4800. Its print buffer holds 640 characters, and its print head has a life of 200 million characters. The printer comes with a one-year warranty on parts.

The GE 2030 RO costs $1,175, and is a receive-only version of the GE 2030 KSR.
(General Electric Co.,Waynesboro, VA 22980, 703-949-1717.)

Prism 80
Color Printer
$1,299
Dot Matrix
Integral Data Systems

This bidirectional, correspondence-quality, color printer has a nine-wire, staggered dot matrix, and is capable of producing high-resolution (84-by-84) graphics. It prints 5, 10, 12, or 16.5 characters per inch at up to 150 cps on 9.5-inch paper. The printer uses a full 96-character ASCII set, and comes in both parallel and serial models. Its baud rates range from 300 to 9600, and its print buffer holds 3.4K characters. The print head has a life of 250 million characters. The printer comes with a 90-day warranty.
(Integral Data Systems, Milford, NH 03055, 603-673-9100.)

GE 3010
$1,300
Dot Matrix
General Electric Co.

This bidirectional parallel or serial printer can produce 5, 6, 8.25, 10, 12, or 16.5 characters per inch at up to 160 cps. It uses paper from 3.2 to 15.5 inches wide. The printer includes a 96-character ASCII set plus 40 national and 64 graphic characters. It has a baud rate of 9600 and a 2K buffer. The print head has a life of over 300 million characters. The printer comes with a one-year warranty on parts.
(General Electric Co.,Waynesboro, VA 22980, 703-949-1717.)

DTC 380Z Daisy Wheel Printer
$1,359
Daisy Wheel
DTC Data Terminals & Communications

This bidirectional, letter-quality printer is capable of high-resolution graphics. It prints 10, 12, or 15 characters per inch at 16–32 cps on 13.2-inch paper. The printer uses the full ASCII character set, and is available in parallel, serial or IEEE versions. Its buffer holds 48K characters. The printer comes with a 90-day warranty.
(Data Terminals & Communications, 590 Division St., Campbell, CA 95008, 408-378-1112 ext. 21.)

Microline 84
$1,395 Parallel, $1,495 Serial
Dot Matrix
Okidata Corporation

This bidirectional, correspondence-quality printer uses a 9-by-9 dot matrix for data processing, and a 13-by-17 dot matrix for correspondence-quality documents. It creates high-resolution (102-by-72) graphics. The printer produces 5, 6, 8.5, 10, 12, and 17 characters per inch at 200 cps in the data-processing mode, and 50 cps in the correspondence-quality mode on 16-inch sprocket or 15-inch cut-sheet paper. Standard, correspondence, downline loadable, foreign, and special character sets are included. The printer is also available with an IEEE interface. The parallel version has a one-line print buffer; the serial's holds 2K characters. The print head has a life of 200 million characters, and a one-year warranty. The printer itself has a 90-day parts and labor warranty.
(Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054, 609-235-2600.)

DWP-410
$1,495
Daisy Wheel
Tandy/Radio Shack

The DWP-410 is a unidirectional, letter-quality printer that produces 10 or 12 characters per inch, or proportional spacing at up to 25 cps. It uses the 96-character ASCII set, comes with a parallel interface, and uses paper up to 16 inches wide. The printer comes with a 90-day warranty.

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Edit without Retyping with insert & delete	YES	YES	NO	NO
Restrict field Length automatically	YES	YES	YES	NO
Unlimited Restriction choice for each field	YES	YES	NO	NO
User defined Custom Prompts for each Field	YES	YES	NO	NO
Full Speed Typing in ALL Fields	YES	YES	NO	YES
Immediate Exit from Any Field to Menu	YES	YES	NO	YES
Enter Fields from last Record automatically	YES	YES	NO	NO
Fast BTREE File Structure (No Sort Needed)	YES	YES	NO	NO
Find Record with Part of a Key	YES	YES	NO	NO
Hi-Speed Global Search for ANY Field in a Record	YES	YES	NO	NO
Duplicate Keys and Multiple Keys Supported	YES	YES	limited	NO
Global Field Replacement Function	YES	YES	NO	NO
Run Predefined Reports from Finished Program	YES	YES	NO	NO
Select Reports from Menu in Finished Program	YES	NO	NO	NO
Sort (machine language) ANY Field-Free	YES	NO	NO	NO
Custom Mailing Labels Option (any Size)	YES	NO	NO	NO
Do Calculations on fields in Program	YES	YES	YES	NO
Sell Finished Program with No Royalty	YES	YES	NO	NO
PRODUCER CAPABILITIES & FEATURES				
Toll Free Question Line	YES	YES	NO	NO
Create PROFESSIONAL Finished Program	YES	YES	NO	NO
Modify Program without Starting Over	YES	YES	NO	NO
Ease of Use, including Complete TUTORIAL	YES	NO	NO	NO
Number of Calculations allowed per field	8	8	1	0
Use Field Names for Calculations	YES	NO	NO	NO
Use ALL Math Functions in Calculations	YES	NO	NO	NO
Generates a BASIC Program	YES	YES	YES	YES
Custom Design exact Screen YOU desire	YES	YES	NO	NO
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FREE UTILITIES INCLUDED				
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- much more (see technical comparison chart)

The PRODUCER, Jr. comes to you complete with all the above features and its own operating system for only $89.95. But don't let this low price fool you--The PRODUCER, Jr. is still the most powerful program generator on the market today, with the exception of the original PRODUCER. And The PRODUCER, JR. is completely compatible to the original PRODUCER, so if you decide to upgrade at a later date you may do so for only $75.00. So don't miss out. Order today.

For an independent product review of the PRODUCER see page 62 of March issue of 80 Micro

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(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

Prism 132
Color Printer
$1,499
Dot Matrix
Integral Data Systems

This bidirectional, correspondence-quality color printer has a nine-wire staggered print head capable of producing high-resolution (84-by-84) graphics. It prints 5, 10, 12, or 16.5 characters per inch at up to 150 cps on up to 15-inch paper. The printer includes the full 96-character ASCII set, and is available in parallel and serial versions. Its baud rates range from 300–9600, and its print buffer holds 3.4K characters. The print head has a life of 250 million characters. The printer has a 90-day warranty.
(Integral Data Systems, Milford, NH 03055, 603-673-9100.)

Z-125 Dot-Matrix Printer
$1,499
Dot Matrix
Zenith Data Systems

The Z-125 is a bidirectional, serial printer with a 9-by-9 dot matrix. It is capable of producing block graphics. It can print 10, 12, 13.2, or 16.5 characters per inch at up to 150 cps on paper ranging from 3.5–17.78 inches wide. It comes with a 95-character ASCII set, and 33 block graphics. It has a baud rate of 110–9600, and a buffer that holds 256 characters. The printer comes with a 90-day warranty.
(Zenith Data Systems, 1000 Milwaukee Ave., Glenview, IL 60025, 312-391-8860.)

$1,500–$1,999

Model 500
$1,530
Dot Matrix
Infoscribe Inc.

This bidirectional, correspondence-quality printer prints in both a 9-by-9 and an 18-by-9 dot matrix. It prints 10, 12, or 16.5 characters per inch at 75 cps (for correspondence-quality printing) or 150 cps (for data processing applications). It uses paper that is 1.5–16 inches wide, and has 96 ASCII, foreign, or other special character sets. It comes in both parallel and serial versions. The printer has a baud rate of 110–9600, and a print buffer that holds 3K characters. The print head has a life of 350 million characters. The Model 500 comes with a six-month warranty.
(Infoscribe Inc., 2720 South Croddy Way, Santa Ana, CA 92704, 714-641-8595.)

GE 3014
$1,550
Dot Matrix
General Electric Co.

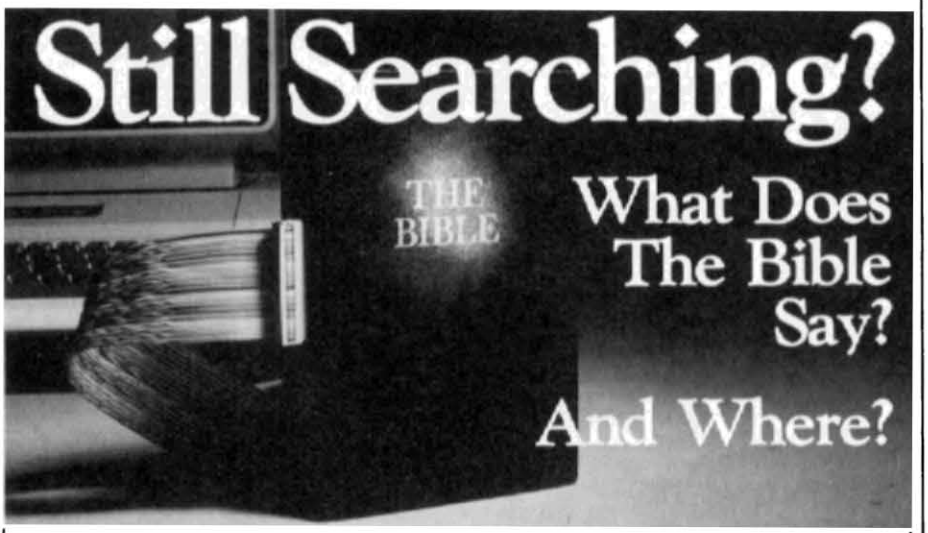
This bidirectional parallel or serial printer prints 5, 6, 8.25, 10, 12, or 16.5 characters per inch at 40, 80 or 160 cps. It uses paper that is 3.2–15.5 inches wide, and comes with 96-character ASCII, 40 national, and 64 graphic character sets. It has a baud rate of 9600, and a print buffer that holds 2K characters. Its print head life is over 300 million characters. The printer comes with a one-year warranty on parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Model 910 Printer
$1,595
Dot Matrix
Printek Inc.

This bidirectional, serial printer uses one staggered row of nine pins. It is capable of high-resolution (144-by-144, or 72-by-72) graphics, and can print 10, 12, 13, or 16 characters per inch at up to 200 cps. The printer uses paper that is 2.5–16 inches wide, and comes with 96 ASCII and six additional foreign fonts. It has baud rates ranging from 300–9600, and a print buffer that holds 1,792 characters. The print head has a life of 300 million characters. A 180-day warranty is provided by the distributor.
(Printek Inc., 1517 Townline Road, Benton Harbor, MI 49022, 616-925-3200.)

DS-180 Dot-Matrix Printer
$1,595
Dot Matrix
Datasouth Computer Corporation

This bidirectional printer has a 650-million-character, nine-wire printhead and includes parallel, serial and 20mA current loop interfaces. Baud rates range from 110–9600. It prints 5, 6, 8.25, 10, 12, or 16.5 characters per inch at 180 cps on paper from 2.5–15 inches wide. Its character sets include full ASCII, APL, and certain foreign



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64K Memory, 200nsec, Guar 1 yr	8/$48
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sets. Its print buffer holds 2K characters. The printer comes with a 90-day parts and service warranty.
(Datasouth Computer Corporation, 4216 Stuart Andrew Blvd., P.O. Box 240947, Charlotte, NC 28205, 800-438-5050, service; 704-532-8500, sales.)

DMP-500
$1,795
Dot Matrix
Tandy/Radio Shack

This bidirectional, parallel printer produces 10 characters per inch at up to 220 cps. It uses the 96-character ASCII set, and paper 15 inches wide. The printer comes with a 90-day warranty.
(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

Model 1000
$1,895
Dot Matrix
Infoscribe Inc.

The Model 1000 is a bidirectional printer available in both parallel and serial versions. It uses a 7-by-9 dot-matrix for data processing purposes, and a 14-by-9 dot matrix for correspondence-quality documents. It is capable of high-resolution (72-by-72) graphics, and prints 10, 12, or 16.5 characters per inch at up to 200 cps. It uses paper that is 1.5–16 inches wide and its character sets include ASCII, foreign and some special sets. Available in parallel and serial models, the printer lets you select baud rates from 110–9600. Its print head has a life of 350 million characters, and its buffer will hold 3K characters. The printer comes with a six-month warranty.
(Infoscribe Inc., 2720 South Croddy Way, Santa Ana, CA 92704, 714-641-8595.)

Starwriter F10
$1,895
Daisy Wheel
C. Itoh/Leading Edge Products

The Starwriter is a bidirectional, letter-quality printer that prints 10, 12, or 15 characters per inch, as well as supporting proportional spacing. It prints up to 40 characters per second on paper as wide as 16.24 inches. It comes with a 96-character ASCII set, and selectable baud rates from 300–2400. A 256-byte print buffer can be expanded with a 2K option. The printer is available in parallel, serial and IEEE 488 models. A parts and labor warranty covers the Starwriter for one year.
(C. Itoh/Leading Edge Products, 225 Turnpike St., Canton, MA 02021, 800-343-6857.)

GE 3181
$1,930
Dot Matrix
General Electric Co.

This bidirectional, 9-by-9 dot-matrix printer includes both parallel and serial interfaces. It prints 10, 12, 13.1, or 16.7 characters per inch at up to 180 cps, and it uses paper that is 3.2–11.5 inches wide. Its character sets include 96 graphics (ASCII/ISO) and 10 national sets. It has a baud rate of 9600, and a 512-character print buffer. The print head has a life of 300 million characters. The printer comes with a one-year parts warranty.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Daisy Wheel II
$1,995
Daisy Wheel
Tandy/Radio Shack

This unidirectional, letter-quality printer produces 10 or 12 characters per inch, or proportional spacing at up to 43 cps. It uses the 96-character ASCII set, plus special and international symbols. It has a parallel interface, and uses paper up to 15 inches wide. The printer comes with a 90-day warranty.
(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

Printmaster F10
$1,995
Daisy Wheel
C. Itoh/Leading Edge Products

This letter-quality printer can print 10, 12, or 15 characters per inch as well as support proportional spacing. It prints up to 55 cps and uses paper as wide as 16.24 inches. It has selectable baud rates from 110–9600, and comes with a 256-byte print buffer. The printer is available in parallel, serial, or IEEE 488 models, and is covered by a one-year parts and labor warranty.
(C. Itoh/Leading Edge Products, 225 Turnpike St., Canton, MA 02021, 800-343-6857.)

GE 3180
$1,990
Dot Matrix
General Electric Co.

The GE 3180 is a bidirectional, dot-matrix printer available with both parallel and serial interfaces. The serial version has a baud rate of 9600. It prints 10, 12, 13.1, or 16.7 characters per inch at up to 180 cps and it uses paper that is 3.2–15.5 inches wide. The printer comes with a 96-character graphics (ASCII/-ISO) set as well as 16 national sets. Its print head has a life of 300 million characters and the printer has a 512-character buffer. The printer comes with a one-year warranty on parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

DMP-2100
$1,995
Dot Matrix
Tandy/Radio Shack

This triple-mode printer has data-processing, letter-quality, and dot-addressable graphics modes. It prints up to 160 cps in the data-processing mode. In letter-quality mode, characters are printed in a 24-by-36 matrix for each letter. It gives a character to rival a daisy-wheel character in quality. The printer uses the 96-character ASCII set plus 31 international and 31 special symbols. It uses paper up to 16 inches wide. The printer comes with a 90-day warranty.
(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

Model 7030
$1,995
Dot Matrix
North Atlantic/Qantex Division

The Model 7030 is a bidirectional, correspondence-quality printer capable of high-resolution (up to 144-by-144) graphics. It prints 10, 12, 13.2, 15, or 17 characters per inch on paper up to 15 inches wide. Its speed varies with the printing mode chosen. It prints 180 cps for data processing or drafting purposes. Correspondence-quality documents are printed at 37 cps. Available in parallel and serial versions, the printer has selectable baud rates up to 19,200. The print buffer holds 4.7K characters. The printer comes with a 90-day warranty.
(North Atlantic/Qantex Division, 60 Plant Ave., Hauppauge, NY 11788, 516-582-6060.)

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GE 2120 KSR/RO
$2,195/$2,120
Dot Matrix
General Electric Co.

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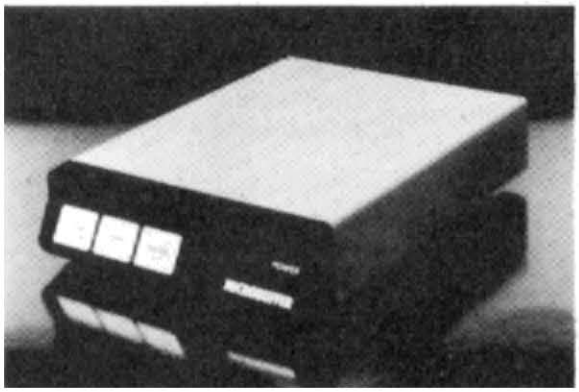

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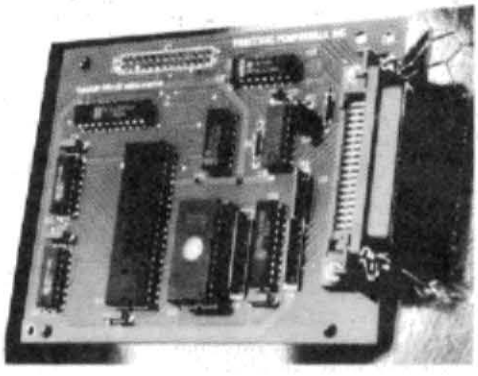
The MBIP in-line parallel interface works with almost any computer/printer combination utilizing a Centronics type parallel interface. Available with up to 256K of RAM for data buffering, the MBIP can accept very large files for buffering as fast as your computer can send it.

Most computers are able to send data to the printer at very high speeds, usually much faster than the printer can print it. The MBIP, placed between the computer and the printer, accepts this data as fast as the computer can send it, stores it in it's own memory and then sends it on to the printer at the printer's own speed. Since the computer has now transmitted all of its data to the memory of the MBIP, the computer is now free to continue useful work while the MBIP dumps its's memory to the slower printer. Under normal circumstances without a MBIP the computer could be tied up for hours on a large file being dumped into the printer costing you valuable time and money.

Using the MBIP's touch sensitive front panel controls, multiple copies of your document can be made without tying up the computer any further. The MBIP simply keeps dumping copies of your document from its memory until it has printed the amount of copies you have specified. Printing may be halted at any point and continued where it left off later. You can even turn your computer off and MBIP will continue until the print job is complete. Additional files may be transmitted to the MBIP for processing even while the MBIP is handling copies from a previous job.

The MBIP requires no user modifications of software and installs in seconds with virtually any computer (including TRS-80, ATARI, IBM-PC, APPLE, OSBORNE, NEC etc.) and any printer (including EPSON, CENTRONICS, NEC, C.ITOH, IDS, ANADEX, OKIDATA, IBM PERSONAL etc.).



MBP-16K EPSON PARALLEL BUFFER 16,384 Byte Buffer

16K Epson 80/100 . . . . . **$159.95**
8K Serial Epson 80/100 . . . . . **$159.95**

The MBP-16K is an intelligent Centronics-Compatible parallel interface for the Epson MX-80, MX-80 F/T, and MX-100 printers, with 16,384 bytes of on-board RAM for data buffering.

The buffering capability of the MBP-16K increases your data processing efficiency by eliminating the wait normally experienced while printing. An Epson printer prints at 80 characters per second; at this speed it takes about five minutes to print a 16,000 character document. During most of this time the computer is waiting for Epson to finish one line so it can send the next. The computer can't do anything else because it's tied to the printer. By using the MBP-16K it takes the computer only *four seconds* to send a 16,000 character document. The Practical Peripherals MBP-16K interface typically accepts data as fast as the computer can send it, until full, returning use of the computer to you while it handles the printing. You can continue with other processing while simultaneously printing data from a previous job, gaining all the time you normally would have spent waiting for the printer to finish. The net result is to eliminate the computer-waiting-for-printer/printer-waiting-for-computer bottleneck, and keep both working. Any program that involves printed output will be speeded up by using the MBP-16K.

The MBP-16K supports all standard Epson Commands, is compatible with GRAFTRAX-80, and is plug compatible with the standard Epson cable. The MBP-16K does not require any user software for control.

The MBP-16K is easy to install — it simply plugs into the existing auxilliary interface connector inside the Epson without modification of the printer.

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(the receive-only version) are bidirectional printers capable of printing 10, 13, and 16.5 characters per inch at up to 150 cps. They use 2.95–15.35 inch-wide paper and have serial interfaces. They use a 94-character ASCII set and have a baud rate of 9600. The print buffers hold 640 characters, and the print heads have a life of 200 million characters.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

GE 3300
$2,275
Dot Matrix
General Electric Co.

The GE 3300 is a bidirectional, 9-by-9 dot-matrix printer that prints 10, 12, 13.1, or 16.7 characters per inch at up to 300 cps. It uses paper that is 3.2–15.5 inches wide, and a 96-character graphics (ASCII/ISO) set plus 16 national sets. The printer has both parallel and serial interfaces and a baud rate of 9600. Its print buffer holds 512 characters. The print head has a life of over 300 million characters. The printer is covered by a one-year warranty on parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Model 1100
$2,295
Dot Matrix
Infoscribe Inc.

The Model 1100 is a bidirectional, correspondence-quality printer that uses 7-by-9, 14-by-9, and 19-by-18 dot matrices for different printing tasks. It is capable of high-resolution (72-by-72, or 144-by-144) graphics. It can print 10, 12 or 16.5 characters per inch at 40, 100, or 200 cps, and uses ASCII, foreign and special character sets. The printer is available with either a parallel or serial interface and has selectable baud rates from 110–9600. It has a 3K character print buffer. The print head has a life of 350 million characters. The printer is covered by a six-month warranty.
(Infoscribe Inc., 2720 South Croddy Way, Santa Ana, CA 92704, 714-641-8595.)

GE 3185
$2,300
Dot Matrix
General Electric Co.

This bidirectional, correspondence-quality printer uses 9-by-9 and 9-by-18 dot matrices. It prints 10, 12, 13.1, or 16.7 characters per inch at 45 or 180 cps. The printer is capable of high-resolution (72-by-144) graphics, and uses paper that is 3.2–11.5 inches wide. Character sets include 96 graphics (ASCII/ISO), and 16 national sets. The GE 3185 is available with both parallel and serial interfaces; its baud rate is 9600. It has a 512-character print buffer, and its print head has a life of 300 million characters. The printer comes with a one-year warranty on parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Only those companies that responded to our questionnaire are included in these listings.

GE 3240
$2,340
Dot Matrix
General Electric Co.

The GE 3240 is a bidirectional, 9-by-9 dot-matrix printer that prints 10, 12, 13.1, or 16.7 characters per inch at 240–400 cps on paper that is 3.2–15.5 inches wide. Character sets include 96 graphics (ASCII/ISO) plus 16 national sets. The 3240 comes with a serial RS-232 interface; others are optional. Its print buffer holds 512 characters, and its print head has a life of 300 million characters. The printer comes with a one-year warranty on parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

GE 200 KSR/RO
$2,350/$2,160
Dot Matrix
General Electric Co.

The GE 200 KSR printer and the GE 200 RO (its receive-only counterpart) are bidirectional dot-matrix printers able to print 10, 12.9, 15, and 16.5 characters per inch at up to 200 cps. The printer uses paper that is 2–16.5 inches wide, and comes with a 96-character ASCII set. The GE 200 has both parallel and serial interfaces; the serial version has a baud rate of up to 1200. The printer has a 1K-character print buffer, a print head life of 150 million characters, and a one-year warranty on parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

GE 3184
$2,360
Dot Matrix
General Electric Co.

This bidirectional, dot-matrix printer prints 10, 12, 13.1, or 16.7 characters per inch at up to 180 cps. It is capable of high-resolution (72-by-144) graphics as well, and uses paper that is 3.2–15.5 inches wide. The printer uses the 96-character graphics set (ASCII/ISO), as well as 16 national sets. It has a baud rate of 9600, a print buffer that holds 512 characters, and a print head with a life span of 300 million characters. The printer comes with a one-year warranty on parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Model 920
$2,395
Dot Matrix
Printek Inc.

The Model 920 is a bidirectional printer capable of producing 10, 12, 13, and 16 characters per inch at up to 340 cps on paper that is 2.5–16 inches wide. It also prints high-resolution (144-by-144, or 72-by-72) graphics. Its character sets include US ASCII and six additional foreign fonts. The printer comes with a serial interface; a parallel interface is optional. Its selectable baud rates range from 300–9600. The print head has a life of 300 million characters, and the print buffer holds 1,792 characters. The printer comes with a distributor's 180-day warranty.
(Printek Inc., 1517 Townline Road, Benton Harbor, MI 49022, 616-925-3200.)

GP300 Dot-Matrix Printer
$2,455
Dot Matrix
Amperex Electronic Corporation

This bidirectional, correspondence-quality printer prints 10, 12, and 15 characters per inch and supports proportional spacing. It is also capable of high-resolution (144-by-144) graphics. The GP300 prints 80–120 cps for correspondence-quality documents, and 300 cps for data processing purposes. Character sets include 25 sets on ROM data and Gothic Standard. The printer uses 15.7-inch paper. It comes with a serial interface, and has a baud rate of 19,200. Its print buffer holds 520 characters and its print head has a life of 300 million characters. The printer comes with a six-month warranty.
(Amperex Electronic Corporation, 230 Duffy Ave., Hicksville, NY 11802, 516-931-6200.)

GE 200 LP
$2,465
Dot Matrix
General Electric Co.

This line printer uses 7-by-9 and 9-by-9 dot matrices to print 10, 12.9, 15,

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Data-Timer is the brand new computer program that manages your billable time and resources more accurately and more profitably. And it's so simple to use. Used in conjunction with your Day-Timer™ Diary, Data-Timer is the ideal package for:

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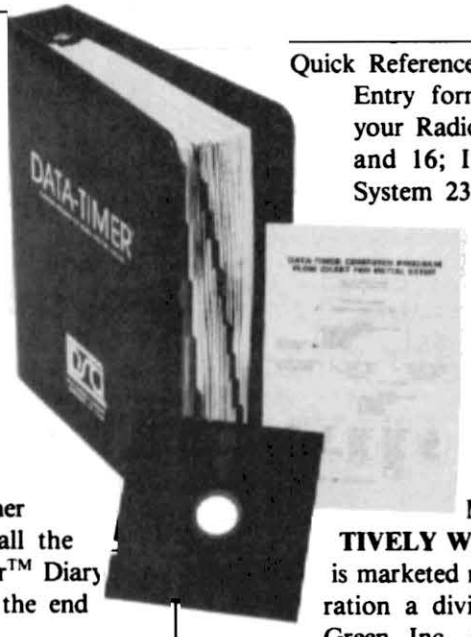

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***PROVIDE PASSWORD PROTECTION**—Data-Timers built-in security system is designed to prohibit unauthorized access to the information stored on the program.

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and 16.5 characters per inch at up to 200 cps. The GE 200 LP comes with a 96-character ASCII set. Parallel and serial interfaces are standard; the serial version has a baud rate of 9600. The printer's buffer can hold up to 1,024 characters, and the print head has a life of 150 million characters. Printer parts are covered by a one-year warranty.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Model 1200
$2,495
Dot Matrix
Infoscribe Inc.

This bidirectional printer uses three dot matrices: 7-by-9, 14-by-9, and 19-by-18 to print 10, 12, and 16.5 characters per inch at speeds ranging from 40–200 cps. The printer uses paper from 1.5 to 16 inches wide. It is also capable of producing high-resolution (72-by-72, or 144-by-144) graphics. Its character sets include ASCII and several foreign and special sets. The printer is available with both serial and parallel interfaces; the selectable baud rate ranges from 110–9600. Its print buffer holds 3K characters, and its print head has a life of 350 million characters. The printer comes with a six-month warranty.
(Infoscribe Inc., 2720 South Croddy Way, Santa Ana, CA 92704, 714-641-8595.)

$2,500–$2,999

GE 3204
$2,610
Dot Matrix
General Electric Co.

The GE 3204 is a bidirectional printer that uses two dot matrices, 9-by-9 and 9-by-18, to print 10, 12, 13.1, and 16.7 characters per inch at speeds up to 200 cps. It has high-resolution (72-by-144) capability, and uses 3.2 to 15.5-inch paper. Its character sets include 96 graphics (ASCII/ISO) plus 16 national sets. The printer is available with both parallel and serial interfaces; its baud rate is 9600. Its print buffer holds 512 characters. The print head has a life of 300 million characters. The printer comes with a one-year parts warranty.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Model 100 by Printer Products

GE 3400
$2,630
Dot Matrix
General Electric Co.

The GE 3400 is a bidirectional printer that uses a 9-by-9 dot matrix to print 10, 12, 13.1, and 16.7 characters per inch. It prints up to 400 cps, and uses 3.2 to 15.5-inch paper. Its character sets include 96 graphics (ASCII/ISO) plus 16 national sets. It is available with both parallel and serial interfaces. The serial version has a baud rate of 9600. Its print buffer holds 512 characters, and the print head has a life of 300 million characters. The printer comes with a one-year parts warranty.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

GE 3304
$2,675
Dot Matrix
General Electric Co.

This bidirectional dot-matrix printer comes with both 9-by-9 and 9-by-18 dot matrices. It is able to print 10, 12, 13.1, and 16.7 characters per inch at 100–300 cps. It uses paper from 3.2 to 15.5 inches wide. The printer's character sets include 96 graphics (ASCII/ISO) plus 16 national sets. It is available with both parallel and serial interfaces; the serial version has a baud rate of 9600. The printer has a 512 character buffer, and a print head whose life is 300 million characters. It comes with a one-year warranty on parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Pacemark 2350
$2,695
Dot Matrix
Okidata Corporation

This bidirectional printer uses a 9-by-9 dot matrix to print 5, 6, 8.5, 10, 12 and 17 characters per inch. It is capable of high-resolution (72-by-72) graphics and prints up to 350 cps. Character sets include standard, foreign languages, downline loadable, and alternate sets. The printer is available with parallel and serial interfaces and has a maximum baud rate of 19.2K. The printer uses paper up to 16 inches wide, has a 2K print buffer, and a 500-million-character print head life. The printer is covered by a 90-day parts and labor warranty; the print head is covered for six months.
(Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054, 609-235-2600.)

GE 3244
$2,840
Dot Matrix
General Electric Co.

The GE 3244 is a bidirectional printer that uses two dot matrices, 9-by-9 and 9-by-18, to print 10, 12, 13.1, and 16.7 characters per inch. It is capable of high-resolution (72-by-144) graphics, and prints from 120–240 cps. Its character sets include 96 graphics (ASCII/ISO) plus 16 national sets. The printer comes with both parallel and serial interfaces; the serial version has a baud rate of 9600. The printer uses paper from 3.2 to 15.5 inches wide, has a 512 character print buffer, and has a print head whose life is 300 million characters. The unit is covered by a one-year parts warranty.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Model 1500
$2,995
Dot Matrix
Infoscribe Inc.

This bidirectional, correspondence-quality printer has two dot matrices: 9-by-9 for data processing, and 18-by-9 for correspondence-quality printing. It is capable of high-resolution (72-by-72) graphics. The printer produces 10, 12, and 16.5 characters per inch at 400 cps in the data processing mode, and at 200 cps in the correspondence-quality mode. Character sets include ASCII, foreign and special sets. The printer is available with both parallel and serial interfaces and has selectable baud rates from 110–9600. It has a 3K print buffer, and a print head with a 350-million-character life. The printer is covered by a six-month warranty.
(Infoscribe Inc., 2720 South Croddy

Way, Santa Ana, CA 92704, 714-641-8595.)

Digistrip Printer Model LP-1
$2,990
Dot Matrix
Kaye Instruments

This bidirectional printer has a 5-by-8 dot matrix. It prints 13 characters per inch on 11-inch paper. The printer's character sets include full ASCII, both upper- and lowercase, plus extras. It has a serial interface with a selectable baud rate from 110–2400. The printer comes with a 3K-character print buffer, and a 10-million-character print head life. The printer comes with a one-year warranty.
(Kaye Instruments, 15 DeAngelo Drive, Bedford, MA 01730, 800-343-4624.)

Pacemark 2410
$2,995
Dot Matrix
Okidata Corporation

The Pacemark 2410 is a bidirectional, correspondence-quality printer that uses a 9-by-9 dot matrix for data processing, and a 28-by-17 dot matrix for correspondence. It is capable of high-resolution (72-by-72 or 144-by-144) graphics. The printer produces 5, 6, 8.5, 10, 12 and 17 characters per inch, and has three speeds: 85, 175, and 350 cps. Its character sets include foreign language, downline loadable standard and correspondence mode, and alternate character sets. The Pacemark 2410 is available with both parallel and serial interfaces, the serial version has a maximum baud rate of 19.2K. Its print buffer holds 2K characters and its print head has a life of 500 million characters. The printer comes with a 90-day parts and labor warranty; the print head remains under warranty for six months.
(Okidata Corporation, 111 Gaither Drive, Mt. Laurel, NJ 08054, 609-235-2600.)

$3,000–$3,999

GE 3404
$3,085
Dot Matrix
General Electric Co.

This bidirectional printer uses two dot matrices, 9-by-9, and 9-by-18, to print 10, 12, 13.1, and 16.7 characters per inch. It is capable of high-resolution (72-by-144) graphics. Its character sets include 96 graphics (ASCII/ISO) plus 16 national sets. The GE 3404 is available with both parallel and serial interfaces; the serial version has a baud rate of 9600. The printer has a 512-character print buffer and a print head with a life of 300 million characters. A one-year warranty covers all parts.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Model MVP
$3,745
Dot Matrix
Printronix

The Model MVP is a dot-matrix printer that prints 10 or 12.5 characters per inch at up to 440 cps. It has high-resolution (200-by-96) graphics capability as well and uses paper up to 16 inches wide. It comes with a 96-character ASCII set, and is available with both parallel and serial interfaces. The serial baud rate is selectable up to 19.2K. The print buffer holds 264 characters. The printer is covered by a one-year warranty.
(Printronix, 17500 Cartwright Road, Irvine, CA 92713, 714-549-7700.)

$4,000–$4,999

OSP 120, 125, 130
$4,100
Dot Matrix
Florida Data Corporation

These bidirectional printers have eight-pin, one-billion-character print heads and print 10–18 characters per inch at 100–600 cps. They are capable of high-resolution (360-by-384) graphics. Many character sets are available, including the font-downline-load option. The printers come with both parallel and serial interfaces; there is a selectable baud rate from 100 to 19.2K. The print buffers hold from 512–2,560 characters. Each printer comes with a 90-day warranty.
(Florida Data Corporation, 600D John Road Blvd., Melbourne, FL 32935, 305-259-4700.)

GE 310/340
$4,170/$4,835
Belt Mechanism
General Electric Co.

These belt-mechanism printers produce correspondence-quality documents in fully formed letters at 10, 13, and 16.5 characters per inch. Their print speeds vary from 240–425 lines per minute. They use paper 3–15 inches wide, and come with a 94-character ASCII set. The printers are available with both parallel and serial interfaces; the serial baud rate is 9600. The print buffers hold 132 characters. The printers come with a one-year warranty.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

Over $5,000

P-300
$5,595
Dot Matrix
Printronix

The P-300 is a dot-matrix printer that prints 10 characters per inch at up to 660 cps. It is also capable of high-resolution (120-by-72) graphics. The printer uses a 96 ASCII character standard set, and is available with parallel and serial interfaces. The serial version has a baud rate selectable up to 19.2K characters. The printer's buffer holds 132 characters. It is covered by a one-year warranty.
(Printronix, 17500 Cartwright Road, Irvine, CA 92713, 714-549-7700.)

GE 510
$5,795
Belt Mechanism
General Electric Co.

This belt-mechanism printer produces letter-quality documents with fully formed letters printed 10 characters per inch at a rate of 510 cps. Its character sets include 96 ASCII, Courier 10, letter Gothic, OCR-B, and national sets. The printer is available with both parallel and serial interfaces; the serial baud rate is 9600. The printer parts are covered by a one-year warranty.
(General Electric Co., Waynesboro, VA 22980, 703-949-1717.)

P-600
$7,695
Dot Matrix
Printronix

This printer uses 66 print hammers and one print size (10 characters per inch) to produce 1,320 cps. It is capable of high-resolution (120-by-72) graphics. The P-600 uses the 96 ASCII character set and is available with both parallel and serial interfaces. The serial baud rate is selectable up to 19.2K. The print buffer holds 132 characters. The printer has a one-year factory warranty.
(Printronix, 17500 Cartwright Road, Irvine, CA 92713, 714-549-7700.)

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Recover Blown Files!! Now you can directly access, modify, copy, zero, or print any sector on your diskette OR Radio Shack Hard Drive. Includes a SCAN utility to facilitate a disk search for a specified string. Documentation includes a description of the TRSDOS II directory structure.

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Keyed File System 'KFS-80' Mod I and III $100 Mod II $175 Machine language BASIC ISAM utility. Binary tree index system.

Model II Utility Package $150 Includes Superzap, bulk copies and other utilities for repair of blown diskettes. Complete documentation on diskette structure and guidance for repair.

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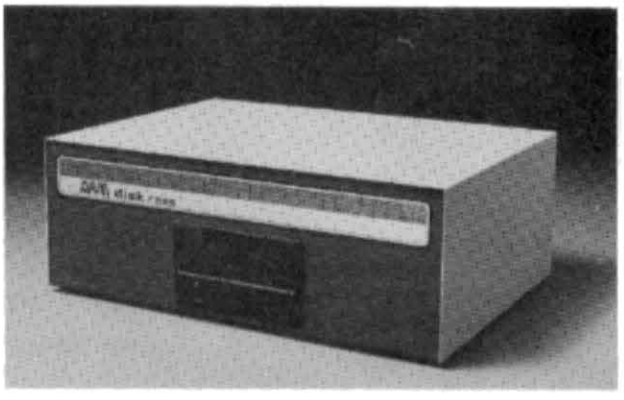

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Includes ECC error detection and correction. FAST. Service Contract Available ($30/month/drive). Multiplexor available. SHARE hard drive between four Model II's!!

20 Megabyte CII Honeywell Bull Cartridge Drive $7995
10 Megabytes fixed, 10 removable for the professional installation requiring Removable Media for BACKUP. 60 and 120 Megabyte add-on drives available. Up to 240 MEGABYTES!! Four port multiplexor available to SHARE hard drives.

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Radio Shack 2.0 Compatible Operating System for Hard Drive Operation. Run your 2.0 software on hard drives without conversion (except drive designation). Compatible with most machine language programs that use the standard calling sequence. Supports ARM, Cameo, Cynthia Bull, Corvus, Data Peripherals, QCS, Radio Shack, and certain other hard drives.

Access **BOTH** your floppy disk drives and hard drive files **INTERCHANGEABLY!!** Complete utilities include HZAP (Hard Disk SUPERZAP), Directory Catalog System, Parameterized FORMAT, HPURGE (Bulk Copy/Purge Utility) and others.

The Hard/Soft Disk System (HSDS) Software has almost two years **FIELD** experience. Version 5.0 adds several enhancements including maintenance of system files on the hard drive, files as large as the disk, the ability to segment the disk as logical drives, and definable directory size. Floppy backup (close to a Megabyte per minute) is provided for Winchester drives.

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↵See List of Advertisers on Page 371

. . . and Plotters

While printers are great for most documents, some tasks require special care. For example, most printers can't draw circles, arcs, grids or maps; those that can require complicated software routines.

Data and function plots require greater resolution than is available with most printers.

There are two types of plotters. Flat-bed plotters hold the paper on a flat surface while the plotter pen moves across it according to the commands it receives. The second type of plotter, called a drum plotter, has the paper attached to a revolving drum. The pen moves vertically as the drum rotates to position the pen horizontally.

Some plotters digitize data; by positioning the pen over a point on a predrawn figure and pressing enter, the plotter determines the exact coordinates of that point. This is accomplished with a digitizing routine, either one provided by the plotter or one you write yourself.

As with printers, you should know what the plotter will be expected to do before you shop. One point to consider is resolution. If you need fine, detailed figures, you should get an accurate plotter. If a plotter is accurate to .002 inches, the minimum step size, any errors made by the pen are likely to be less than the thickness of a pen line.

Programming ease is another point to consider. Some plotters have their own microprocessors and operating systems. This means, for instance, that a plotter can translate a simple set of numbers into a drawing of a blue circle. An intelligent plotter like this makes writing applications much easier.

If you wish to use color to add contrast to drawings, plotters are available with up to ten colors. But consider the duration of pen life and replacement cost.

If you want a plotter that makes transparencies as well, it is wise to check availability and cost of the required felt-tip pens.■

Model DXY-100
$749
Flatbed
Amdek Corporation

This one-pen parallel plotter has a resolution of .1mm and a plotting speed of 2.75 inches per second. It uses 10-by-14-inch paper and has a 10-by-14-inch plotting range. It plots in four directions and plots characters. Its expandable expansion ROM automatically plots circles and crosshatching. The DXY-100 comes with a 90-day warranty.
(Amdek Corporation, 2201 Lively Blvd., Elk Grove Village, IL 60007, 312-364-1180.)

Strobe 100 Plotter
$785
Drum
Strobe Inc.

This parallel interface, high-resolution plotter is accurate to .002 inches. The plotter digitizes data and plots characters on paper up to the standard 8½ by 11 inches. It comes with a 90-day warranty.
(Strobe Inc., 897 Independence Ave., Bldg. 5A, Mountain View, CA 94043, 415-969-5130.)

Hiplot DMP-40
$995
Drum
Houston Instrument, Division of Bausch & Lomb

This drum plotter uses up to eight colors and plots both vertically and horizontally. Five different character sets can be presented normally or as italics, at 255 possible sizes and 360 different degrees of rotation. The plotter is available with parallel, serial, and IEEE interfaces. Its resolution is .005 inches; its axial speed is 3 inches per second, and its diagonal speed is 4.2 inches per second. The plotting ranges are 7 by 9.25 inches and 9.25 by 15 inches. The plotter uses 8.5-by-11-inch, and 11-by-17-inch paper. The Hiplot DMP-40 comes with a 90-day warranty.
(Houston Instrument, Division of Bausch & Lomb, 8500 Cameron Road, Austin, TX 78753, 800-531-5479.)

FP-215 Flatbed Plotter/Printer
$995
Flatbed
Tandy/Radio Shack

This plotter produces four color figures at 3.93 inches per second. It has a plotting range of 7.32 by 10.63 inches and uses 10.12-by-14.1-inch paper. The FP-215 moves its pens both horizontally and vertically and plots characters as well. It is available with both parallel and serial interfaces. The plotter comes with a 90-day warranty.
(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

WX 4671
$1,190
Flatbed
Watanabe Instruments Corporation

This parallel, one-pen, intelligent plotter comes with four colors. It has a

Confidential Customer Price List

TRS-80 Model I/III Software

Stock Number	Program name	Machine	List	Our price
MOD I/III Programs				
101 - 6	ALIEN DEFENSE CASS	I/III	$15.95	$11.17
101 - 7	ALIEN DEFENSE DISK	I/III	$19.95	$13.97
102 - 246	APPLE PANIC CASS	I/III	$19.95	$13.97
102 - 247	APPLE PANIC DISK	I/III	$24.95	$17.47
102 - 14	ASSAULT CASS	I/III	$19.95	$13.97
102 - 15	ASSAULT DISK	I/III	$24.95	$17.47
102 - 92	ATTACK FORCE CASS	I/III	$15.95	$11.17
102 - 93	ATTACK FORCE DISK	I/III	$19.95	$13.97
102 - 250	BABLE TERROR CASS	I/III	$19.95	$13.97
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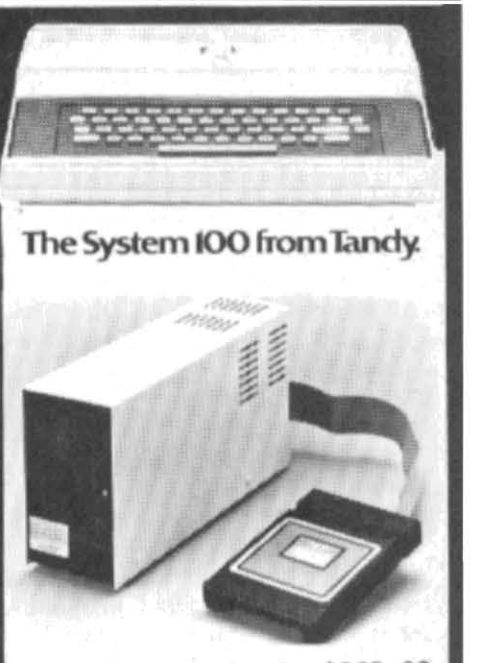

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resolution of .004 inches, and a plotting speed of 5 inches per second. It plots characters and comes with an 18-month warranty.
(Watanabe Instruments Corporation, 3186-D Airway Ave., Costa Mesa, CA 92626, 714-546-5344.)

Amplot II
$1,290
Flatbed
Amdek Corporation

The Amplot II is a six-pen, intelligent plotter that features a speed of 7 inches per second, automatic pen retrieval and .002-inch resolution. It is capable of plotting characters. The plotter is available with both parallel and serial interfaces. It has a plotting range of 10 by 14 inches, and plots four ways. It comes with a 90-day warranty.
(Amdek Corporation, 2201 Lively Blvd., Elk Grove Village, IL 60007, 312-364-1180.)

WX 4675
$1,490
Flatbed
Watanabe Instruments Corporation

This six-pen, intelligent plotter has a resolution of .004 inches, a plotting speed of 2 inches per second, and plots characters. The plotter comes with an 18-month warranty.
(Watanabe Instruments Corporation, 3186-D Airway Ave., Costa Mesa, CA 92626, 714-546-5344.)

TRS-80 Multi-pen Plotter
$1,995
Flatbed
Tandy/Radio Shack

The Multi-pen plotter comes with six colored pens, and plots 2.8 inches per second. It plots vertically and horizontally, has a plotting range of 7 by 9.25 inches, and requires 8.5-by-11-inch paper. The plotter includes a 93-character ASCII set. It is covered by a 90-day warranty.
(Tandy/Radio Shack, Fort Worth, TX 76102, 817-390-3011.)

Hiplot DMP-29 Plotter
$1,995
Flatbed
Houston Instruments, Division of Bausch & Lomb

This eight-pen, intelligent plotter has selectable resolution: .001- or .005-inch. Its axial speed is 16 inches per second and its diagonal speed is 22.62 inches per second; the plotter's speed is programmable to 1, 2, 4, 8, and 16 inches per second. The DMP-29 has a plotting range of 10 by 15 inches, and uses 8.5-by-11 or 11-by-17-inch paper. It plots both vertically and horizontally, and plots characters. The plotter is available with parallel, serial, and IEEE interfaces, and is covered by a 90-day warranty.
(Houston Instruments, Division of Bausch & Lomb, 8500 Cameron Road, Austin, TX 78753, 800-531-5479.)

WX 4672
$2,190
Flatbed
Watanabe Instruments Corporation

The WX 4672 is a single-pen, flatbed plotter with a SANUC N/C control system. It plots in four colors, has a resolution of .004 inches, and prints characters. It comes with a parallel interface, and an 18-month warranty.
(Watanabe Instruments Corporation, 3186-D Airway Ave., Costa Mesa, CA 92626, 714-546-5344.)

WX 4731
$2,490
Drum
Watanabe Instruments Corporation

The WX 4731 plots figures and characters in four colors and has a resolution of .004 inches. It plots vertically and horizontally, and comes with an 18-month warranty.
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WX 4635
$3,990
Flatbed
Watanabe Instruments Corporation

The WX 4635 is a single-pen intelligent plotter with a resolution of .004 inches and plots characters. It comes with a serial interface and is covered by an 18-month warranty.
(Watanabe Instruments Corporation, 3186-D Airway Ave., Costa Mesa, CA 92626, 714-546-5344.)

WX 4634
$4,290
Flatbed
Watanabe Instruments Corporation

This two-pen, intelligent plotter has a resolution of .004 inches and plots characters as well as figures. It is available with a serial interface, and is covered by an 18-month warranty.
(Watanabe Instruments Corporation, 3186-D Airway Ave., Costa Mesa, CA 92626, 714-546-5344.)

WX 4638
$4,490
Flatbed
Watanabe Instruments Corporation

The WX 4638 is a single-pen, high-speed plotter with a resolution of .004 inches. It plots characters and comes with a serial interface. The plotter is covered by an 18-month warranty.
(Watanabe Instruments Corporation, 3186-D Airway Ave., Costa Mesa, CA 92626, 714-546-5344.)

WX 4633
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Flatbed
Watanabe Instruments Corporation

This 10-pen, intelligent plotter has a resolution of .004 inches, plots characters as well as figures, and comes with a serial interface. It is covered by an 18-month warranty.
(Watanabe Instruments Corporation, 3186-D Airway Ave., Costa Mesa, CA 92626, 714-546-5344.)

WX 4637
$4,790
Flatbed
Watanabe Instruments Corporation

This two-pen, high-speed plotter has a resolution of .004 inches, plots characters, and comes with a serial interface. The plotter is covered by an 18-month warranty.
(Watanabe Instruments Corporation, 3186-D Airway Ave., Costa Mesa, CA 92626, 714-546-5344.)

WX 4636
$5,190
Flatbed
Watanabe Instruments Corporation

This 10-pen, high-speed plotter has a resolution of .004 inches, plots characters as well as figures, and comes with a serial interface. It is covered by an 18-month warranty.
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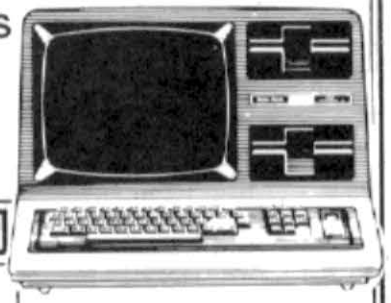

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Which TRS-80 Accounting Software Do I Buy . . .*

That's a tough question. I know, I asked it myself not very long ago. I'm Mike Motta. As president of Shawmut Systems, specialists in TRS-80* custom software, my customers were asking me for Model II and 16 Accounting Software — GL, AR, AP and Payroll. But I said "Why write the software. There must be a good package already available." So I searched for the best I could find. And I found it!

Now, when I tell you that these are the best Accounting programs I've seen on a microcomputer, you probably think that you are just listening to another sales pitch. But you're not. You're listening to a businessman with over twenty years combined experience in sales, management, and programming. So when I say that these programs will work for you, it really means something.

Each program, designed for the Model II or 16, will work with one or more floppy or hard disks. With each program, I'll include a 200 page manual written with the first time user in mind, and a set of sample data files so you can start using the program right away.

But I won't stop there. If you have a question, or a problem, call me. You won't get an operator, or order taker. You'll get me. And if I can't talk to you on the spot, I'll call you back. And I'll fix your problem. FAST.

Now I could say a lot more about these programs, but you really won't know how good they are until you try them. So, order the programs you need, and try them for 14 days. If you're not convinced that these are the programs for you, send them back, and I'll refund your money.

My price for these programs is only $289.00 each, postpaid. I could charge hundreds more, but I want you to have the best programs at the best possible price. So mail or call your order in today. I'll make sure you'll be satisfied.

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by Carl Oppedahl

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Radio Shack's Model I Double-Density Disk Kit (Cat. #26-1143) upgrades your Model I to support many Model III features. Aside from double-density disk capability, you get better versions of TRSDOS and Basic.

The kit provides a circuit board, manual, quick reference card, and a disk containing TRSDOS 2.7DD. The 7 indicates that this version is a newer release than the TRSDOS 2.3 that accompanied the Model I. The DD signifies that it performs double-density disk operations and will only run with the circuit board installed.

Installation

The word kit is a misnomer as you are not allowed to do the installation yourself, but it's a simple procedure. My Radio Shack store did the work in about 20 minutes. They opened up my Expansion Interface, extracted the Western Digital 1771 floppy-disk controller chip from its socket, plugged the chip into an available socket in the new board, plugged the new board in where the chip had been, adjusted a couple of potentiometers on the new board, closed the case, and put a warranty sticker on one of the screw holes.

With a few exceptions, the Radio Shack Model I disk drives made by Tandon and TPI had double-density and 40-track capability all along. According to Radio Shack, Shugart made the first several thousand drives sold under the 26-1160/1 catalog number that had only 35-track single-density operation. These drives are identified by the lack of a -1 in the serial number.

Although the kit instructions don't call for it, I chose to have my drives realigned and tested at the same time that Radio Shack installed the double-density kit.

The stepping time of the drives, previously 30 milliseconds, is trimmed to as little as 6 ms with TRSDOS 2.7DD. My two Radio Shack Tandon drives work fine at 6 ms, while my Siemens flippy drive requires a 12-ms step.

If a single-density disk operating under TRSDOS 2.3 is in drive zero when the system is booted, the computer runs in single density, at 35 tracks and 30 ms stepping time. This is important since most expensive Radio Shack software does not run under TRSDOS 2.7DD.

The circuit board has no detrimental effect on single-density operation; it actually improves things by providing separation of clock and data in circuitry external to the 1771 chip.

If a double-density disk running with TRSDOS 2.7DD is in drive zero when the system is booted, the new double-density disk capability of the hardware is utilized. If you have programs or files on a single-density disk you can put it in drive 1, 2, or 3. The DIR and Copy commands identify single-density files located there and transfer them to a double-density disk on another drive.

Hardware

The kit circuit board carries the Western Digital 1791 floppy-disk controller chip, which is an improved version of the 1771, with both single- and double-density capability. However, the single-density capability of the 1791 is not used in this circuit. When software invokes single-density operation, latches on the board disable the 1791 and enable the 1771, which is wired in parallel.

The circuit also provides external data separation in both single- and double-density operation.

In double-density operation, the 1's and zeros are spaced twice as closely as in single-density operation. As the track number increases to 40 and the read-write head moves closer to the hub, the spacing becomes even smaller. Adjacent 1's and zeros begin to interact with each other.

To minimize the problem, write-precompensation circuits are provided on the double-density board. They shape

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the pulses that are written to disk so that you can better distinguish the pulses on playback. Latches allow software enabling and disabling of write precompensation, and TRSDOS 2.7DD uses it for tracks above 21 or so.

Another latch allows further upgrading of the hardware for double-sided disk drives.

When you push the reset button on the Model I keyboard, these latches are preset to single density, no write precompensation, and side zero is selected. Then CPU execution commences at ROM address 0000 hex. ROM loads the single-density file BOOT/SYS from track zero, sector zero, and the operating system is read in and started.

Here is a problem with the Double-Density Kit. A lot of software written for the Model I relies on a jump to ROM address 0000 hex as a way of rebooting TRSDOS. (This is one of the published Model I ROM addresses that Radio Shack has promised to support.)

With the kit installed, however, this won't always work because the latches might be set to double density. Then the ROM, which thinks it's communicating with the 1771 single-density controller, is actually talking with the 1791 controller in double-density mode. The controller is unable to load BOOT/SYS, and the bootup fails.

If you have easy access to the source code, reset the latches before jumping to 0000 hex. Another solution is revising the ROM boot routine to include a reset of the latches. I spoke with people in Fort Worth about this and they say a correction is under consideration.

The Double-Density Kit makes one other hardware change: It disconnects the interrupt line from the disk controller to the Z80 chip. This has no effect on TRSDOS since TRSDOS disables interrupts during disk operation anyway, but other software depending on disk interrupts won't work with the kit installed.

I strongly recommend you get the service manual for the kit ($2.97, part number MS-2601143 from the Tandy warehouse). It provides a schematic, parts list, board layout, and explanation of the theory of the hardware operation. It does not explain anything about TRSDOS 2.7DD.

Stop Scripsit

In TRSDOS, an Assembly programmer chooses either of two ways to end a program. One is to jump to hex 0000, which reboots the system, while the other is to jump to hex 402D, which merely returns to DOS Ready.

In version 2.7DD, I found that a jump to hex 0000 stops the computer. Since that problem occurred with Scripsit, it was a good guess that the writers of Scripsit for the Model I chose to end with a jump to hex 0000.

My task was to substitute a different exit routine. With the source code for Scripsit, it would be an easy matter. I could replace the JP 0000 with the following lines:

```
3E A0       LD A,0A0H
32 EE 37    LD (37EEH),A ; Select Single-
            Density Controller
3E C0       LD A,0C0H
32 EE 37    LD (37EEH),A ; Disable Write
            Precompensation
C3 00 00    JP 0000H  ; Reboot System
```

```
102A00: CD24 6ED1 CDFA 52C3 706E 0000 0000 0000
102A10: 0000 3AB9 7CB7 2801 05C9 EB09 79B7 C825
102A20: C9FE 8CCA 8371 FE8D C289 71C3 8371 2812
102A30: FE0D 280E FE0A 280A 083E 2032 E837 08C3
102A40: 745F 32E8 37C3 745F 3B02 0200 525D 6E24
102A50: 6E5F 6B50 6E18 6E64 7937 6FF3 6E26 6F18
102A60: 5583 5878 56FB 5442 6FB5 586A 58AD 6D46
102A70: 6426 6F18 55FB 545D 6E24 6EB9 542D 5505
102A80: 0618 031C 1A6E 6D1D 6D55 6D2F 6D96 6D09
102A90: 0601 9C9B 9E9D 1B8E 8D0E 6EFE 6D56 6EC7
102AA0: 01A7 007A 6DE5 6D11 5463 54E5 6DC7 6D03
102AB0: 111A 034D 590E 59D2 5A3C 0C48 0159 4E4E
102AC0: 5959 0106 3C4E 4280 8034 1278 5621 ED5C
102AD0: FD36 078F C9CD E96B C35D 5ACD FA52 2141
102AE0: 7A22 297C C931 FA41 218B 6F22 297C CDE9
102AF0: 6BED 5B43 7CFD CB34 C6D5 CD24 6ECD 846E
```

Fig. 1. This is the Unmodified Last Record of Scripsit/LC.

The problem is that the assembled code presently contains three bytes, namely C3 00 00, and I wanted 13 bytes there. If I were to insert the 13 bytes, the program would probably not run properly, as the many program addresses above the C3 00 00 would be offset by 10 bytes.

To do a good modification, I had to find somewhere else to put the 13 bytes. Then I could replace the C3 00 00 with a jump to the new 13 bytes.

The writers of TRSDOS 2.7DD

Continues on p. 286

```
102A00: CD24 6ED1 CDFA 52C3 706E 0000 0000 0000
102A10: 0000 3AB9 7CB7 2801 05C9 EB09 79B7 C825
102A20: C9FE 8CCA 8371 FE8D C289 71C3 8371 2812
102A30: FE0D 280E FE0A 280A 083E 2032 E837 08C3
102A40: 745F 32E8 37C3 745F 3B3E A032 EE37 3EC0
102A50: 32EE 37C3 0000 0202 0052 6FF3 6E26 6F18
102A60: 5583 5878 56FB 5442 6FB5 586A 58AD 6D46
102A70: 6426 6F18 55FB 545D 6E24 6EB9 542D 5505
102A80: 0618 031C 1A6E 6D1D 6D55 6D2F 6D96 6D09
102A90: 0601 9C9B 9E9D 1B8E 8D0E 6EFE 6D56 6EC7
102AA0: 01A7 007A 6DE5 6D11 5463 54E5 6DC7 6D03
102AB0: 111A 034D 590E 59D2 5A3C 0C48 0159 4E4E
102AC0: 5959 0106 3C4E 4280 8034 1278 5621 ED5C
102AD0: FD36 078F C9CD E96B C35D 5ACD FA52 2141
102AE0: 7A22 297C C931 FA41 218B 6F22 297C CDE9
102AF0: 6BED 5B43 7CFD CB34 C6D5 CD24 6ECD 846E
```

Fig. 2. Last Record of Scripsit/LC as Modified, with the New 13 Bytes Highlighted.

```
102900: 5252 4F52 CD43 A08D 8C97 B79B BBBE 5E8C
102910: 5C8B 5B8D 5D18 8D03 8E11 9716 8C1C 9B9B
102920: 8B9B 201E 1E00 001D 1D9B 8B9C 8C9E 8E9D
102930: 8D20 2019 9B9C 1B1C 9E9D 1E1D 1711 0512
102940: 0113 0406 1803 16FF 8E8D 1F8B 8C5D 6E24
102950: 6E5F 6B50 6E18 6E64 7937 6FF3 6E26 6F18
102960: 5583 5878 56FB 5442 6FB5 586A 58AD 6D46
102970: 6426 6F18 55FB 545D 6E24 6EB9 542D 5505
102980: 0618 031C 1A6E 6D1D 6D55 6D2F 6D96 6D09
102990: 0601 9C9B 9E9D 1B8E 8D0E 6EFE 6D56 6EC7
1029A0: 01A7 007A 6DE5 6D11 5463 54E5 6DC7 6D03
1029B0: 111A 034D 590E 59D2 5A3C 0C48 0159 4E4E
1029C0: 5959 0106 3C4E 4280 8034 1278 5621 ED5C
1029D0: FD36 078F C9CD E96B C35D 5ACD FA52 2141
1029E0: 7A22 297C C931 FA41 218B 6F22 297C CDE9
1029F0: 6BED 5B43 7CFD CB34 C6D5 CD24 6ECD 846E
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Fig. 3. Second to Last Record of Scripsit/LC Showing the Original Load Byte 01A7.

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Features of TRSDOS 2.7DD

Most of the improvements to TRSDOS come straight from the Model III. Perhaps the handiest is the Do/Build utility. It allows you to fill a disk file with TRSDOS and Basic commands, and later to direct TRSDOS to begin executing the commands as if you had typed them in. The disk file, with extension "/BLD", is created with the Build utility and executed with the Do command.

You can invoke such execution with the Auto command, allowing you to accomplish a lot automatically when you turn on the computer. The manuals make no mention of the BLD file structure and do not tell how to edit them. But I found that you can edit them with Filfix and Scripsit. The file ends with an FF hex, and command lines are separated by a 0D hex.

Other commands from the Model III include Dual, which routes all screen and printer output to both; Help, which provides a reminder of the syntax for a given utility; Patch, which provides an easy way to implement fixes and revisions to disk files; Setcom, which programs the RS-232 interface; WP, which provides software write-protect for a specified drive; and Create, which builds a preallocated disk file of any size.

One feature notably missing from TRSDOS 2.7DD is a keyboard command to dump a screenful of text to the printer.

Some utilities familiar from TRSDOS 2.3 are improved. DIR lists directories of both single- and double-density disks, lists them to the printer, and no longer crashes if you type a colon and forget to specify a drive number.

Free provides information on only one drive at a time, but shows a granule allocation map for the disk. Radio Shack has enhanced the Copy command to allow copying to and from a single-density disk, and to allow limited wildcard copying—the user can transfer all files with a specified extension from one drive to another.

Copy and Backup run much faster under 2.7DD because they use all of RAM as a temporary buffer, reducing the number of times the controller shifts from one drive to the other.

A couple of commands from TRSDOS 2.3 are not found in TRSDOS

Continued from p. 284

provide Filfix, which displays 256-byte pages of a selected disk file on the screen. Filfix lets the user move a cursor around on the screen, entering desired changes to the displayed record. Filfix then transfers the changes to the disk file.

The Scripsit/LC disk file was in the following format: the bytes 01 02 00 52, then 256 program bytes, then 01 02 00 53, then 256 program bytes, and so on up to 01 02 00 79, then 256 program bytes, and, finally, 01 A7 00 7A, then 165 program bytes, then 02 02 00 52.

These last bytes are in the forty second logical record. The remaining bytes in the record are useless because they're identical to the bytes in the same position in the previous record.

TRSDOS loads and executes a program (CMD) file by checking that the first byte is 01. If not, TRSDOS generates an error message.

If the next byte is 02, a full 256 bytes load to RAM, starting at the address following the 02. The convention in Z80 programming is to reverse the high- and low-order bytes, so that a number stored as 00 52 is interpreted as 5200.

This process repeats until the byte following 01 is not 02. In Scripsit, this happens when 01 A7 is encountered. A7 is 167 decimal, and the 167 bytes following the A7 (ignoring the load address, 00 7A) load into RAM starting at 7A00.

Then TRSDOS encounters the stop code 02 02. If it is not found, a TRSDOS error results. Scripsit execution begins at the address following the stop code, namely 5200. This address is often referred to as the transfer address.

This means that Scripsit version 1.0 resides in RAM from 5200 to 7AA4. I put my 13 bytes in the area following 7AA4, hoping that Scripsit did not use or modify that area. The experiment was successful.

Using Filfix, I displayed the last record of Scripsit/LC (see Fig. 1). I inserted the new 13 bytes and wrote out the stop code and transfer address again (see the modified record in Fig. 2).

I then went to the previous logical record and increased the number of bytes to load from A7 to B4. The disk file was now set up to load the Scripsit program and my 13 bytes. Now, I only needed to modify the Scripsit code to jump to my 13 bytes, rather than to 0000, at the user's End command.

In Z80 assembler, such a jump (JP 0000) is assembled as C3 00 00. My goal was to find three such bytes somewhere in Scripsit, and change them to C3 A5 7A. Starting at the beginning, I paged through Scripsit, and by page 20 I found what I needed. (In Fig. 5, you can see the C3 0000 in the middle of the second line from the bottom.) I changed the code to C3 A5 7A.

I used Filfix to change Scripsit because I didn't know where in the

```
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102910: 5C8B 5B8D 5D18 8D03 8E11 9716 8C1C 9B9B
102920: 8B9B 201E 1E00 001D 1D9B 8B9C 8C9E 8E9D
102930: 8D20 2019 9B9C 1B1C 9E9D 1E1D 1711 0512
102940: 0113 0406 1803 16FF 8E8D 1F8B 8C5D 6E24
102950: 6E5F 6B50 6E18 6E64 7937 6FF3 6E26 6F18
102960: 5583 5878 56FB 5442 6FB5 586A 58AD 6D46
102970: 6426 6F18 55FB 545D 6E24 6EB9 542D 5505
102980: 0618 031C 1A6E 6D1D 6D55 6D2F 6D96 6D09
102990: 0601 9C9B 9E9D 1B8E 8D0E 6EFE 6D56 6EC7
1029A0: 01B4 007A 6DE5 6D11 5463 54E5 6DC7 6D03
1029B0: 111A 034D 590E 59D2 5A3C 0C48 0159 4E4E
1029C0: 5959 0106 3C4E 4280 8034 1278 5621 ED5C
1029D0: FD36 078F C9CD E96B C35D 5ACD FA52 2141
1029E0: 7A22 297C C931 FA41 218B 6F22 297C CDE9
1029F0: 6BED 5B43 7CFD CB34 C6D5 CD24 6ECD 846E
```

Fig. 4. Second to Last Record of Scripsit/LC Showing the Increased Load Byte 01B4.

```
101400: 34C6 CD24 6EED 5B51 7CCD 377A ED53 537C
101410: 2A47 7CEB CD3C 6FEB D254 65D5 CD2B 53DD
101420: 7100 CDFF 53F5 FD36 0500 CD7C 53F1 280F
101430: 41CD 6C53 3245 7CFD 8610 FDBE 3538 05F1
101440: DD2B 18C8 2600 3A64 7CD6 0381 0102 0065
101450: FD96 16B9 28ED 6FD1 D519 2243 7CEB CD70
101460: 6E21 8A6A CDC8 6BCD CC5F FE2D 200D CD5F
101470: 5CFD 3601 20CD BA56 F118 95FE 9E20 0ADD
101480: 7E00 B928 DC1B 0C18 D8FE 9D20 0B2A 437C
101490: ED52 28CD 130D 18C9 FE1E 20C5 F1ED 5B53
1014A0: 7CC3 C064 21B4 6ACD C86B ED5B 517C C351
1014B0: 7AFA 41C3 377A 7A61 FD36 123D FD36 133D
1014C0: CD08 67D8 CD4C 6CAF BCC2 766F C921 D37D
1014D0: 7EFE 4EC2 766F 237E FE44 C276 6F23 7EFE
1014E0: 1EC2 766F C300 00CD 6865 DA77 6FBD CA76
1014F0: 6F7D FE85 D276 6F3A 647C 3239 7CFD 7535
```

Fig. 5. Twentieth Record of Scripsit/LC, Unmodified.

2.7DD: Basic2, which jumps to Level II ROM Basic, and Device, which lists the devices for which the system is configured. I have never used either one and did not feel the loss. No matter what operating system you use, you can always get to ROM Basic by holding down the break key upon power-up or reset.

Finally, TRSDOS 2.7DD provides some features not found on the Model III, such as an Unkill command that's a real lifesaver and Spool, an in-memory print spooler. When you turn on the spooler, you specify the amount of high-end RAM allocated to it. Basic automatically protects the spooler area.

Printing is noticeably slower with Spool. TRSDOS only checks the printer status and sends a line of text once per second, less often if disk operations are under way. It's still a delightful capability and doesn't seem to have any bugs.

Basic is improved, too. You can start Basic and load and run a program, all with a single TRSDOS command line. All the new Model III CMD functions are present, such as break-key disable, in-RAM string sort, Basic line compression, display of disk directory, dual printer/screen routing, and calendar-date conversion.

The CMD "I" from TRSDOS 2.3, which exits to TRSDOS and executes a command line, is corrected so that the command line can include spaces.

Single-Density Compatibility

Basic and machine-language programs written and debugged on a single-density system run properly under 2.7DD so long as they rely on no TRSDOS or ROM calls other than those documented by Radio Shack.

However, few Model I Radio Shack applications programs will run on TRSDOS 2.7DD. For example, I have tried unsuccessfully to run Microfiles version 1.6 (26-1565), Profile version 1.0 (26-1562), and the Disk Editor/Assembler version 1.0 (26-2202) in double density.

Apparently, each program uses undocumented TRSDOS calls that are different in TRSDOS 2.3 and 2.7DD. This is particularly distressing when you consider what Jon Shirley, vice president of Radio Shack's Computer Division, says: "Our programmers and our outside program sources are not allowed to use any addresses of calls not included in our documentation. This guarantees that the software will run on all future DOS releases." (*TRS-80 Microcomputer News*, Vol. 2, No. 6, August 1980.)

All TRSDOS calls listed in the TRSDOS 2.3 manual (pp. 6-5 through 6-13) also appear in the TRSDOS 2.7DD manual (pp. 80–95) with the exception of $CMDTXT, the buffer containing the last command line entered under TRSDOS. In version 2.3, it's hex 4318, while in version 2.7DD, it's hex 44DA.

Thus, any programmer confining himself to the TRSDOS 2.3 manual would find that his programs work perfectly under 2.7DD. But it seems that Mr. Shirley is wrong when he says that all Radio Shack software restricts itself to publicly documented TRSDOS calls.

People at Radio Shack in Fort Worth have reminded me that they rereleased much Model I software to run on the Model III, and told me to expect the same for the double-density Model I.

file to find the bytes to be changed. Given the addresses, however, you can use another utility, Patch, to make the change.

Recall that the bytes to be changed are in the twentieth record. This is reflected in the second through fourth digits (hex 014 = decimal 20) in the left column of Fig. 5. The last two digits, hex E0 (decimal 224), give the byte number within the record for the first byte in that row of the listing, while the first digit gives the drive number. The bytes requiring a change are bytes 230 and 231.

You can use the Patch utility as follows:

```
PATCH SCRIPSIT/LC (R=20,B=230,
F=0000,C=A57A)
```

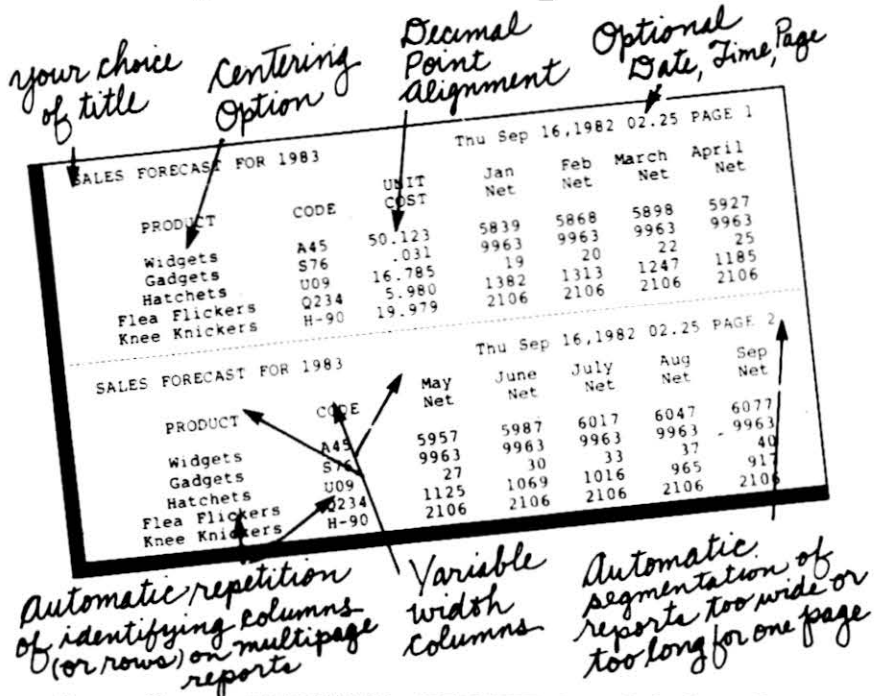
The Patch utility goes to record 20 of the disk file named Scripsit/LC, and looks for the data 0000 starting at byte 230 in the record. If the 0000 is found, it is changed to A57A.

The other patches are as follows:

```
PATCH SCRIPSIT/LC
(R=42,B=074,F=02020052,C=3EA032EE)
PATCH SCRIPSIT/LC
(R=42,B=078,F=5D6E246E,C=373EC032)
PATCH SCRIPSIT/LC
(R=42,B=082,F=5F6B506E,C=EE37C300)
PATCH SCRIPSIT/LC
(R=42,B=086,F=186E647937,C=
  0002020052)
PATCH SCRIPSIT/LC (R=41,B=162,
  F=A7,C=B4)
PATCH SCRIPSIT/LC (R=07,B=083,
  F=30,C=31)
```

The last patch changes the version number to 1.1. ■

Can your VisiCalc print this?



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Scripsit version 1.0 (26-1563) works fine under 2.7DD, with the exception that the End command, which is supposed to return the user to TRSDOS, stops the computer. Then the only way to return to TRSDOS is to push the reset button.

I was able to find a way to patch Scripsit so that it ends properly under 2.7DD. (I have described the fix and discussed a couple of the utilities that make 2.7DD better than 2.3 in the accompanying sidebar.)

VisiCalc version 1.20Z (26-1566) seems to run fine under 2.7DD.

Model III Compatibility

Although both the Model III and the double-density Model I use the Western Digital 1791 controller and 5¼-inch drives in 40-track double-density operation, the directory formats are different. The Model I with TRSDOS 2.7DD does not read disks written by the Model III.

The Copy utility of TRSDOS 2.7DD converts both ways between Model I single- and double-density formats, and the Model III Convert utility allows the Model III to read Model I single-density disks. Some enterprising programmers should create a utility that converts Model III format to both single- and double-density Model I formats.

Basic programs written for the Model III should run on the double-density Model I with few, if any, changes. Many machine-language programs are also compatible, except for the ones sensitive to hardware differences, as in the line printer interfacer.

Documentation

Documentation for TRSDOS 2.7DD is generally good, but a few weaknesses exist. Radio Shack scatters the reference material a programmer might need among several manuals: the *Level II Basic Reference Manual*, the *Model I Disk System Owner's Manual*, and the *Model I Double-Density Disk System Owner's Manual*.

For example, both *Disk System* manuals discuss the Free command, which is different under TRSDOS 2.3 and 2.7DD. The *Double-Density* manual says "use the prior manuals as the primary source of information," but the user has no choice except to search the *Double-Density* manual as well as the two earlier manuals for the whole story.

The Quick Reference Card is similarly incomplete. Even a user who never expects to run in single-density again must keep the old reference card to explain various nondisk Basic functions, such as LEFT$.

Some puzzling gaps appear in the *Double-Density* manual. TRSDOS automatically loads the upper/lowercase driver (assuming the lowercase mod has been installed), but nowhere does the *Double-Density* manual tell the user how to lock capitals on the keyboard. (You type a shift-zero.)

For those who like to write user-oriented software that is fully error-trapped, it's frustrating that there is still no comprehensive list of the possible error numbers for each Basic command and function.

A chart on page 78 of the *Double-Density* manual spells out the number of free bytes available to the user on a system disk (110,592 on 40 tracks) and on a data disk (175,104 on 40 tracks).

Also listed there is a MIN-TRSDOS system disk, with 156,762 bytes free. "MIN-TRSDOS disk" is not in the index, nor defined in the manual. A cryptic reference in the documentation to the Purge command tells the story.

Under TRSDOS 2.3 are visible and invisible files, with Basic and the TRSDOS overlays (e.g., SYS0/SYS) in the latter category. Under 2.7DD there are visible files, invisible files, and super-invisible files.

Radio Shack made the Basic and TRSDOS overlays super-invisible. This means a disk that appears to be completely blank when you do a DIR might have anywhere from 144 to 228 free granules depending on whether the super-invisible overlays are present. Since the user cannot see file names for the overlays (e.g., SYS0,SYS1), the user cannot kill them.

The Purge command, however, has options to kill all overlays and yield a data disk, or to kill all but a few essential I/O and error routines. You can use the latter format, called a MIN-TRSDOS disk, in drive zero in place of a system disk while a Basic program is running, thus providing some 46 extra granules on the drive.

Manufacturer's Support

I bought my Model I from one of the Radio Shack-affiliated mail-order outlets, and obtained local customer support grudgingly during the first few months. More recently, the personnel at the Radio Shack stores in my area have been helpful.

The store that performed the installation did not balk at the 32K of non-Radio Shack memory I had installed in the expansion interface. The Radio Shack people I dealt with seemed pretty well informed, although one local technical-service rep thought that disk drives with the -1 serial numbers could not be used for double density.

At the Fort Worth Computer Services numbers, technicians took all my calls courteously and answered virtually every question quickly and correctly. The single exception was that only two of three phone calls regarding the MIN-TRSDOS disks reached people who knew the right answers. Overall, I was impressed with the support.

Conclusions

This kit would be a much more attractive product if Radio Shack rereleases its software packages to run on the double-density system. However, the documentation and customer support are both excellent.

The Radio Shack Model I Double-Density Kit provides a reasonably priced improvement over the Model I disk system both in the operating system and in the vastly increased disk-storage capability. ■

Carl Oppedahl can be reached at 99 Park Ave., New York, NY 10016.

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A useful text editor can be written in less than 200 bytes. I wrote one that uses 173 bytes.

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My text editor uses standard TRS-80 commands, with one exception. When you want to send your text to a printer, type: RUN 1000.

The Mini-Micro Text Editor is actually a Basic program. Enter the text as remarks using the apostrophe abbreviation. You must use the apostrophe and not REM. The machine language printing routine interprets any line which does not begin with an apostrophe as the end-of-text signal. The apostrophe also prevents the Basic interpreter from entering everything as capital letters regardless of the shift key. The machine language part of this program includes a section to reverse the shift key action. If you do not need it, the source code for the machine language contains instructions to eliminate it.

Since the text is really a Basic program, you can record or reload it using your usual recording method. This is a real advantage, especially if you are not using a disk system. Since both the standard cassette and ESF data file systems store data in 256 byte segments, much time and tape are spent recording leaders. My text editor uses no file system. CSAVE (if you are using a cassette) or @SAVE (stringy floppy) store all the text using only one leader. The punctuation used in a remark statement is unimportant. The Basic part of this text editor is stored with the text.

Disadvantages

There is no automatic limit on line length; however, if you use a line of 64 characters, you will reach the line limit when the number of characters and spaces on the wrap-around line equals the number of digits in the line number plus one.

Pages are neither numbered nor formatted automatically. To skip one line enter only the apostrophe. Enter a down arrow for each additional line you want to skip. Put page numbers on a text line if you choose to use them. You cannot use the NEW command. You need the two lines of Basic in lines 1000 and 1010.■

Program Listing

```
42E9            00100          ORG     42E9H           ;START OF US
ER RAM
                00110 ;RESERVE SPACE FOR USER SUBROUTINEE AT START
 OF USER RAM BY
                00120 ;CCHANGING THE START OF BASIC.
42E9 214643     00130          LD      HL,4346H        ;LOAD NEW ST
ART OF BASIC
42EC 22A440     00140          LD      (40A4H),HL      ;INTO RESERV
ED RAM.
42EF 214843     00150          LD      HL,4348H        ;LOAD NEW ST
ART OF
42F2 22F940     00160          LD      (40F9H),HL      ;VARIABLES I
NTO RESERVED
                00170                                  ;RAM
42F5 21FE42     00180          LD      HL,PRINT        ;LOAD PRINTT
 ADDRESS INTO
42F8 228E40     00190          LD      (408EH),HL      ;RESERVED RA
M FOR USR
42FB C3CC06     00200          JP      06CCH           ;RETURN TO B
ASIC
                00210 ;PRINT TEXT.  RETURN IF BASIC STATEMENT IS N
OT A REMARK.
42FE 2AA440     00220 PRINT    LD      HL,(40A4H)      ;START OF BA
SIC
                00230 ;LOAD THE POINTER TO THE START OF THE NEXT L
INE IN DE.
4301 5E         00240 LNPTR    LD      E,(HL)          ;LSB IN E
4302 23         00250          INC     HL
4303 56         00260          LD      D,(HL)          ;MSB IN D
                00270 ;TEST FOR LINE TO BE PRINTED.
4304 23         00280          INC     HL              ;SKIP THE LI
NE NUMBER
4305 23         00290          INC     HL
4306 23         00300          INC     HL
4307 7E         00310          LD      A,(HL)          ;IF THE STAT
EMENT
4308 FE3A       00320          CP      3AH             ;IS NOT A RE
MARK,
430A C0         00330          RET     NZ              ;DO NOT PRIN
T IT.
430B D5         00340          PUSH    DE              ;SAVE THE LI
NE POINTER
                00350 ;SKIP TO FIRST TEXT BYTE.
430C 23         00360          INC     HL
430D 23         00370          INC     HL
430E 23         00380 NXTBYT   INC     HL
                00390 ;TEST FOR 00 AT END OF STATEMENT.
430F 7E         00400          LD      A,(HL)
4310 B7         00410          OR      A               ;SET FLAGS
```

Listing continues

The Key Box

Basic Level II
Model I
4K RAM
Printer

Jasper Kump is a retired Civil Service photographer and freelance programmer. Instant Software has marketed his Mountain Pilot program for a year and a half and will soon market another.

Listing continued

```
4311 2820      00420          JR      Z,ENDMRK        ;GO IF LINE
FINISHED
               00430 ;REVERSE SHIFT KEY ACTION.  SKIP THIS SECTIO
N IF YOUR
               00440 ;SHIF PRODUCES CAPITAL LETTERS.
4313 FE41      00450          CP      41H
4315 3806      00460          JR      C,NOCHNG        ;;GO IF NOT
A LETTER
4317 FE7B      00470          CP      7BH
4319 3002      00480          JR      NC,NOCHNG       ;GO IF NOT A
 LETTER
431B EE20      00490          XOR     20H             ;SHIFT THE L
ETTER
               00500 ;END OF SHIFT KEY REVERSE.
431D CD2243    00510 NOCHNG   CALL    PRNTR           ;PRINT THE C
HARACTER
4320 18EC      00520          JR      NXTBYT          ;CONTINUE
               00530 ;LINE PRINTER ROUTINE.
4322 D5        00540 PRNTR    PUSH    DE
4323 F5        00550          PUSH    AF
4324 3AE837    00560 WAIT     LD      A,(37E8H)       ;WAIT UNTIL
4327 E6F0      00570          AND     0F0H            ;THE PRINTER

4329 FE30      00580          CP      30H
432B 20F7      00590          JR      NZ,WAIT         ;IS READY
432D F1        00600          POP     AF
432E 32E837    00610          LD      (37E8H),A       ;PRINT THE C
HARACTER
4331 D1        00620          POP     DE
4332 C9        00630          RET
               00640 ;SINGLE OR DOUBLE SPACE BEFORE PRINTING NEXT
 LINE.
4333 E1        00650 ENDMRK   POP     HL              ;ADDRESS OF
NEXT LINE
4334 3E0A      00660          LD      A,0AH           ;LINE FEED
4336 CD2243    00670          CALL    PRNTR
4339 3E00      00680          LD      A,00            ;SPACE FLAG
SET IN BASIC
433B B7        00690          OR      A               ;TEST FLAG
433C 28C3      00700          JR      Z,LNPTR         ;GO IF SINGL
E SPACE
433E 3E0A      00710          LD      A,0AH           ;SECOND LINE
 FEED
4340 CD2243    00720          CALL    PRNTR           ;IF DOUBLE
4343 18BC      00730          JR      LNPTR           ;PRINT THE N
EXT LINE
               00740 ;A ZERO MUST PRECEED THE START OF BASIC.
4345 00        00750          DEFB    00
               00760 ;SET FIRST LINE POINTER TO 00 00.
4346 0000      00770          DEFW    00
0000           00780          END
```


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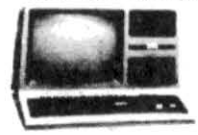

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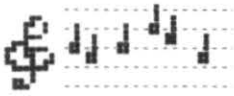

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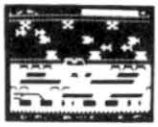

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Who needs QWERTY, anyway?

Dvorak Meets Scripsit

John T. Phillipp
118 West Alosta Avenue #2
Glendora, CA 91740

Waldo Boyd's article on the Dvorak Simplified Keyboard (DSK) in the December 1980 issue of *80 Microcomputing* provided a simple way of experimenting with the advantages of a more scientific arrangement of letters on the keyboard. Unfortunately, you cannot use his QWERTY-Dvorak conversion program with Scripsit or the Electric Pencil. Those word processors use their own keyboard scan routines rather than the one Boyd intercepted and modified in the Basic ROM.

My letter, "Dvorak Aid?" (*80 Microcomputing*, May 1981), asked for help in patching Scripsit for use with the Dvorak keyboard. Bradley Murray answered my plea. Program Listing 1 is a modification of Boyd's conversion program (see the conversion table from the original article). This program does *not* change Scripsit's keyboard scan routine; it catches the A-register contents *after* the return from the keyboard routine and exchanges it for the new Dvorak keyboard value.

This conversion leaves the control keys in their original positions. For example, pressing the D key produces a letter E, and pressing the *same* key still produces the code for delete. The control keys were chosen for their convenient positions on the keyboard, and the conversion maintains these positions. Leave the stick-on labels that came with Scripsit on the same keys they were on before you modified Scripsit.

Although Murray's patch works well, it is located in high memory (starting at address FFCD Hex). You must load it as a separate program in addition to Scripsit. You must protect memory for it by a patch to SYS0/SYS (see Fig. 1) so DOS considers FFCD Hex the highest available memory address; nothing will be written above that address. You must also patch Scripsit (see Fig. 2) so it jumps to the conversion routine after each keyboard scan.

My Basic program DVORPOKE (Program Listing 2) eliminates these problems. It uses a modification of Murray's conversion routine appended to Scripsit starting at 7FF4 Hex. I changed the disk pointers of Scripsit so the patch loads from disk as part of Scripsit. No memory needs to be saved.

Lines 5–10 initialize DVORPOKE to convert Scripsit + SuperScript or Scripsit/LC alone. You can convert either to use the Dvorak keyboard; Note: You *must* change line 170 from Data 2,2,164,124,0,0,0 for SuperScript to Data 2,2,0,82, 0,0,0 for Scripsit/LC alone. This change reflects the different execution addresses of the two word processors—7CA4 Hex for SuperScript and 5200 Hex for Scripsit/LC.

Lines 15–70 add the patch to the end of Scripsit on the disk.

Lines 100–170 are the instructions of the patch in decimal.

Lines 200–390 move Scripsit's text buffer from 7F62 Hex to 8100 Hex to prevent writing over the patch when you input text.

Lines 400–430 patch Scripsit to jump to the conversion routine (7FF4 Hex) after each keyboard scan, close the file, and end DVORPOKE.

```
FF4D            01000          ORG     0FF4DH
                01010 ;
                01020 ;DVORAK keyboard conversion routine for use with
                01030 ;Scripsit and Superscript.
                01040 ;
FF4D C5         01050 START    PUSH    BC              ;Save Scripsit's Pointers
FF4E E5         01060          PUSH    HL
FF4F 4F         01070          LD      C,A             ;Set up index to table
FF50 0600       01080          LD      B,0
FF52 2160FF     01090          LD      HL,TABLE
FF55 09         01100          ADD     HL,BC           ;Look up new char value
FF56 7E         01110          LD      A,(HL)          ;Replace old
FF57 FD21117E 01120            LD      IY,7E11H        ;Replace Scripsit instr.
FF5B E1         01130          POP     HL              ;Restore Scripsit's Ptrs.
FF5C C1         01140          POP     BC
                01150
FF5D C33560     01160          JP      6035H           ;Return to Scripsit
009F            01170 TABLE    DEFS    009FH           ;159 BYTES (SEE TEXT)
FFFF 5A         01180          DEFM    'Z'             ;End of Buffer mark

FF4D            01190          END     START
00000 TOTAL ERRORS
```

Program Listing 1. Dvorak table look-up routine

How to Use DVORPOKE

● Copy Scripsit/LC or Scripsit + SuperScript to a TRSDOS 2.2 disk. TRSDOS 2.2 ensures that the first byte of each file is located at 66DF Hex, an address

Continues on p. 297

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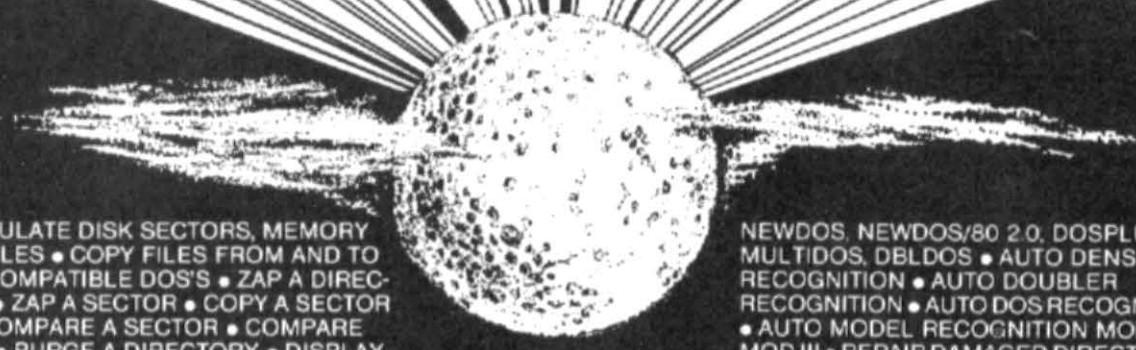

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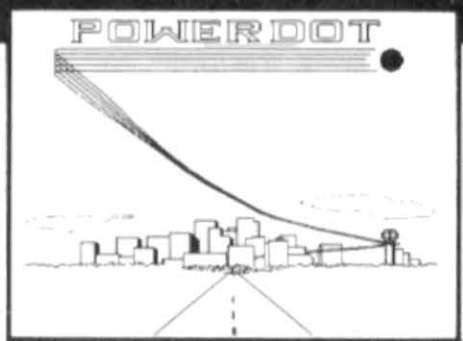

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SCRIPSIT/LC alone (2)";S
6 IFS<>1ANDS<>2THEN5
7 CLS:PRINT@448,"Converting. . .
Please be patient.
There will be multiple accesses of the disk."
10 H=&H66DF:IFS=1THENX1=47:X2=174:X3=255:X4=111:X5=48:ELSEX1=42:
X2=73:X3=255:X4=10:X5=43
12 'ADD THE CONVERSION PATCH TO THE END OF SCRIPSIT
15 OPEN"R",1,"DVORAK/CMD"
20 GET1,X1
25 FORI=X2TOX3
30 READX
35 POKEH+I,X
40 NEXTI
45 PUT1,X1
50 FORI=0TOX4
55 READX
60 POKEH+I,X
65 NEXTI
70 PUT1,X5
100 DATA 1,130,244,127,197,229,79,6,0,33,7,128,9,126,253,33,17,1
26,225,193,195,53,96,0,1
110 DATA 2,3,4,5,6,7,8,9,10,11,12,13,14,15,16,17,18,19,20,21,22,
23,24,25,26,27,28,29
120 DATA 30,31,32,42,34,35,36,37,38,39,40,41,33,83,119,45,118,12
2,54,58,55,53,51,49,57,48,50,52,56,115
130 DATA 87,61,86,90,64,65,88,74,69,62,85,73,68,67,72,84,78,77,6
6,82,76,47,80,79,89,71
140 DATA 75,60,81,70,43,60,61,62,63,64,96,97,120,106,101,46,117,
105,100,99,104,116,110
150 DATA 1,53,116,128,109,98,114,108,63,112,111,121,103,107,44,1
13,102,59,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
160 DATA 139,140,141,142,0,0,0,0,0,0,0,0,0,0,0,0,0,155,156,157,158
,90
170 DATA2,2,164,124,0,0,0:  REM 2,2,0,82,0,0,0 for scripsit/lc
195 'MOVE TEXT BUFFER FROM 7F62H TO 8100H TO AVOID PATCH
200 GET1,1
205 POKEH+123,0:POKEH+124,129
210 PUT1,1
215 GET1,3
220 POKEH+34,0:POKEH+35,129
225 PUT1,3
230 GET1,4
235 POKEH+66,0:POKEH+67,129
240 PUT1,4
245 GET1,8
250 POKEH+179,0:POKEH+180,129
255 POKEH+235,0:POKEH+236,129
260 PUT1,8
265 GET1,12
270 POKEH+230,0:POKEH+231,129
275 PUT1,12
280 GET1,18
285 POKEH+94,0:POKEH+95,129
290 POKEH+154,0:POKEH+155,129
295 PUT1,18
300 GET1,22
305 IFS=1THENPOKEH+55,0:POKEH+56,129:ELSEPOKEH+51,0:POKEH+52,129
310 PUT1,22
315 GET1,25
320 POKEH+20,0:POKEH+21,129
325 PUT1,25
330 GET1,29
335 POKEH+153,0:POKEH+154,129
340 PUT1,29
345 GET1,35
350 POKEH+166,0:POKEH+167,129
355 POKEH+180,0:POKEH+181,129
360 PUT1,35
365 GET1,1
370 POKEH+159,255:POKEH+160,128
375 PUT1,1
380 GET1,10
385 POKEH+252,255:POKEH+253,128
390 PUT1,10
395 'JUMP TO 7FF4 - START OF THE PATCH
400 GET1,15
405 POKEH+109,195:POKEH+110,244:POKEH+111,127:POKEH+112,0
410 PUT1,15
415 CLOSE
420 CLS
425 PRINT@448,"Conversion complete.
Enjoy the Dvorak keyboard."
430 PRINT:PRINT:PRINT:END
```

Program Listing 2

Continued from p. 294

used by DVORPOKE.

● Rename Scripsit to DVORAK/CMD. DVORPOKE uses this name when it opens the file for modification.

● Load Basic, and run DVORPOKE.

● After you modify DVORAK/CMD, Enter DVORAK from DOS to execute Scripsit with the Dvorak keyboard. For details of the Dvorak Simplified Keyboard, refer to Boyd's article. If you are unfamiliar with Dvorak keyboard, press each key to see which letter appears on the screen. You can pry the key caps off, and move them to match the keyboard (if you have the old style keys), or use press-on labels.

If you encounter any problems with the conversion, check DVORPOKE carefully against the listing. If there are any incorrect POKE values, modified Scripsit will not work. ■

```
F00A00  D51E FFCD 894C FE20 3017 67CD 894C 47CD .....L..0....LG.
F00A10  894C 6F25 2819 2520 12CD 894C 6705 AF18 .L.%(.% ....L....
F00A20  043E 22F6 40D1 C91C CC8C 4C10 FA18 D4CD .>".@.....L.....
F00A30  894C 6705 051C CC8C 4C1A 77BE 2005 2310 .L......L.....#.
F00A40  F418 C07E BE3E 2428 DA3D 18D7 1C1A C011 .....>$(.=......
F00A50  0000 CD36 44D1 20CE D511 0042 1AC9 07D2 ...6D..... ...B....
F00A60  4B01 649E 4C44 3E03 B8D0 47C9 4D0A C1C9 K...LD>...G.M...
F00A70  AC4C 05DD 3502 C0DD 3602 0521 353C 1143 .L..5...6..!5<.C
F00A80  400E 3A06 031A 1B36 2F34 D60A 30FB C63A @.:....6/4..0..:
F00A90  2377 2305 CB71 2318 EC11 4640 0E2F 18E3 #.#...#...F@./..
F00AA0  DB4C 2112 0039 5E23 5621 2E3C 7ACD EA4C .L!..9.^V!.<...L
F00AB0  7BF5 1F1F 1F1F CDF3 4CF1 E60F C630 FE3A {.......L....0.:
F00AC0  3802 C607 7723 C900 0000 4EF3 ED56 31FC 8....#....N..V1.
F00AD0  4121 0052 2247 4021 FFFF 7E47 2F77 BE70 A!.R"G@!...G/...
F00AE0  2806 7CD6 0467 18F2 2249 403A C038 E609 (.....g..."I@:.8..
F00AF0  FE09 1806 2178 4322 1640 C376 4E22 BA43 ....!.C".@..N".C

F00AC0  3802 C607 7723 C900 0000 4EF3 ED56 31FC 8....#....N..V1.
F00AD0  4121 0052 2247 4021 4CFF 7E47 2F77 BE70 A!.R"G@!L..G/...
F00AE0  2806 7CD6 0467 18F2 2249 403A C038 E609 (.....g..."I@:.8..
F00AF0  FE09 1806 2178 4322 1640 C376 4E22 BA43 ....!.C".@..N".C
```

Fig. 1. SYS0/SYS patch

```
F00E00  EFFE 59C9 CDCE 55CD E853 C54E D53A 367C ..Y...U..S.N.:6.
F00E10  7711 0004 CD17 6020 041B BA20 0100 E45F ..... ..... ..._
F00E20  F771 200E 1100 04CD 1760 2006 1BBA 20F7 .q. ..... ` .... .
F00E30  18DF D1C1 3230 7C38 0BFE 80D0 FE20 3FC9 ....20.8..... ?.
F00E40  CD0C 60C8 2A29 7CE9 3A40 3BFE 0228 02AF ....*)..:@;..(..
F00E50  C9B7 C9CD 0C60 37C0 D9CD 2660 CD46 60B7 .....`7...&`.F`.
F00E60  D9C9 E5D5 C5CD 6160 B728 13FD E5FD 2111 ..... ..`(....!.
F00E70  7E21 3A60 FD77 047E 3CE6 1F77 FDE1 C1D1 ~!:`.w.~<..w....
F00E80  E1C9 2156 603A 3A60 96C8 FDE5 FD21 117E ..!V`::`.....!.~
F00E90  FD7E 0408 7E3C E61F 7708 FDE1 C921 3640 .~..~<..w....!6@
F00EA0  0101 3816 000A 5FAE 73A3 2055 142C CB01 ..8....._.s. U.,..
F00EB0  F269 60F5 FD6E 0C3A 3C7C A620 10E5 2100 .i`..n.:<|. ....!.
F00EC0  0022 8261 2100 0422 8461 E1F1 C9F5 E5D5 ."..!.."..a.....
F00ED0  2A82 6123 2282 61ED 5B84 61CD 3C6F D1E1 *..a#".a.[.a.<o..
F00EE0  201C F12F A677 E521 0000 2282 6121 3200  ../.w.!.."..a!2.
F00EF0  2284 61E1 AF32 3A60 3256 60F1 189F F1F1 ".a..2:`2V`.....

F00E60  D9C9 E5D5 C5CD 6160 B728 13FD E5C3 4DFF ..... ..`(....M.
F00E70  0021 3A60 FD77 047E 3CE6 1F77 FDE1 C1D1 .!:`.w.~<..w....
F00E80  E1C9 2156 603A 3A60 96C8 FDE5 FD21 117E ..!V`::`.....!.~
```

Fig. 2. Scripsit modifications

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You'll find yourself flying a jet bomber over mountainous, enemy-infested terrain. Your mission is to destroy as many enemy installations as possible with your payload of 25 bombs. The up and down-arrow keys control your altitude, and hitting the space bar drops a bomb. The lower you are when the bomb is dropped, the more points you will score for a hit, but the more likely you are to crash. Wast-

Program Listing 1

```
10 REM * * * RESERVE A MEMORY SIZE OF 31833 BEFORE RUNNING * * *

20 CLS:PRINT CHR$(23):PRINT@338,"JET BOMBER":PRINT:PRINT
30 PRINT TAB(3);"BY THOMAS H. ROGERS JR."
40 FOR X=1 TO 800:NEXT
50 FOR X=31834 TO 31869:READ P:POKE X,P:NEXT
60 DATA 33,128,60,17,126,124,1,128,3,237,176,33,190,124,17,64,0,
6
70 DATA 14,54,128,25,16,251,33,127,124,17,128,60,1,128,3,237,176
,201
80 RANDOM:DEFINT A-Z
90 PRINT:PRINT TAB(5);"DIFFICULTY FACTOR":PRINT TAB(5);"(1-EASY
TO 5-HARD)";:INPUT DF
100 IF DF<1 OR DF>5 THEN 90
110 P1=16340:P2=15380
120 REM * * *            NON-DISK USERS!          * * *
130 REM * * * REPLACE LINE 120 WITH THE FOLLOWING: * * *
140 REM * * *  POKE 16526, 90 : POKE 16527, 124    * * *
150 DEFUSR1=31834
160 REM * * * SET UP THE TERRAIN * * *
170 TF=RND(2)+5
180 DIM L(TF+1), H(TF+1), D(TF+1)
190 FOR X=1 TO TF
200 L(X)=RND(40)+20
210 D(X)=D(X-1)+RND(20)+L(X-1)
220 H(X)=3*DF+RND(12)+RND(DF)
230 IF H(X)/L(X) >.7 THEN H(X)=H(X)-1:GOTO 230
240 NEXT
250 TL=D(TF)+L(TF)+50:L(TF+1)=50
260 REM * * * NON-DISK USERS CHANGE M=USR1(0) * * *
270 REM * * * IN THE NEXT LINE TO  M=USR(0)   * * *
280 FOR X=1 TO 64:M=USR1(0):NEXT:CLS
290 C=1:L=1:NB=25:A=10
300 GOSUB 540:GOSUB 550
```

Listing 1 continues

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ing a bomb will cost you five points; wasting a plane will cost you 100.

Lines 170–250 set up the terrain (length, height and distance to each mountain). The check in line 230 tailors the height to length ratio so that a given mountain will not have holes in its side. Without this feature, it becomes possible to fly through a mountain once in a while. The equation in line 370 determines the height of a mountain at any given point.

The PEEK(14400) in line 360 polls the up and down-arrow keys to provide continuous motion, which is not possible through INKEY$. A value of eight here corresponds to an up arrow, 16 a down arrow.

Assembler Side-scroll Routine

The side-scroll routine works like this: After being POKEd into memory by lines 50–70 (Listing 1), the screen memory is moved into a work buffer at the top of memory (lines 110–140 in Program Listing 2). Next, the 64th character of each new line is blanked to prevent a wrap-around effect (lines 150–200). Finally, the entire buffer minus the first character is returned to the screen.

Listing 1 continued

```
310 FOR X=0 TO 127:SET(X,45):NEXT
320 REM * * * START FLYING * * *
330 FOR X=1 TO TL
340 IF D=1 THEN GOSUB 500
350 IF D=0 THEN B$=INKEY$:IF B$=" " THEN D=1:GOSUB 490
360 AM=PEEK(14400):IF X<D(C) THEN H=45:H1=45:FOR Z=1 TO 100:NEXT
:GOTO 400
370 H=47-(H(C)*EXP(-(4*L/L(C)-2)[2)+2):H1=47-(H(C)*EXP(-(4*(L-.5
)/L(C)-2)[2)+2):IF L>L(C) THEN C=C+1:L=1 ELSE L=L+1
380 REM * * * NON-DISK USERS CHANGE M=USR1(0) * * *
390 REM * * * IN THE NEXT LINE TO  M=USR(0)   * * *
400 GOSUB 440:M=USR1(0):GOSUB 450:SET(126,H1):SET(127,H):IF RND(
10)=5 THEN POKE 15423+64*INT(H/3),91
410 NEXT
420 GOTO 660
430 REM * * * MOVE PLANE UP AND DOWN * * *
440 POKE P1-A*64,128:RETURN
450 IF AM=8 THEN A=A+1:IF A>13 THEN A=13
460 IF AM=16 THEN A=A-1:IF A<0 THEN A=0
470 PP=P1-A*64:IF PEEK(PP)>128 OR PEEK(PP)=91 THEN GOSUB 570:FOR
 X=1 TO 300:NEXT:GOTO 640 ELSE POKE PP,94:RETURN
480 REM * * * BOMBS AWAY! * * *
490 BS=26-2*A:AB=45-A*3:NB=NB-1:GOSUB 550
500 FOR Z=1 TO 3:PP=P2+64*INT((AB+Z)/3):IF PEEK(PP)=91 THEN PRIN
T@94,"DIRECT HIT!!!":SC=SC+BS:GOSUB 540:D=0:GOSUB 630:RETURN ELS
E IF PEEK(PP)>128 THEN PRINT@94,"MISS":D=0:SC=SC-5:GOSUB 540:GOS
UB 630:RETURN
510 NEXT
520 RESET (39,AB):AB=AB+3:IF AB<48 THEN SET (41,AB) ELSE D=0
530 RETURN
540 PRINT@10,"SCORE =>";SC;:RETURN
550 PRINT@30,"BOMBS REMAINING =>";NB:RETURN
560 REM * * * CRASH! * * *
570 FOR X=1 TO 8
580 POKE PP-1,58:POKE PP-64,46:POKE PP+1,58
590 IF INT(X/2)<>X/2 THEN POKE PP,42:POKE PP-63,46:POKE PP-65,46
 ELSE POKE PP,128:POKE PP-63,128:POKE PP-65,128
```

Listing 1 continues

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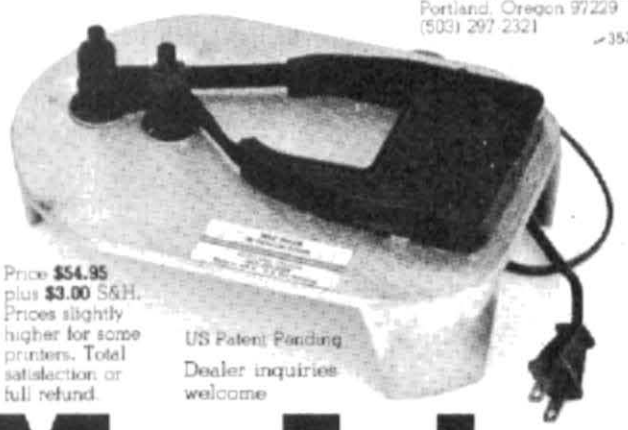

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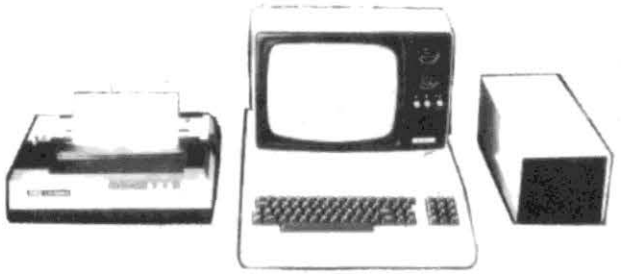

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Some of you are saying that the screen memory is 400H bytes long and only 380H bytes were moved. The top two screen lines are not scrolled to leave the score on the screen. If you want to move the whole thing, make the following changes in Listing 2: Change 3C80H to 3C00H (start of shifted area) in lines 110 and 200; change 380H to 400H (length of shifted areas) in lines 130 and 240; and change 14 to 16 (number of lines to shift) in line 170. On a 16K machine, change the origin to 745AH to leave room for the expanded buffer.

The program will scroll the screen from right to left. It's a simple matter to make it move from left to right with these modifications in Listing 2: Change BUFFER to BUFFER + 1 in line 120; change BUFFER + 64 to BUFFER in line 150; and change BUFFER + 1 to BUFFER in line 210. Variations of this, such as shifting vertically down or even diagonally, can be achieved through similar changes. ■

Thomas Rogers can be reached at 10820 E. Maxwell, Spokane, WA 99206.

Continues on p. 303

Listing 1 continued

```
600 POKE PP-1,128:POKE PP-64,128:POKE PP+1,128
610 FOR Y=1 TO 20:NEXT Y
620 NEXT:RETURN
630 RESET (39,AB):POKE PP,42:IF NB=0 THEN 660 ELSE RETURN
640 CLS:PRINT CHR$(23);:FOR X=1 TO 5:PRINT@334,"LOUSY PILOTING!!
!":FOR Y=1 TO 300:NEXT:PRINT@334,STRING$(18,32):FOR Y=1 TO 300:N
EXT:NEXT:SC=SC-100
650 PRINT@138,"FINAL SCORE =>";SC:GOTO 670
660 PRINT@10,"FINAL SCORE =>";SC
670 PRINT@202,"ANOTHER MISSION";:INPUT Q$
680 IF LEFT$(Q$,1)="Y" THEN RUN 80 ELSE END
```

```
7C5A            00100          ORG     7C5AH
                00105 ;MOVE SCREEN MEMORY TO WORK BUFFER
7C5A 21803C     00110          LD      HL,3C80H        ;START ADDRESS OF SHIFT AREA

7C5D 117E7C     00120          LD      DE,BUFFER       ;ADDRESS OF WORK BUFFER
7C60 018003     00130          LD      BC,380H         ;NUMBER OF BYTES TO MOVE
7C63 EDB0       00140          LDIR                    ;MOVE IT
                00145 ;BLANK LAST COLUMN TO PREVENT WRAP AROUND
7C65 21BE7C     00150          LD      HL,BUFFER+64    ;END OF LINE
7C68 114000     00160          LD      DE,64           ;INCREMENT VALUE
7C6B 060E       00170          LD      B,14            ;NUMBER OF LINES
7C6D 3680       00180 LOOP     LD      (HL),128        ;BLANK LAST COLUMN
7C6F 19         00190          ADD     HL,DE           ;INCREMENT TO NEXT LINE
7C70 10FB       00200          DJNZ    LOOP            ;GO TILL DONE
                00205 ;RETURN WORK BUFFER TO SCREEN MEMORY
7C72 217F7C     00210          LD      HL,BUFFER+1     ;START ADDRESS OF SHIFT AREA

7C75 11803C     00220          LD      DE,3C80H        ;RETURN ADDRESS
7C78 018003     00230          LD      BC,380H         ;NUMBER OF BYTES TO SHIFT
7C7B EDB0       00240          LDIR                    ;MOVE IT
7C7D C9         00250          RET                     ;RETURN TO BASIC
0381            00260 BUFFER   DEFS    381H            ;RESERVED FOR WORK BUFFER
0000            00270          END
00000 TOTAL ERRORS
```

Program Listing 2

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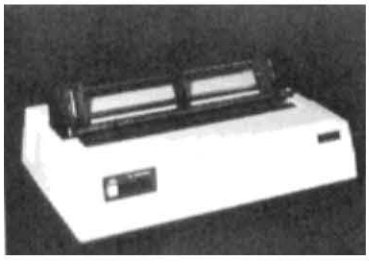

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- C. ITOH 1550 AP CALL • 1550 ACD ..... CALL
- C ITOH F10-40PU & F10-40RU — CALL
- C ITOH F10-55PU & F10-55RU — CALL
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- DAISY WRITERS — CALL

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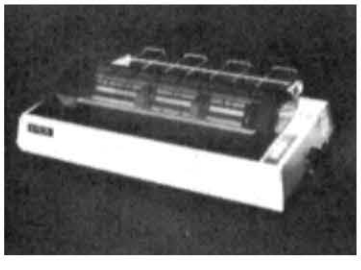

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- EPSON MX-80 F/T GRAFTRAX PLUS ..... CALL
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Model II/16 Conversion

```
                    CONVERSION BY JAMES BARBARELLO

DELETE THE FOLLOWING LINES:

70, 260-280, 380-390, 650

EDIT THE FOLLOWING LINES:

10 REM * * * PROGRAM NAME: JET/BAS -- REV: 4, 28 JAN 83 * * *
20 CLS:CLEAR 100,&HDFFF:SYSTEM"LOAD HSCROLL/CMD":DEFUSR=&HF000:DEFUSR1=&HF013:DE
FUSR2=&HF040:DEFUSR3=&HF048
30 CLS:PRINT@(3,28),STRING$(27,42):I$=CHR$(26)+" "+CHR$(25):PL$=CHR$(131)+CHR$(1
50)+CHR$(140)+"&"
40 PRINT@(4,28),"*  J E T  B O M B E R  *":PRINT@(5,28),STRING$(27,42)
50 PRINT@(7,30),"BY THOMAS H. ROGERS JR."
60 PRINT@(9,19),"(adapted for the Model II by J.J. Barbarello)"
90 PRINT@(14,20),"DIFFICULTY FACTOR (1-EASY TO 5-HARD)... ";:A$=INPUT$(1):DF=VAL
(A$)
110 PRINTDF:PRINT@(0,0),CHR$(2);:FOR I=1 TO 1000:NEXT:X=USR(0):FOR I=1 TO 80:X=U
SR1(0):NEXT
120 PRINT@(10,30),"INSTRUCTIONS (Y/N) ?...";CHR$(23);:A$=INPUT$(1):A=ASC(A$) MOD
 32:IF A=14 THEN PRINTA$:X=USR(0):FOR I=1 TO 80:X=USR1(0):NEXT:GOTO 170 ELSE IF
A<>25 THEN 120
130 PRINT@(2,26),CHR$(24);"I N S T R U C T I O N S":PRINT@(4,5),"Your Jetprop Bo
mber (";PL$;") is flying above enemy terrain. Use the UP or"
140 PRINT"DOWN Arrows to begin moving your Bomber. Press any other key to stop m
ovement.":PRINT@(7,5),"To release a bomb, press the SPACEBAR. Try to hit as many
 targets (";CHR$(159);") as"
150 PRINT"possible before time runs out.":PRINT@(10,26),"Press ANY key to begin.
..";:A$=INPUT$(1):X=USR(0):FORI=1TO80:X=USR1(0):NEXT
290 C=1:L=1:NB=25:A=7
310 PRINT@(15,0),STRING$(79,154);
360 IF X<D(C) THEN H=45:H1=45:FOR Z=1 TO 100:NEXT:GOTO 400
370 H=47-(H(C)*EXP(-(4*L/L(C)-2)^2)+2):H1=47-(H(C)*EXP(-(4*(L-.5)/L(C)-2)^2)+2):
IF L>L(C) THEN C=C+1:L=1 ELSE L=L+1
400 GOSUB 440:M=USR(0):GOSUB 450:PRINT@(H1/3,77),CHR$(154):PRINT@(H/3,78),CHR$(1
54);:IF RND(10)=5 THEN PRINT@(H/3,77),CHR$(159);:PRINT@(H/3-1,77)," ";
440 PRINT@(A,29),SPACE$(4);:RETURN
450 AM=USR2(0):IF AM=30 THEN A=A-1:IF A<3 THEN A=3
460 IF AM=31 THEN A=A+1:IF A>15 THEN A=15
470 PP=USR3(A*256+32):IFPP<32THEN GOSUB 570:FOR X=1 TO 300:NEXT:GOTO 640 ELSE PR
INT@(A,29),PL$;:RETURN
490 BS=32-2*A:AB=A:NB=NB-1:GOSUB 550
500 M=USR3(AB*256+286):IF M=31 THEN PRINT@110,"DIRECT HIT!!!":SC=SC+BS:GOSUB 540
:D=0:GOSUB 630:RETURN ELSE IF M=26THEN PRINT@110,"MISS          ":D=0:SC=SC-5:GOS
UB 540:GOSUB 630:RETURN
510 IFA<>ABTHENPRINT@(AB,29)," "; ELSE PRINT@(A,30),"v";
520 AB=AB+1:IF AB<16 THEN PRINT@(AB,30),"o";ELSE D=0
540 PRINT@5,"SCORE =>";SC;:RETURN
550 PRINT@25,"BOMBS REMAINING =>";NB:RETURN
570 FOR I=1 TO 20:FORJ=-1TO1:PRINT@(A+J,26),SPACE$(8);:NEXT
580 PRINT@(A-1,26),"********";
590 PRINT@(A,26),"*CRASH!*";
600 PRINT@(A+1,26),"********";
610 NEXT I
620 RETURN
630 PRINT@(AB,29)," ";:PRINT@(AB+1,30),"*";:IF NB=0 THEN 660 ELSE RETURN
640 FOR X=1 TO 5:PRINT@(18,30),"LOUSY PILOTING!!!":FOR Y=1 TO 300:NEXT:PRINT@(18
,30),CHR$(23);:FOR Y=1 TO 300:NEXT:NEXT:SC=SC-100
660 PRINT@5,CHR$(23);:PRINT@(1,30),"FINAL SCORE =>";SC
670 PRINT@(18,28),"ANOTHER MISSION (Y/N)... ";CHR$(23);:A$=INPUT$(1):A=ASC(A$) M
OD 32
```

```
TRS-80 Model II DEBUG Program
F000    21 00 F8 11 00 E0 3E E1   D3 FF 01 80 07 ED B0 3E   !.....>........>
F010    21 D3 FF 3E 15 11 A0 E0   21 A1 E0 01 4F 00 ED B0   !..>....!...O...
F020    D5 FD E1 FD 36 01 20 13   23 3D 20 EF 11 00 F8 21   ....6. .#= ....!
F030    00 E0 3E E1 D3 FF 01 80   07 ED B0 3E 21 D3 FF C9   ..>........>!...
F040    DB FC 77 23 3E 00 77 C9   4E 23 46 3E 00 77 2B 16   ..w#>.w.N#F>.w+.
F050    01 3E 0B CF C9 00 FF 00   FF 00 FF 00 FF 00 FF 00   .>..............
F060    FF 00 FF 00 FF 00 FF 00   FF 00 FF 00 FF 00 FF 00   ................
F070    FF 00 FF 00 FF 00 FF 00   FF 00 FF 00 FF 00 FF 00   ................
   PC    SP  SZHPNC  AF   BC   DE   HL   IX   IY   AF'  BC'  DE'  HL'
 F000  21FE  011100 0054 F055 EFFF 2700 DDDF 9BB1 2144 0260 2701 F000
? P
```

Figure 1

Here are instructions for creating the HSCROLL/CMD utility for the Model II version of JETBOMBR.

At TRSDOS Ready, type DEBUG ON and press enter. Then type DEBUG and press enter. Next, press the following keys: M F 0 0 0 [F1]. The Debug display will have the cursor positioned at the first byte on the F000 line. Referring to Fig. 1, type the 85 bytes, starting with 21 and ending with C9. Do not press the enter key, and be sure to use the zero, not the letter O key. If you make any errors, use the arrow keys to position the cursor over the incorrect entry and then type the correct character.

When done, press the following keys: [F2] [ESC] O (not the zero key). Now type: DUMP HSCROLL?CMD [START = H000,END = F054] and press enter. The code you just entered is now in a new file named HSCROLL/CMD. ■

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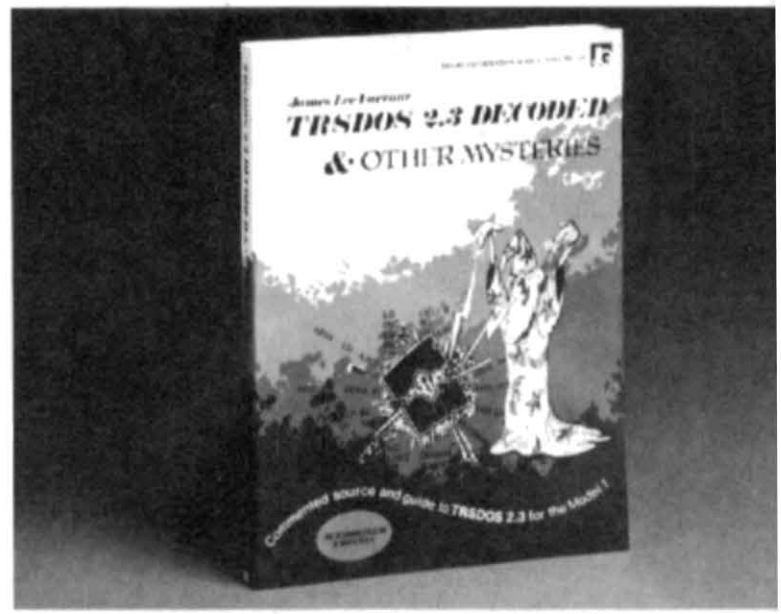

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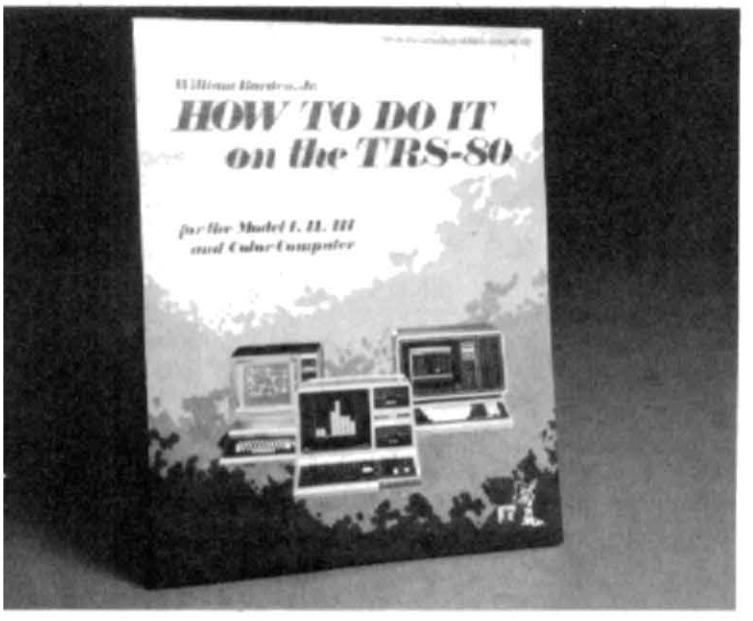

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LISP: Basically Speaking—Part III

by Randy Beer

In this final part of a series on LISP, you will learn about I/O methods, temporary variables, saving function definitions, and more.

In two previous installments on Basic Lisp (March and April 1983), I introduced most of the language's predefined functions and explained how to develop some simple user-defined functions. In this final installment, I will cover input/output in Lisp, temporary variables, internal representation of s-expressions, saving function definitions on tape and advanced Lisp pattern-matching.

In Basic, information is incorporated into or taken out of a program with an Input or Print command. In Lisp, the commands READ and PRINT are used. READ returns an s-expression from the keyboard. The call (READ) waits for the user to type in an s-expression, and then returns that expression unevaluated as the result.

PRINT is used to write an s-expression on the screen. It prints a carriage return, followed by the value of its single argument on the screen. Unlike any other Basic Lisp function discussed so far, PRINT does not return a value. In standard Lisp, PRINT returns a value after printing. As an example of the functions READ and PRINT, (PRINT (CAR (READ))) would print the CAR of any list typed in. This list does not have to be quoted because READ doesn't try to evaluate what's typed in; it only returns the information.

```
$ (SETQ X 'SOMETHING)
SOMETHING

$ ((LAMBDA (X) (ADD X 1)) 4)
5

$ X
SOMETHING
```

Fig. 1. A LAMBDA expression operates as ADD1 might.

The function PATOM allows atoms to be printed without a carriage return. PATOM prints the value of its single argument wherever the cursor is positioned. It, too, does not return a value.

Several special atoms cannot be printed in the normal way. For example, to print a left parenthesis you might try (PATOM '( ). This won't work, however, because the interpreter reads the "(" following the quote mark as the beginning of another list, not an atom to be printed. Since all the open parentheses haven't been closed, it waits for the user to type another right parenthesis and then evaluates the call (PATOM '( )). This prints the atom NIL on the screen, clearly not the desired result.

To remedy this, Basic Lisp provides several predefined atoms for these special characters. The values of RPAREN, LPAREN, QT, SP, and CR are ")", "(", " ' ", a space, and a carriage return, respectively.

Perhaps you're tiring of all the parentheses and would like to see something printed on your screen the way good old Basic used to print. Using PATOM, it's easy to define a function that takes a message in the form of a list of atoms and prints it on the screen as a Basic print statement. The function PRINTS is defined below:

```
(DEFUN PRINTS (MESSAGE)
    (PATOM CR)
    (DOUNTIL (EQ MESSAGE NIL)
        (PATOM (CAR MESSAGE))
        (PATOM SP)
        (SETQ MESSAGE (CDR
        MESSAGE))))
```

The DOUNTIL loop in PRINTS is a

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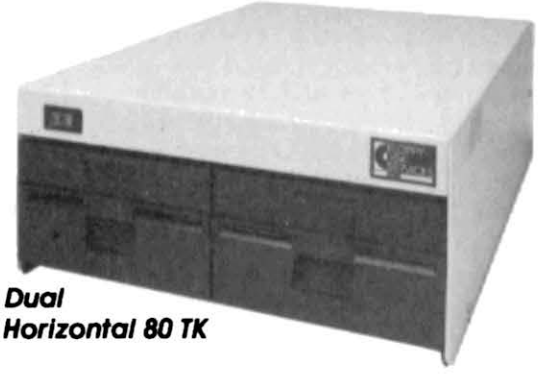

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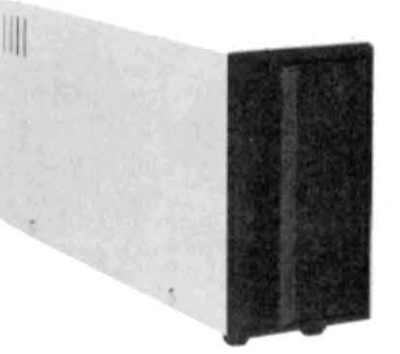

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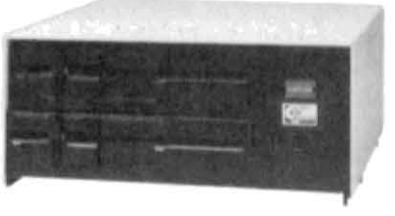

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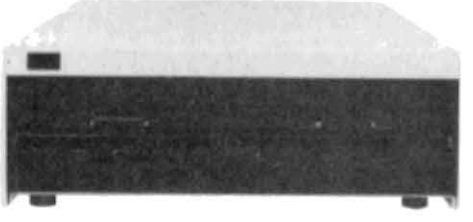

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good example of one way to process a list from left to right. The first element of the list is processed by getting the CAR and then performing some process, such as printing, on it. Then the first element is discarded by setting the atom with the value of the list to the CDR of the list and looping until it reaches the end of the list. That atom's value is NIL.

You may have noticed in Part II (April 1983) that when it evaluates a list, the interpreter is really looking for a predefined function name or an atom whose value is a list with either LAMBDA or NLAMBDA as its first element.

You can also give the interpreter a LAMBDA or NLAMBDA expression to work with and bypass the function name completely. In fact, this works equally well, and has some useful applications. Figure 1 shows a LAMBDA expression that performs the same operation as a function called ADD1 might. Notice that, just as when a function is evaluated, the value of X isn't changed because it is saved when the LAMBDA expression is evaluated.

This may not seem useful and, in fact, might appear confusing. However, this is one way to allow temporary variables within a function body. There are other ways in standard Lisp, but this is the only one in Basic Lisp.

"In Basic Lisp, there are three distinct storage locations: the list memory, the OB LIST, and the FP."

Consider the iterative version of FACT defined in Part II. Recall that the atom X is a free variable with respect to FACT, because its value is permanently altered within the function body. Suppose you wanted X to be bound with respect to FACT. One way to do this would be to put X in the parameter list with N, but this requires giving X a value each time FACT is called: for example, (FACT 4 NIL).

Clearly, there should be a more elegant way to accomplish this. By using a LAMBDA expression in the way described above, X is made local to FACT without changing the way it's called. Here is a new definition of FACT, incorporating a LAMBDA expression to make X local.

```
(DEFUN FACT (N)
   ((LAMBDA (X)
      (SETQ X 1)
      (DOUNTIL (COND
                  ((EQ N 0) X))
         (SETQ X (MUL X N))
         (SETQ N (SUB N 1)))) NIL))
```

Just as the LAMBDA expression in Fig. 1 is called with a value of 4, the LAMBDA expression in FACT is "called" with NIL in the last line of the definition. Its value is arbitrary in this case, because it is never used. Nevertheless, it must be present to prevent an error. This idea can be extended to any number of temporary variables just by placing them in the LAMBDA expression's parameter list and initializing each to NIL (for example) as above.

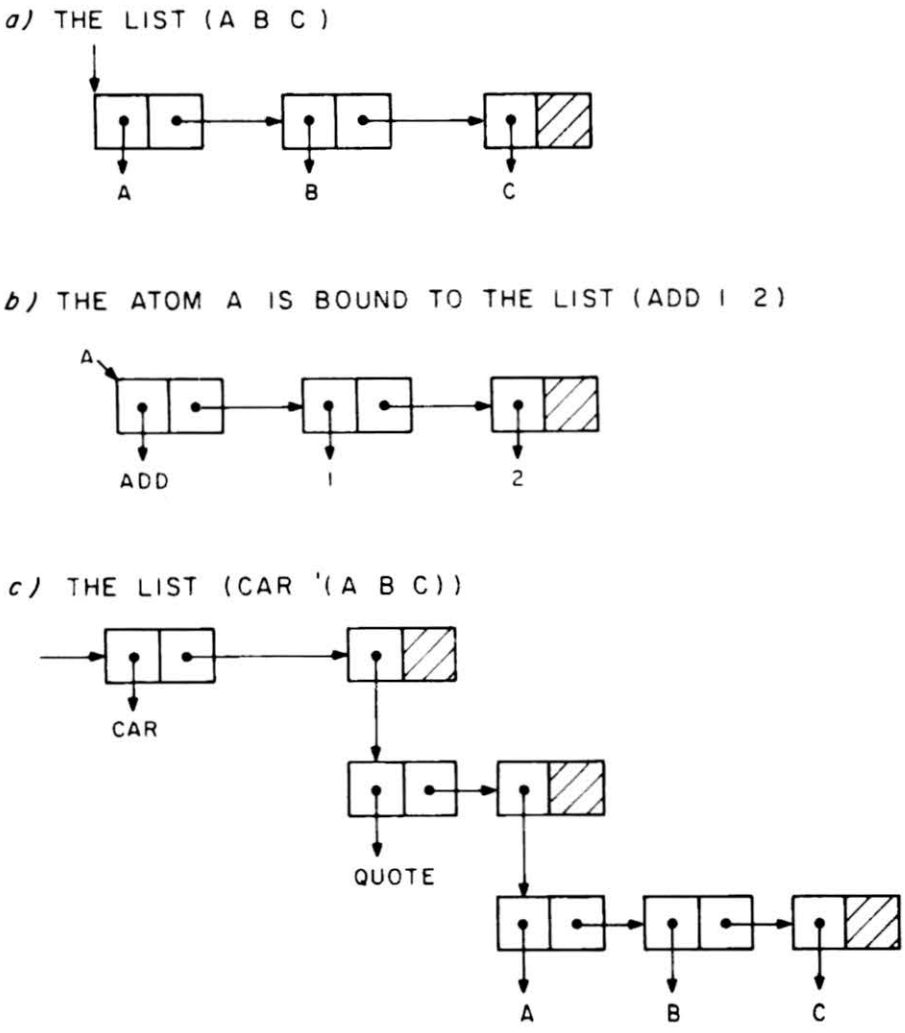

Fig. 2. Internal Representation of S-Expressions

Internal Representation in Lisp

To understand how and why Lisp functions operate, it's helpful to know a little about how Lisp internally represents lists, atoms, and numbers. Whenever possible, I will avoid the details of exactly how Basic Lisp does things in favor of a general discussion on how any Lisp interpreter operates.

In Basic Lisp, there are three distinct storage locations: the list memory, the OB LIST, and the FP. They store lists, atoms, and numbers, respectively. Atoms and numbers are stored uniquely so that, regardless of how many times a given atom or number is used, it is stored only once.

Lists are stored in a linked list format where each element in a list can be thought of as a box divided in half. The first half contains a pointer to an s-expression and the second half contains a pointer to the rest of the list. Pointers can be thought of as arrows that point to something.

Figure 2 contains several sample s-expressions and their corresponding representation in this box-and-arrow notation. The end of a list is designated with diagonal lines and actually contains a pointer to the atom NIL, the empty list.

For example, in Fig. 2b, the fact that the value of A is the list (ADD 1 2) is

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"The value of any Lisp atom may be a number, a list, or another atom."

represented by A containing a pointer to that list. This is why the value of any Lisp atom may be a number, a list, or another atom. What the atom actually contains is merely a pointer to its value. This pointer may point to anything. Notice, in Fig. 2c, that if a list is made up of sublists, each of these also has a NIL pointer to mark its end.

To show how a few Basic Lisp functions work using this notation, suppose you want to take the CAR of the list in Fig. 2a. The function CAR just returns the pointer in the left half of the first box of the list it is given. In this case, a pointer to the atom A would be returned. We know from experience, of course, that (CAR '(A B C)) is A. This call is represented internally as in Fig. 2c. As mentioned in Part I, '(A B C) is transformed into (QUOTE (A B C)) by the interpreter.

On the other hand, CDR returns the pointer in the right half of the first box of the list it is given. Again, in Fig. 2a you can see that this would be a pointer to the list (B C), as would be expected.

The function CONS is complementary to the functions CAR and CDR. It takes a new box off of a list of unused boxes and places a pointer to the new first element in the left half of this box and a pointer to the old list in the right half, as in Fig. 3a.

The second argument to a CONS does not have to be a list. If both arguments are atoms, the result is a pointer to a box whose left- and right-half pointers both point to atoms. This is called a dotted pair and is indeed printed with a dot, as in Fig. 3b. Though not often used, dotted pairs can really save space when many pairs need to be represented, since they require only half the space of a two-element list like (A B). Compare the representation of the dotted pair (A . B) in Fig. 3b to that of the list (A B) in Fig. 3c.

With this background on the Lisp interpreter, consider a question that came up in Part II: Why is EQ so restrictive and in what cases would it be better to use EQUAL? In short, EQ returns T only if both its arguments represent the same pointer. Remember that EQUAL returns T if its arguments are simply equivalent.

To better understand this distinction,

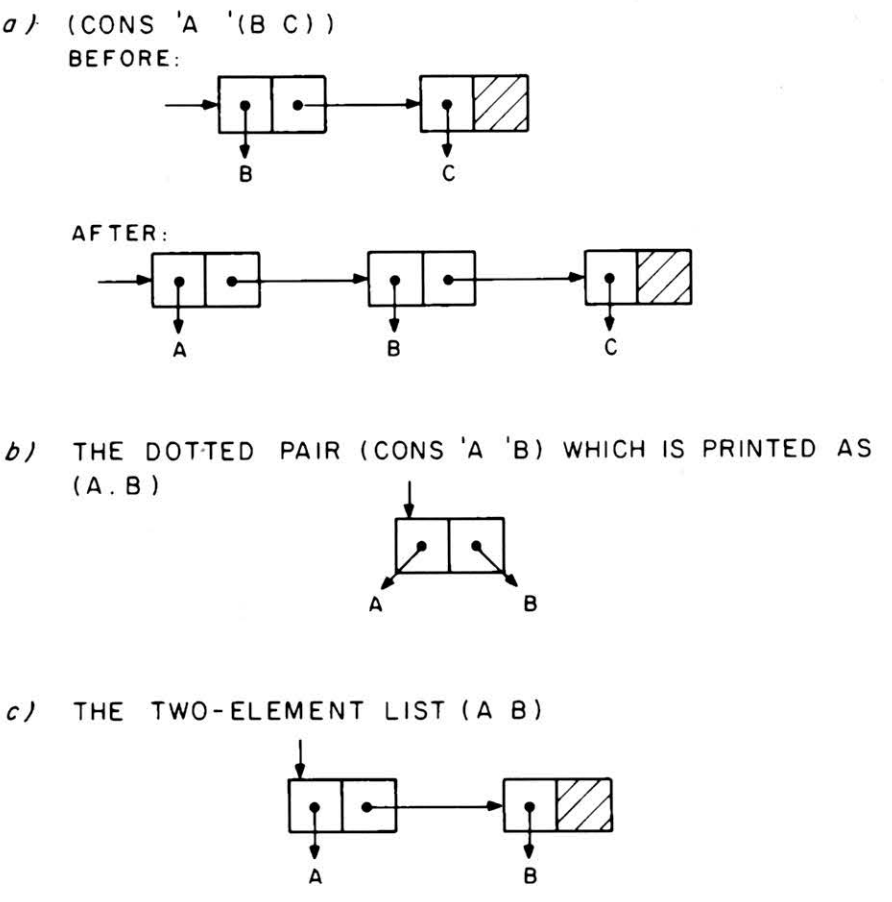

Fig. 3. CONS and Dotted Pairs

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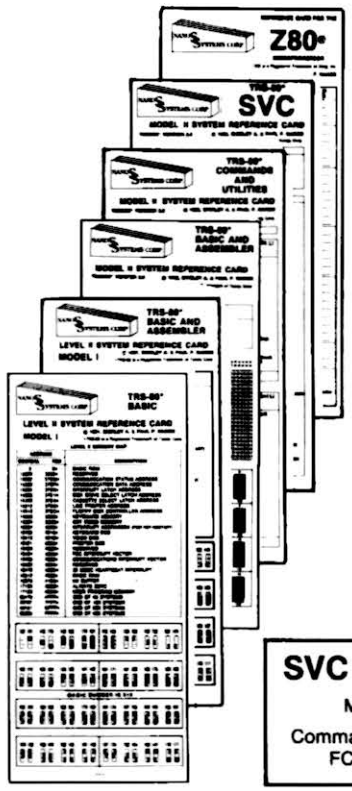

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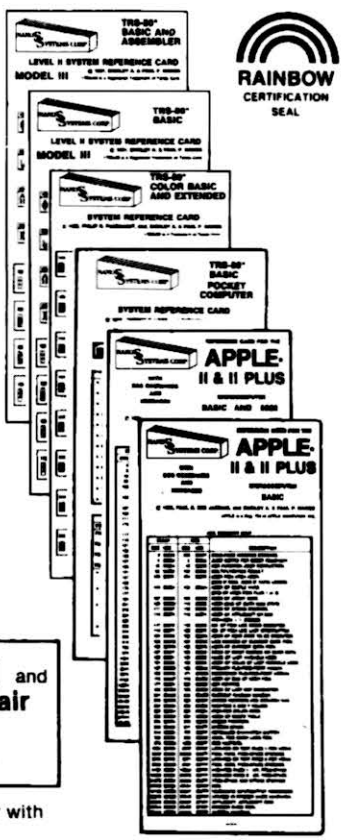

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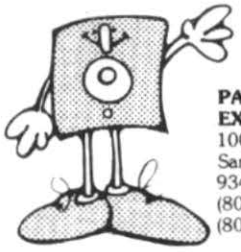

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consider the situation that occurs after the s-expressions in Fig. 4a are evaluated. The resulting list structure is shown graphically in Fig. 4b. Each time a list is typed in, it is allocated a new set of boxes; lists aren't uniquely represented as are atoms and numbers. SETQ, on the other hand, simply copies a pointer from its second argument to its first.

(EQUAL L1 L2), (EQUAL L2 L3), and (EQUAL L1 L3) would all return T because the lists all contain the same elements. EQ, on the other hand, simply compares pointers. To EQ, (EQ L1 L2) and (EQ L2 L3) would return NIL, while (EQ L1 L3) would return T because L1 and L3 both contain the same pointers.

While some Lisp programming can be done without ever thinking about how things are done internally by a Lisp interpreter, some knowledge of the underlying representation can be helpful. The most important thing to realize is that what's being passed around within a Lisp interpreter are pointers to s-expressions, and these pointers are returned whenever a function call returns a value.

A collection of atom bindings, such as atom values or function definitions, is called an environment and is really an array of pointers and boxes. Just as a Basic program can be saved by reproducing its internal code on tape, a Lisp environment can be saved by writing all its pointers to tape. There are several more efficient ways of saving an environment, but this is the simplest and the one employed in Basic Lisp.

Basic Lisp provides two functions, SAVE and LOAD, to save and load environments on tape. LOAD should only be used just after Basic Lisp is initialized. Both of these functions have no parameters and are called by simply (SAVE) or (LOAD).

Because Basic Lisp uses Level II Basic's PRINT# and INPUT# statements, SAVE and LOAD operate rather slowly and should only be used for small environments. They are useful for saving a few function definitions rather than retyping them each time they're needed. Like CLOAD in Basic, LOAD destroys any resident environment if it isn't used immediately after initialization. To save several function definitions, type each in and then save the entire environment. When the environment is reloaded later, these functions will again be available.

Pattern Matching in Lisp

If Lisp is just another programming language, why is it so popular in artificial intelligence research? Perhaps the foremost reason is that Lisp is ideally suited to the manipulation of symbols. This manipulation is the cornerstone of almost all artificial intelligence research. Another reason is the ease with which recursive functions can be written.

a)

```
$ (SETQ L1 '(A B C))
(A B C)

$ (SETQ L2 '(A B C))
(A B C)

$ (SETQ L3 L1)
(A B C)
```

b)

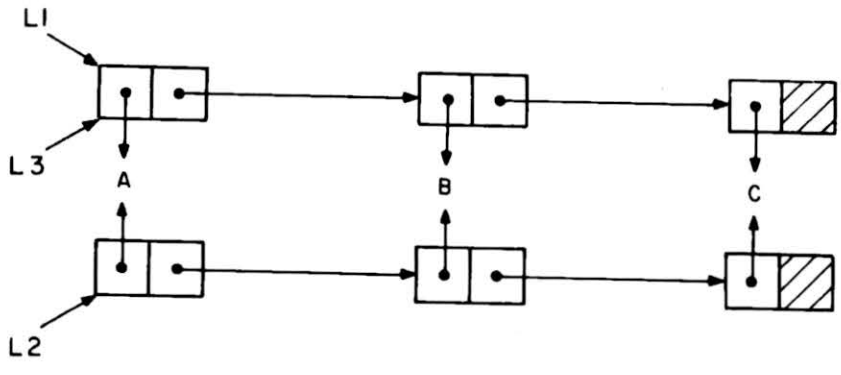

Fig. 4. EQ and EQUAL

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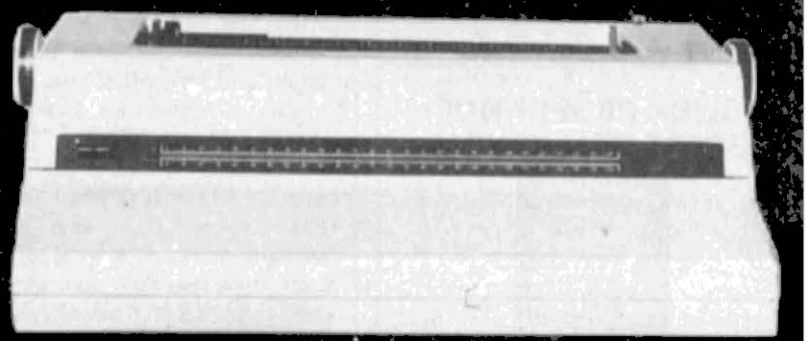

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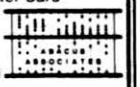

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```
(DEFUN MATCH (PAT AS)
   (COND
      ((EQ PAT '?) T)
      ((ATOM PAT) (COND
                     ((ATOM AS) (EQ PAT AS))
                     (T NIL)))
      ((ATOM AS) NIL)
      ((MATCH (CAR PAT) (CAR AS)) (MATCH (CDR PAT) (CDR AS)))
      (TNIL)))
```

Program Listing 1

```
(DEFUN  MATCH  (PAT AS)
      (COND
         ((EQ PAT '?) T)
         ((ATOM PAT) (COND
                        ((ATOM AS) (EQ PAT AS))
                        (T NIL)))
         ((ATOM AS) NIL)
         ((AND
                  (LISTP (CAR PAT))
                  (EQ (CAAR PAT) '>)
                  (MATCH (CDR PAT) (CDR AS))) (SET (CADAR PAT) (CAR AS)) T)
       ((MATCH (CAR PAT) (CAR AS)) (MATCH (CDR PAT) (CDR  AS)))(T NIL)))
```

Program Listing 2

Without delving too deeply into what consitutes artificial intelligence, the remainder of this series will describe an area in which Lisp's affinity for symbols is especially helpful, and illustrate how some functions to implement this might be defined in Basic Lisp.

Pattern Matching

Pattern Matching is the process of comparing various s-expressions to determine their similarities. In its simplest form, the function MATCH is a predicate that returns T if its arguments match, and NIL otherwise.

Some s-expressions that match are (PLUS 1 2) and (PLUS 1 2), A and A, and (A(B ?) ?) and (A (B C) D). In many cases, MATCH acts just like EQUAL. However, MATCH also allows the question mark as a kind of wildcard atom that matches any s-expression. This is the first step toward making our pattern-matcher more flexible than a function like EQUAL.

Our first definition of MATCH appears in Program Listing 1.

As could be expected, MATCH looks and works much like the function EQUAL defined in Part II. The only difference is that the MATCH function first tests to see if the pattern to be matched is the atom "?". If so, it returns T immediately since "?" matches anything.

MATCH is a two-argument function whose first argument is a patten containing any number of wildcard question marks and whose second argument is an assertion in which no wildcards may appear. A sample call on MATCH might be (MATCH '(A ? (?)) '(A (B C) (D))) which returns T.

Once a pattern matches some assertion, it would be useful to know exactly what s-expression a given "?" matched. For example, suppose we decide that lists like (> A), in addition to acting like a "?", also bind the atom in their right half to whatever they match if the entire match is successful. The ">" is meant to be a symbol for pushing a value into A if the match succeeds.

A second definition of MATCH, incorporating the above binding feature, appears in Program Listing 2.

An additional clause has been added to the COND, where lists like (> A) are tested for and the indicated binding is performed if the remainder of the match succeeds. This version of MATCH uses three other functions defined here.

```
(DEFUN LISTP (X)
    (NOT (ATOM X)))
(DEFUN CAAR (X)
    (CAR (CAR X)))
(DEFUN CADAR (X)
    (CAR (CDR (CAR X))))
```

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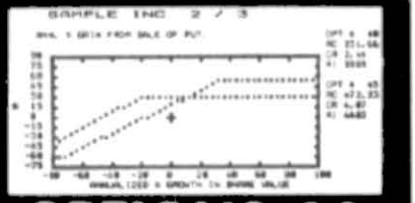

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```
(DEFUN RETRIEVE (FACT)
   ((LAMBDA (TEMP FOUND ANS)
        (SETQ TEMP DATABASE)
        (DOUNTIL (OR
                     FOUND
                     (EQ TEMP NIL))
            (COND
                ((MATCH (SUBST '(> ANS) '? FACT) (CAR TEMP)) (SETQ FOUND T))
                (T (SETQ TEMP (CDR TEMP)))))
        ANS) NIL NIL NIL))

(DEFUN SUBST (NEW OLD S-EXP)
   (COND
        ((EQ OLD S-EXP) NEW)
        ((ATOM S-EXP) S-EXP)
        (T (CONS
                (SUBST NEW OLD (CAR S-EXP))
                (SUBST NEW OLD (CDR S-EXP))))))

(DEFUN ADDF (FACT)
   (SETQ DATABASE (CONS
                     FACT
                     DATABASE))
   FACT)
```

Program Listing 3

With this definition, a call like:

```
(MATCH '(SISTER-OF LAURA
(>BROTHER)) '( SISTER-OF
LAURA TOM))
```

would return T and result in the atom BROTHER receiving the value TOM.

You have the makings of a knowledge base here, in which facts about the world are represented as a list of relations between objects. You should be able to write a function that searches a list of these relations looking for one that matches a pattern like the example above and returns the unknown.

As practice in Lisp programming, write a function called RETRIEVE, using MATCH, that looks up a fact in the knowledge base and returns the unknown if the fact is found and NIL otherwise. Simple calls like (RETRIEVE '(SISTER-OF LAURA ?)) promote readability. Assume that the atom DATABASE is bound to the list of relations ((SISTER-OF LAURA TOM) (FATHER-OF RALPH (LAURA TOM))). You might want to use a substitution function to replace the "?" in a call on RETRIEVE with something like (> ANS) so that MATCH will return the value of the unknown. One possible definition of the functions RETRIEVE and SUBST, along with a fact-adding function ADDF, appears in Program Listing 3.

We have begun to implement another language in Lisp that manipulates facts about the world. Although RETRIEVE isn't a very intelligent function, it can be extended to make inferences from known facts. It would be possible, for example, to derive the fact (SON-OF TOM RALPH) using the RETRIEVE function, though this is never explicitly stated in our sample database. This extension, though beyond the scope of this article, is not as difficult to achieve as you might expect and makes RETRIEVE a very powerful function. Extensions such as these are the basis of much of the artificial intelligence research conducted today.

If you have typed in and used MATCH, RETRIEVE, and their associated functions, you've probably noticed that you have pretty much reached the limits of Basic Lisp, both in terms of error correction and execution speed (it can take RETRIEVE several minutes to search a knowledge base of only five facts). However, Basic Lisp has fulfilled its original purpose of providing a vehicle for learning the Lisp language.

Though Basic Lisp differs from standard Lisp in a few ways, anyone who can program in Basic Lisp could be writing efficient Lisp functions in a short time. Alternatively, several reasonably priced Lisp interpreters for the TRS-80 currently exist which far surpass Basic Lisp's capabilities. ■

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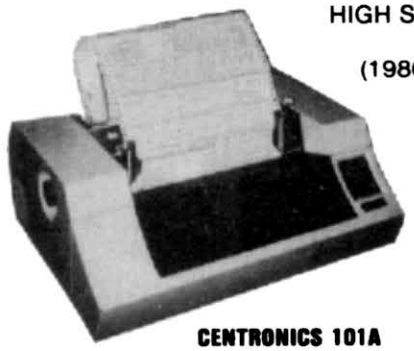

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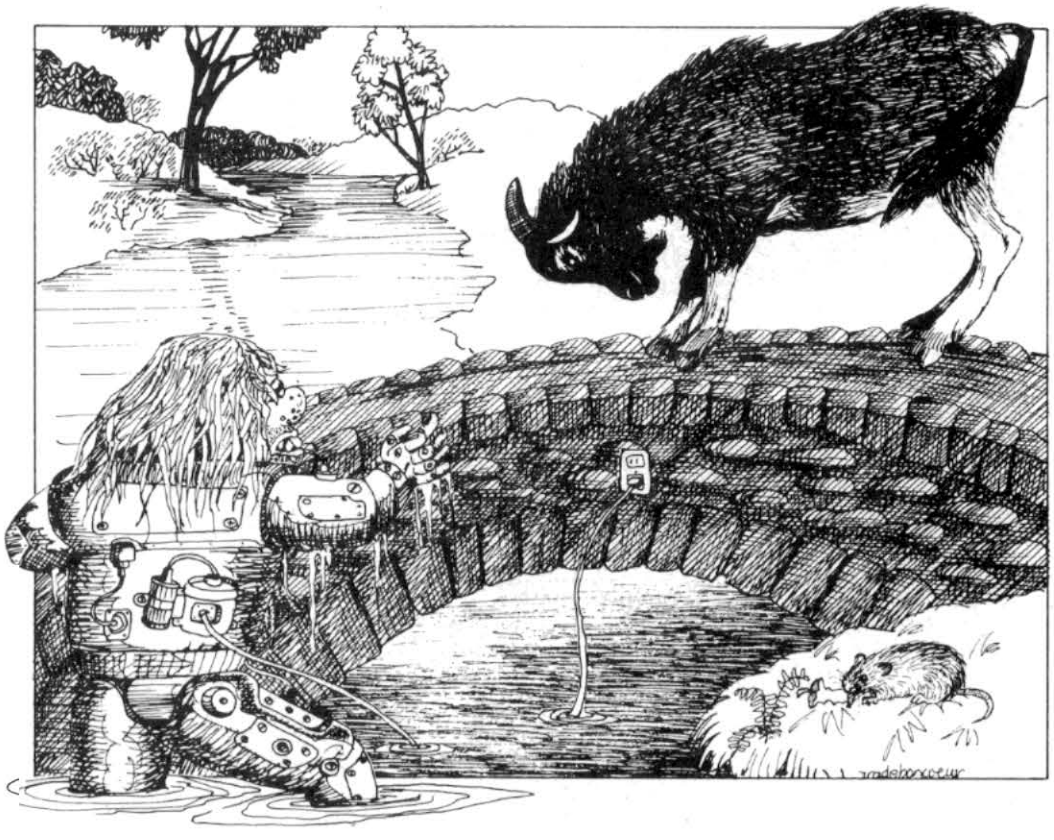

When you were a child, remember how proud you felt when you told everyone that you could count up to one hundred? You had a right to be pleased with yourself, because you had to endure learning your numbers with long, repetitious drills. Today, however, personal computers take the monotony out of such learning tasks and replace it with fun and games.

Buck the Troll

The concept of the game is simple. Billy (a goat) loves apples, but the orchard is guarded by an electric troll. Billy knows that he can run across the bridge and buck the troll out of the orchard. The only problem is that he must hit the troll at just the right speed—a randomly generated number between 1 and 100. If Billy runs too slow, he bounces off the troll. If he runs to fast, he misses his target and hits an armor plate. . . crunch!

The Key Box

Model I and III
16K RAM
Cassette Basic

The player can then figure out whether his guess was too high or too low. If the right number is selected before the number of guesses runs out, an alarm sounds, sparks fly, the troll is knocked up into the air, apples fall from a tree, and Billy gets to eat his lunch.

Connect the gray aux plug to an amplifier/speaker in order to hear the sound of Billy's hoofs as he runs along the bridge from a slow 1 mph to a speedy 100 mph, or to hear the blare of the troll's loud emergency alarm when he is hit. Although the program will run without sound, the noise does add to the enjoyment of the animated graphics.

Number Patterns

Young children should be given a sheet of paper with a list of the numbers between 1 and 100. A 10 by 10 matrix will do nicely. Using this visual aid, they will be able to select numbers for input into the program. Soon they will begin to recognize the number patterns of our decimal system.

Although this program is presented as a learning game for young children, older children (and sometimes even adults) like to play it too. It would be easy to modify the program so that the player wins when the correct solutions to a series of arithmetic problems are entered. Learning the multiplication tables just might become a little more interesting, and any program capable of doing that is a good addition to your library. ■

Scanned by Ira Goldklang - www.trs-80.com

Program Listing

```
100 REM ** BILLY AND THE TROLL
                BY
          VICTOR T. ALBINO
             JUNE 1981
110 CLS
120 CLEAR200
130 GOSUB 10000
140 A1$=CHR$(144)+CHR$(132)+STRING$(4,129)+CHR$(177)+STRING$(7,1
29)+CHR$(132)+CHR$(144)
141 A2$=CHR$(144)+CHR$(129)+STRING$(2,128)+CHR$(131)+STRING$(7,1
28)+CHR$(131)+STRING$(2,128)+CHR$(176)+STRING$(2,128)+CHR${161)
142 A3$=CHR$(132)+STRING$(5,128)+CHR$(131)+CHR$(128)+CHR$(128)+C
HR$(140)+STRING$(3,128)+CHR$(140)+STRING$(4,128)+CHR$(136)
143 A4$=CHR$(130)+CHR$(160)+STRING$(2,128)+CHR$(140)+STRING$(9,1
28)+CHR$(131)+STRING$(2,128)+CHR$(160)+CHR$(129)
144 A5$=CHR$(129)+CHR$(132)+STRING$(4,144)+CHR$(131)+CHR$(128)+S
TRING$(4,144)+CHR$(132)+CHR$(129)
150 T1$=CHR$(160)+CHR$(157)+CHR$(188)+CHR$(174)+CHR$(144)
160 T2$=CHR$(171)+CHR$(077)+CHR$(176)+CHR$(183)+CHR$(179)+CHR$(1
87)+CHR$(176)+CHR$(178)+CHR$(151)
170 T3$=CHR$(191)+CHR$(191)+CHR$(191)
180 T4$=CHR$(168)+CHR$(176)+CHR$(186)+CHR$(128)+CHR$(181)+CHR$(1
76)+CHR$(148)
190 G$=CHR$(128)+CHR$(159)+CHR$(159)+CHR$(143)+CHR$(175)+CHR$(17
5)+CHR$(131)+"``"
195 GOSUB340
200 C=0
205 N=RND(99)+1
206 PRINT@140,"SELECT THE LEVEL OF DIFFICULTY

                EASY ..... ( 7 GUESSES )
                MODERATE.. ( 6 GUESSES )
                HARD ..... ( 5 GUESSES )";:PRINT:PRINT:PRINT:PRINT

"HOW MANY GUESSES DO YOU WANT: 5, 6, OR 7";:INPUTDL
207 IFDL<5ORDL>7THEN206ELSECLS
210 C=C+1:RC=(DL+1)-C:IFC=(DL+1)THEN220  ELSE230
220 CLS:PRINT@204,CHR$(23)"THE NUMBER WAS ";N:PRINT:PRINT"TOO BA
D.  YOU HAVE USED UP YOUR
GUESSES.  BILLY WILL HAVE
TO STAY HUNGRY.":PRINT:PRINT:
INPUT"WANT TO TRY AGAIN (Y/N)";J$:CLS:IFJ$="Y"THEN200  ELSEEND
230 PRINT@258,"     ";:PRINT@38,"NUMBER OF GUESSES LEFT:";RC;:PR
INT@102,"HOW FAST SHOULD BILLY RUN?";:PRINT@170,"(ENTER A NUMBER
";:PRINT@232,"BETWEEN 1 AND 100)";:INPUTS:
235 IFS<1ORS>100THEN230
240 L=INT(100/S)+49
245 GOSUB600
250 PA=748:PRINT@PA,T1$;:PRINT@PA+62,T2$;:PRINT@PA+129,T3$;:PRIN
T@PA+191,T4$;
260 FOR M=768 TO 802
270 PRINT@M,G$;
280 X=USR(0)
290 FORT=50TOL:NEXT
300 NEXTM
305 FORT=1TO500:NEXT
310 IFS=NTHEN1000
320 IFS<NTHEN2000
330 IFS>NTHEN3000
340 REM ** OPENING AND INSTRUCTIONS
350 BO=15360:PRINT@1,STRING$(62,191):PRINT@961,STRING$(62,191);:
FORX=0TO1023STEP64:POKEBO+X,191:POKEBO+X+1,191:POKEBO+X+62,191:P
OKEBO+X+63,191:NEXT
360 PRINT@452,CHR$(23)"BILLY AND THE ELECTRIC TROLL";
370 FORT=1TO1500:NEXT:CLS:PRINT@460,"DO YOU WANT INSTRUCTIONS (Y
/N)";:INPUTI$:PRINT@460,"                                    ";:IFI
$="N"THEN205ELSECLS
380 PRINT@256,"ONCE UPON A TIME, IN THE LAND OF RAM, THERE LIVED
 A GOAT
WHO WAS KNOWN TO EVERYONE BY THE NAME OF BILLY."
390 PRINT@536,G$:PRINT@664,"(BILLY)";
400 PRINT@980,"(PRESS '/ ' KEY)";
410 IFINKEY$<>"/"THEN410ELSECLS
420 PRINT:PRINT"THE LAND OF RAM WAS A BEAUTIFUL PLACE WITH ROLLI
NG HILLS AND
TALL PINE TREES.  BUT IT WAS RULED BY AN EVIL SULTAN WHO
WOULD NOT SHARE THE LAND'S WEALTH WITH HIS PEOPLE."
430 PRINT"THE SULTAN WAS ESPECIALLY PROUD OF HIS APPLE ORCHARD.
IN ORDER TO KEEP HUNGRY PEOPLE AWAY, HE PLACED A GIANT ELECTRIC
TROLL TO GUARD THE BRIDGE THAT LED TO THE ORCHARD."
440 PA=540:PRINT@PA,T1$:PRINT@PA+62,T2$:PRINT@PA+129,T3$:PRINT@P
A+191,T4$:PRINT@856,"ELECTRIC TROLL";
450 PRINT@983,"(PRESS '/ ' KEY)";
460 IFINKEY$<>"/"THEN460ELSECLS
470 PRINT@256,"NOW BILLY REALLY LOVED APPLES, AND HE WAS DETERMI
NED TO GET
THEM.  HE HAD LEARNED FROM ONE OF THE SULTAN'S ENGINEERS THAT
THE TROLL HAD A WEAKNESS."
480 PRINT"AN EXACT HIT, AT JUST THE RIGHT SPEED, ON THE TROLL'S
THERMAL
EXHAUST PORT WOULD SCRAMBLE ITS CIRCUITS AND SHOOT IT INTO THE
AIR."
490 PRINT@982,"PRESS '/ ' KEY";
500 IFINKEY$<>"/"THEN500ELSECLS
510 PRINT:PRINT:PRINT"YOU CAN HELP BILLY.  JUST DECIDE HOW FAST
HE SHOULD BE RUNNING
WHEN HE HITS THE TROLL.  BILLY CAN RUN AT ANY SPEED FROM 1 TO
100 MPH."
520 PRINT"EACH TIME YOU GUESS, YOU WILL FIND OUT IF THE SPEED WA
S TOO SLOWOR TOO FAST.  IF BILLY RUNS TOC SLOW, HE WILL JUST BOU
NCE OFF
THE TROLL AND IF HE IS TOO FAST, HE WILL MISS THE EXHAUST PORT
AND CRUNCH AGAINST THE TROLL'S ARMOR."
530 PRINT"IF YOU STILL HAVE NOT PICKED THE RIGHT SPEED AFTER ALL
 YOUR
GUESSES ARE USED UP, THEN ANOTHER DAY DAWNS IN THE LAND OF RAM,
AND A NEW SPEED MUST BE GUESSED."
540 PRINT@982,"PRESS '/ ' KEY";
541 IFINKEY$<>"/"THEN541ELSECLS
560 PRINT@320,"THIS GAME HAS A SOUND OPTION.  IT YOU CONNECT YOU
R GRAY
AUX PLUG INTO AN AMPLIFIER/SPEAKER, YOU'LL HEAR THE SOUND OF
BILLY'S HOOFS AS HE RUNS ALONG THE BRIDGE.  IF YOU HIT THE TROLL
AT THE RIGHT SPEED, YOU'LL HEAR HIS EMERGENCY ALARM."
570 PRINT@982,"PRESS / KEY";
580 IFINKEY$<>"/"THEN580ELSECLS
590 RETURN
600 REM ** SUN
602 H=15380
604 POKEH,130:POKEH+1,136:POKEH+2,160:POKEH+5,162:POKEH+8,160:PO
KEH+9,136:POKEH+10,130
606 H=15443
608 FORX=0TO3:POKEH+X,144:NEXTX:POKEH+4,154:FORX=H+5TOH+8:POKEX,
130:NEXT:POKEH+9,164:FORX=H+10TOH+13:POKEX,160:NEXT
610 H=15511
612 POKEH,169:FORX=H+1TOH+4:POKEX,160:NEXT:POKEH+5,134
614 H=15573
616 POKEH,144:POKEH+1,132:POKEH+2,129:POKEH+4,162:POKEH+7,129:PO
KEH+8,132:POKEH+9,144
618 REM ** MOUNTAINS
620 H=15680
622 POKEH+2,176:POKEH+3,188:POKEH+4,191:POKEH+5,188:POKEH+6,176:
POKEH+13,176:POKEH+14,188:POKEH+15,191:POKEH+16,188:POKEH+17,176
:POKEH+23,176:POKEH+24,188:POKEH+25,176
628 H=15744
630 FORX=H+1TOH+3:POKEX,131:NEXT:POKEH+4,191:FORX=H+5TOH+7:POKEX
,179:NEXT:POKEH+8,176:FORX=H+9TOH+14:POKEX,140:NEXT:POKEH+15,143
:POKEH+16,140:POKEH+17,140:POKEH+18,176:POKEH+19,176:POKEH+20,14
4:POKEH+21,140:POKEH+22,143:POKEH+23,143
631 POKEH+24,191:POKEH+25,143:POKEH+26,143:POKEH+27,140
632 REM ** APPLE TREE
634 PRINT@367,A1$;:PRINT@429,A2$;:PRINT@493,A3$;:PRINT@557,A4$;:
PRINT@624,A5$;
636 FORX=106TO112:FORY=30TO43:SET(X,Y):NEXTY,X
648 REM ** MORE MOUNTAINS
650 H=15808
652 POKEH,140:POKEH+1,140:POKEH+2,131:POKEH+3,131:POKEH+13,176:P
OKEH+14,188:POKEH+15,191:POKEH+16,188:POKEH+17,176:POKEH+20,131:
POKEH+21,131:POKEH+22,131:POKEH+23,140:POKEH+24,143:POKEH+25,176
:POKEH+26,176:POKEH+27,176:POKEH+28,176
654 H=15884
656 FORX=HTOH+6:POKEX,131:NEXT:POKEH+3,191:FORX=H+17TOH+27:POKEX
,131:NEXT
658 H=15946
660 POKEH,176:POKEH+1,176:POKEH+2,140:POKEH+3,140:FORX=H+4TOH+8:
POKEX,131:NEXT:POKEH+9,140:POKEH+10,140:POKEH+11,176:POKEH+12,17
6
662 REM ** BRIDGE
664 FORX=0TO83:SET(X,39):NEXT:FORX=4TO74STEP10:SET(X,40):NEXT:FO
RX=5TO75STEP10:SET(X,40):NEXT:FORX=3TO83STEP10:SET(X,41):NEXT:FO
RX=2TO82STEP10:SET(X,42):NEXT
666 FORX=1TO81STEP10:SET(X,43):NEXT:FORX=0TO80STEP10:SET(X,44):N
EXT:FORX=11TO81STEP10:SET(X,44):NEXT:FORX=8TO78STEP10:SET(X,43):
NEXT:FORX=7TO77STEP10:SET(X,42):NEXT:FORX=6TO76STEP10:SET(X,41):
NEXT:FORX=9TO79STEP10:SET(X,44):NEXT:SET(83,40):SET(1,44)
667 SET(1,42):FORY=40TO43:SET(0,Y):NEXT:RESET(2,42):SET(2,41)
668 REM ** RIVER
670 PRINT@964,STRING$(35,",");
672 RETURN
```

Listing continues

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Listing continued

```
1000 REM ** BILLY BUCKS TROLL
1010 P1$=CHR$(191)+CHR$(179)+CHR$(179)+CHR$(187)+CHR$(149)+CHR$(
128)+CHR$(150)+CHR$(131)+CHR$(131)+CHR$(169)+CHR$(128)+CHR$(130)
+CHR$(164)+CHR$(128)+CHR$(160)+CHR$(144)+CHR$(128)+CHR$(152)+CHR
$(129)
1020 P2$=CHR$(143)+CHR$(128)+CHR$(128)+CHR$(128)+CHR$(128)+CHR$(
128)+CHR$(137)+CHR$(140)+CHR$(140)+CHR$(134)+CHR$(128)+CHR$(128)
+CHR$(128)+CHR$(137)+CHR$(129)+CHR$(130)+CHR$(134)
1030 PRINT@-1,
1035 PRINT@38,"                              ";:PRINT@102,"
               ";:PRINT@170,"                    ";:PRINT@232,"
                ";
1040 FORF=1TO15
1050  PRINT@747,"*";:PRINT@753,"*";
1060  FORT=1TO20:NEXTT
1070  PRINT@682+RND(8),"*";
1080  FORT=1TO20:NEXTT
1090  PRINT@682,"  ";
1100  FORT=1TO20:NEXTT
1110  PRINT@747," ";:PRINT@753," ";
1120 NEXTF
1130 PRINT@603,P1$;
1140 PRINT@667,P2$;
1150 FORT=1TO250:NEXTT
1160 PRINT@603,"                    ";
1170 PRINT@667,"                    ";
1180 AA=684:PA=748
1190 FORR=1TO2
1200  PRINT@AA,T1$;:PRINT@AA+62,T2$;:PRINT@AA+129,T3$;:PRINT@AA+
191,T4$;
1210  PRINT@PA+190,"          ";:PRINT@PA+127,"        ";:PRINT@PA
+62,"          ";:PRINT@PA-2,"          ";
1220  PA=PA-64:AA=AA-64
1230 NEXTR:PRINT@620,"     ";:SET(96,27)
1231 AA=108:PA=172
1232 FORR=1TO2
1233  PRINT@AA,T1$;:PRINT@AA+62,T2$;:PRINT@AA+129,T3$;:PRINT@AA+
191,T4$;
1234  PRINT@PA+185,"          ";:PRINT@PA+127,"          ";:PRINT@
PA+63,"          ";:PRINT@PA-2,"          ";
1235 PA=PA-64:AA=AA-64
1236 NEXTR
1240 PRINT@44,"          ";
1241 FORT=1TO325:NEXT:PB=51:PRINT@PB+62,T4$;:PRINT@PB,T3$;
1242 PRINT@PB+62,"          ";:PRINT@PB,"          ";
1243 PRINT@PB,T1$;:PRINT@PB+62,T2$;:PRINT@PB+129,T3$;:PRINT@PB+1
91,T4$;
1244 FORX=48TO240STEP64:PRINT@X,"              ";:NEXTX
1245 PRINT@307,T1$;
1246 FORI=1TO10:PRINTCHR$(23);
1247 FORT=1TO5:NEXTT
1248 PRINTCHR$(28);:NEXTI
1249 FORT=1TO350:NEXTT:F$=CHR$(131)
1250 PRINT@443," ";:PRINT@441," ";:PRINT@499," ";:PRINT@571," ";

1251 PRINT@753,F$;:PRINT@761,F$;:PRINT@819,F$;:PRINT@891,F$;
1252 PRINT@753," ";:PRINT@761," ";:PRINT@819," ";:PRINT@891," ";

1253 PRINT@817,F$;:PRINT@825,F$;:PRINT@883,F$;:PRINT@955,F$;
1254 PRINT@817," ";:PRINT@825," ";:PRINT@883," ";:PRINT@955," ";

1255 PRINT@1089,F$;:PRINT@1011,F$;:PRINT@1017,F$;:PRINT@1019,F$;

1256 FORT=1TO500:NEXTT:PRINT@188,"CURSES,";:PRINT@241,"FOILED AG
AIN !";:FORT=1TO700:NEXTT:PRINT@188,"       ";:PRINT@241,"
       ";
1257 S$="       ":FORX=802TO810:PRINT@X,G$;:NEXTX:PRINT@810,S$;

1258 FORX=874TO1002STEP64:PRINT@X,G$;:FORD=874TO938STEP64:PRINT@
D,S$;:NEXTD,X
1259 FORT=1TO500:NEXTT
1260 GOTO1264
1262 FORT=1TO200:NEXTT:RETURN
1264 PRINT@1003,G$;:GOSUB1262:PRINT@1011,CHR$(128);:GOSUB1262
1266 FORX=1004TO1010:PRINT@X,G$;:NEXTX:GOSUB1262
1270 FORX=1011TO1012:PRINT@X,G$;:NEXTX:GOSUB1262
1274 GOSUB1262
1276 PRINT@826,"YUM";:GOSUB1262
1278 PRINT@890,"YUM ";:GOSUB1262
1280 PRINT@954,"YUMMY!";
1400 FORT=1TO500:NEXTT:CLS:PRINT@268,CHR$(23)"CONGRATULATIONS!":
PRINT:PRINT"NOW BILLY AND EVERYONE IN THE
KINGDOM OF RAM CAN EAT ALL
THE APPLES THEY WANT."
1410 FORT=1TO2000:NEXTT:PRINT:PRINT:PRINT:END
2000 REM ** BILLY RAN TOO SLOW
2010 PRINT@737,"B O I N G !";
2020 PRINT@803,"          ";
2030 PRINT@798,G$;
2040 FORT=1TO250:NEXTT
2050 PRINT@737,"          ";
2060 PRINT@652,"BILLY RAN TOO SLOW";
2070 PRINT@718,"HE BOUNCED BACK";
2080 FORT=1TO700:NEXTT
2090 PRINT@798,"          ";
2100 PRINT@652,"                    ";
2110 PRINT@718,"                  ";
2120 GOTO2100
3000 REM ** BILLY RAN TOO FAST
3010 PRINT@735,"C R U N C H !";
3020 FORT=1TO500:NEXTT
3030 PRINT@735,"              ";
3060 PRINT@652,"BILLY RAN TOO FAST";
3070 PRINT@716,"HE HIT ARMOR PLATE";
3080 FORT=1TO700:NEXTT
3090 PRINT@803,"        ";
3100 PRINT@652,"                    ";
3110 PRINT@716,"                    ";
3120 GOTO2100
9999 END
10000 REM SOUND SUBROUTINE
10010 POKE16527,125:POKE16526,1
10020 FORY=32001TO32030
10030 READD:POKEY,D
10040 NEXTY
10050 RETURN
10060 DATA 14,1,6,20,58,61,64,230,253,198,2,211,255,214,2,211
10070 DATA 255,197,16,254,193,16,242,13,121,246,0,32,234,201
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KTI strikes again. . .

Monkey Business

80 Micro's man in Sri Lanka, David Busch, convinced KTI's engineers to produce TLS-8E software compatible with TRS-80s. The following is the result of their efforts. The program, Pulitzer Prize Winner Text Generator, will run on TRS-80 Models I and III.

This program is based on the premise that if a group of monkeys pounded on typewriters for a long enough period of time, they would eventually, if accidentally, turn out recognizable prose. These works might include Shakespearian plays, Pulitzer Prize caliber novels, a Wayne Green editorial and documentation for VTOS 3.0.

As a writer, I find the idea interesting. As a computerist, the chore of generating random characters by monkeys seems a terrible waste of resources. After all, most things monkeys can do, a TRS-80 can do faster and nearly as well.

Imagine my surprise when I discovered that Kitchen Table Inc. had been working on exactly that sort of program for more than a year. The company generated the software to alleviate a monkey shortage in Sri Lanka.

Type in the program and use it as you wish. A modified version will soon be available for sportswriters and attorneys.

Pulitzer Prize Winner Generator (PPWG) does *not* select its characters at random. According to KTI mathematicians true randomness would extend the time needed to produce a good Hemingway novel beyond practical limits. Because the TRS-80, Models I and III, operate the Z80 chip at a paltry few megahertz, producing a good book would take something on the order of 1.9E + googolplex seconds. A best-selling diet book, on the other hand, would require only 2.3E + zilliontrillion seconds.

PPWG uses some well documented figures on the frequency of the appearance of each letter of the alphabet in a typical document. The program "weights" the random choices to account for this. For example, in 1,000 characters of English text, the letter E will appear about 100 times, the letter T, 77 times, and so forth.

The program loads an array (A$(n)) with letters, spaces and digraphs (two-letter groups) in roughly the proper proportions. It seems the KTI programmer got sloppy at the end; the actual array size is 1,060 elements rather than 1,000.

Once this array has been filled, the program generates random numbers from 1 to 1,060 and displays that letter on the screen. Periods and question marks are inserted in appropriate places. Other punctuation has been omitted: monkeys don't use good grammar, either.

As written, PPWG dumps all text generated to the screen. The user either has to sit there and watch for a best-selling novel to flash by, or change the Prints in the program to LPRINTs. That can use up a lot of paper—fast. Another alternative is to hire a 10-year-old kid to sit at the keyboard and hit JKL when anything good appears.

My computer turned out a spicy Erica Jong novel (her next one) on the first run-through—total run time: 45 days.

My thanks to the innovative crew at KTI for making this program available. ■

The Key Box

Model I or III
4K RAM
Model II (without PEEKs or POKEs)

Program Listing

```
10 '### Pulitzer Prize Winner Generator ######
   By: Kitchen Table, Inc.
    Atwater, Ohio
   ##########################################

20 ' ****** Harmless Poke ******

30 POKE 15360,65
40 POKE 15360,32

50 ' ****** Clear screen really good ******

60 CLS:CLS:CLS:CLS

70 CLEAR 8000
80 DIM A$(1061),FR(40),LE$(40)

90 ' ****** Look for more interesting program on disk ******

100 INPUT "Would you rather run another program";AN$
110 IF LEFT$(AN$,1) = "N" GOTO 190
120 INPUT "Okay, what's the name of it";AN$
130 RUN AN$

140 ' ****** Okay, run this one, then ******
```

Listing continues

Listing continued

```
150 DATA 310,50,31,47,54,20,46,38,30,4,18,20,23,23,23,15,15,15,15,15
160 DATA 38,31,18,17,17,16,14,14,13,12,12,12,8,7,6,5,4
170 DATA " ",E,T,A,O,N,I,R,S,H,D,L,F,C,M,U,G,Y,P,B
180 DATA TH,HE,ER,AN,IN,ON,RE,AT,ED,ST,ND,ES,LL,EE,SS,OO,TT

190 INPUT "Would you like instructions";AN$
200 IF LEFT$(AN$,1) = "N" GOTO 230
210 PRINT "Sorry, no instructions available."

220 ' ****** Fill array with dots ******

230 : FOR N1 = 1 TO 4
240 :  P$(N1) = CHR$(46)
250 : NEXT N1

260 ' ****** Fill another array with question marks ******

270 : FOR N2 = 5 TO 6
280 :  P$(N2) = CHR$(63)
290 : NEXT N2

300 ' ****** Fill useless array with nothing ******

310 : FOR Z = 1 TO 0
320 :  Z$(Z) = ""
330 : NEXT Z

340 '****** Obligatory Peek ******

350 WOW = PEEK(15360)

360 ' ****** Read Frequency Data into Array ******

370 : FOR N3 = 1 TO 37
380 :  READ FR(N3)
390 : NEXT N3

400 ' ****** Read Letters into another Array ******

410 : FOR N4 = 1 TO 37
420 :  READ LE$(N4)
430 : NEXT N4

440 ' ****** Set value of B to 1, for no special reason ******

450 B = 1

460 ' ****** Fill up array A$(n) with a bunch of letters and digraphs, their frequency having a vague relationship to actual occurrence in English language ******

470 : FOR J = 1 TO 37
480 :  FOR N5 = B TO FR(J) + B - 1
490 :  A$(N5) = LE$(J)
500 :  NEXT N5
510 :  B = N5
520 : NEXT J

530 ' ******Choose a random number smaller than a googol ******

540 R = RND(1060)
550 T$ = T$ + A$(R)
560 T = LEN(T$)

570 ' ****** If length of current sentence (T) is less than 20 characters, don't worry about it ******

580 IF T<20 GOTO 680
590 IF A$(R) < > CHR$(32) GOTO 680
600 IF RIGHT$(T$,1) < > CHR$(32) GOTO 680

610 ' ****** Choose punctuation ******

620 G = RND(6)
630 T$ = LEFT$(T$,LEN(T$) - 1)
640 T$ = "."
650 PRINT P$(G);
660 PRINT STRING$(2,32);
670 GOTO 540
680 PRINT A$(R);
690 GOTO 540

700 ' ****** Impressive, redundant code ******

710 POKE(PEEK(ASC(STR$(VAL(A$)))),ABS(SIN(R))
720 VARPTR A$ = MID$(A$,1,1)*256 + &H234
730 RETURN
```

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Business Graphics

by John Corbani

Tell your company's story with graphics. Figures made with these powerful, self-documenting subroutines speak louder than words.

Nothing proves the time-honored adage "A picture is worth a thousand words" better than business graphics. But many businessmen fear the arcane world of writing graphics programs. I have developed a set of Basic subroutines for the Model I and Model III that reduce the junior executive's programming anxiety. These subroutines are powerful, fast, and self-documenting.

You can make your graphics programs easier to use by creating appealing and useful interactive menus and auto-scaling bar and line charts.

Most of you are familiar with the type of menu shown in Fig. 1, where you press a number key to select an option. How many times have you missed by one digit?

The menu in Fig. 2 is the same, except that the numbers are replaced by a cursor that runs up and down the list under the control of the up and down arrow keys. Choose your option by moving the cursor to the desired function and pressing enter. This system reduces errors and requires no training.

Business programs should be easy to write and modify. A good program stimulates users to think of ways to improve the software. User suggestions incorporated into a program build job satisfaction and productivity. Programming and debugging are easier with reasonably structured programs. Ideally, programmers should build well-documented, completely debugged general-purpose routines that can be called from many places in a program.

Basic works well in the business environment; the language is easy to learn, and it has powerful commands to handle strings, format text and manipulate files. You can write self-documenting, structured code in a fraction of the time required by other languages. The Program Listing illustrates some of the basics.

The programming sequence illustrated in Fig. 3 is straightforward. It provides a clean structure that you can easily modify and expand, and is compatible with standard renumbering programs. Add to the end of each section, but leave old routines you're comfortable with as they are. When the program proves itself and no changes have been made for months, close things up for neatness.

The menu treatment illustrates the use of high-speed character graphics, and the selection routines illustrate high-speed graphics interaction. The plotting routines illustrate mixed-character and point graphics intelligently, reliably and quickly.

Printing A Menu

The easiest way to improve a menu's appearance is to put a border around it. This is where character graphics can show their speed. A single string forms all but one character of the frame. You can't print a character at the lower right corner of the screen without causing the whole screen to scroll. This character is handled by POKE 16383,191, a direct

```
TYPICAL NUMERIC INPUT MENU

     <1> Edit File
     <2> Add to File
     <3> Purge File
     <4> Print Labels
     <5> Search
     <6> Zip Code Sort
     <7> Alphabetic Sort
     <8> QUIT

What is your option (1-8) ? _
```

Fig. 1. A number-oriented menu. The actual screen display is narrower.

```
GROSS SALES
BY MONTH
1983

 LOAD
 SAVE
 EDIT
 DELETE
 PLOT BAR
 PLOT LINE
 PLOT BOTH
```

Fig. 2. Cursor-oriented menu as used in the Program Listing. The actual screen display is narrower.

The Key Box

Model I or III
16K RAM
Cassette or Disk Basic

loading of the video memory with the desired character.

Border string BR$ is built up in lines 50 and 60. STRING$(63,131) draws a line across the top of the screen to position 62. CHR$(191) puts a full white character in position 63, the last position in the first line, and moves the next print position to the first character of line two. CHR$(24) (backspace) moves the print position to the end of the second line. Additional combinations of CHR$(191) and CHR$(24) print down to the end of line 15. CHR$(28) moves the print position back to zero. T$ in line 60 splices together sequences of CHR$ (191), CHR$(24) (backspace), and CHR$(26) (down line) to draw the left border to line 15. The print position is left at the first character of line 16. T$ is added to BR$ along with CHR$(191) and 62 each of CHR$(176) to form the bottom line. All 202 characters stay well within Basic's 255-character limit. Printing a single string formed this way is the fastest way to print predefinable shapes.

Continues on p. 329

Program Listing

```
10 '                    BUSINESS GRAPHICS                  1/29/83
                           "B" #16
                             BY
                          JOHN CORBANI
20 '                      2455 CALLE LINARES
                          SANTA BARBARA, CA 93109
.
                            INITIALIZATION
    ************************************************************
    '
30 CLEAR 1000: CLS: DIM D(12), ME$(3,12), SC(6):
   X=0: Y=0: X1=0: Y1=0: S=0: S1=0: X2=0: Y2=0
40 '
    FULL BORDER STRING
    '
50 BR$=STRING$(63,131):
   FOR A=1 TO 15: T$=T$+CHR$(191)+CHR$(24): NEXT:
   BR$=BR$+T$+CHR$(28): T$=""
60 FOR A=1 TO 15: T$=T$+CHR$(191)+CHR$(24)+CHR$(26): NEXT:
   BR$=BR$+T$+CHR$(191)+STRING$(62,176)
70 '
    MENU # 1
    '
80 DATA
"                        GROSS SALES",
"                         BY MONTH",
"                           1983  ",
" "
90 FOR A=1 TO 4: READ ME$(1,A): NEXT
100 DATA
    LOAD, SAVE, EDIT, DELETE, PLOT BAR, PLOT LINE, PLOT BOTH:
    FOR A=5 TO 11: READ ME$(1,A): NEXT
110 '
     Y AXIS SCALE MARKING POSITIONS
    '
120 DATA
    64, 192, 384, 576, 768, 896:
    FOR A=1 TO 6: READ SC(A): NEXT
130 '
     SAMPLE 1983 DATA
    '
140 DATA
    1034, 10987, 15354, 9452, 8945, 96542,
    6439, 14236, 19435, 6589, 17004, 12036:
    FOR A=1 TO 12: READ D(A): NEXT
150 '
     CURSOR CONTROL CHARACTERS
    '
160 CW$=CHR$(133)+CHR$(24):
    CU$=CHR$(32)+CHR$(24)+CHR$(27)+CW$:
    CD$=CHR$(32)+CHR$(24)+CHR$(26)+CW$
400 GOTO 1010
410 '
                            SUBROUTINES
    ************************************************************
    '
420 '
    PRINT BORDER
    '
430 CLS: PRINT @ 0, BR$;: POKE 16383,191: RETURN
440 '
     PRINT M MENU
    '
450 P=129: FOR A=1 TO 4: PRINT @ P, ME$(M,A);: P=P+64: NEXT:
    P=413: FOR A=5 TO 11: PRINT @ P. ME$(M,A);: P=P+64: NEXT:
```

Listing continues

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Listing continued

```
    RETURN
460 '
     SELECT MENU ITEM
    '
470 CC=1: CC$=CW$: PRINT @ 412,;:
480 PRINT CC$;: FOR A=1 TO 25: IF PEEK(14400)=0 THEN A=30
490 NEXT: POKE 16444,0
500 I$=INKEY$: IF I$="" THEN 500ELSE I=ASC(I$):
    IF I=91 AND CC>1 THEN CC=CC-1: CC$=CU$ ELSE
    IF I=10 AND CC<7 THEN CC=CC+1: CC$=CD$ ELSE
    IF I=13 THEN RETURN ELSE 500
510 GOTO 480
520 '
     PLOT BAR CHART BY MONTH
    '
530 A=1: FOR X=14 TO 127 STEP 10:
    Y2=42-D(A)*SF: IF Y2<4 THEN Y2=4 ELSE IF Y2>43 THEN Y2=43
540 FOR Y=42 TO Y2 STEP -1: SET(X,Y): NEXT: A=A+1:
    NEXT: RETURN
550 '
     PLOT LINE CHART BY MONTH
    '
560 A=1: X1=14: Y1=D(A)*SF+4: FOR X2=14 TO 127 STEP 10:
    Y2=D(A)*SF+4: GOSUB 580: A=A+1:
    NEXT: RETURN
570 '
     PLOT LINE
    '
580 DX=X2-X1: DY=Y2-Y1: X=ABS(DX): Y=ABS(DY):
    IF Y>X THEN 610ELSE
    IF X=0 THEN 630
590 S=SGN(DX): S1=DY/X: Y1=Y1-.5:
    FOR X=X1 TO X2 STEP S:
    IF X>10 AND X<127 AND Y1>3 AND Y1<44 THEN SET(X,47-Y1)
600 Y1=Y1+S1: NEXT: GOTO 630
610 S=SGN(DY): S1=DX/Y: X1=X1+.5:
    FOR Y=Y1 TO Y2 STEP S:
    IF X1>10 AND X1<127 AND Y>3 AND Y<44 THEN SET(X1,47-Y)
620 X1=X1+S1: NEXT
630 X1=X2: Y1=Y2: IF X1>10 AND X1<127 AND Y1>3 AND Y1<44
    THEN SET(X1,47-Y1)
640 RETURN
650 '
      SCALE Y AXIS TO DATA
     '
660 TM=0: FOR A=1 TO 12: TT=D(A): IF TT>TM THEN TM=TT
670 NEXT
680 IF TM<1000 THEN TT=1000 ELSE
    IF TM<2000 THEN TT=2000 ELSE
    IF TM<5000 THEN TT=5000 ELSE
    IF TM<10000 THEN TT=10000 ELSE
    IF TM<20000 THEN TT=20000 ELSE 700
690 GOTO 710
700 IF TM<50000 THEN TT=50000 ELSE
    IF TM<100000 THEN TT=100000 ELSE
    IF TM<200000 THEN TT=200000 ELSE
    TT=500000
710 SF=40/TT: SS=TT/5: RETURN
720 '
      DRAW PLOTTING SCREEN
     '
730 CLS: PRINT @ 0,
"MAIN TITLE";:
     PRINT @ 960,
"     JAN  FEB  MAR  APR  MAY  JUN  JUL  AUG  SEP  OCT  NOV  DEC
";
740 FOR X=12 TO 127: SET(X,3): SET(X,43): NEXT:
    FOR Y=3 TO 43: SET(12,Y): SET(127,Y): NEXT
750 FOR Y=3 TO 43 STEP 8: RESET(12,Y): RESET(127,Y): NEXT
760 FOR A=1 TO 6:
    PRINT @ SC(A), USING "######"; TT;: TT=TT-SS: NEXT
770 RETURN
1000 '
                        RUN DEMO PROGRAM
     ************************************************************
    '
1010 GOSUB 430: M=1: GOSUB 450
1020 GOSUB 470: ON CC GOSUB
     1040, 1050, 1060, 1070, 1080, 1090, 1100
1030 GOTO 1010
1040 RETURN
1050 RETURN
1060 RETURN
1070 RETURN
1080 GOSUB 660: GOSUB 730: GOSUB 530: GOTO 1110
1090 GOSUB 660: GOSUB 730: GOSUB 560: GOTO 1110
1100 GOSUB 660: GOSUB 730: GOSUB 560: GOSUB 530
1110 PRINT @ 57, "CLEAR ?";
1120 I$=INKEY$: IF I$=CHR$(31) THEN RETURN ELSE 1120
1130 I=PEEK(14400): PRINT I: GOTO 1130
```

Continued from p. 327

BR$ is used in subroutine 430, along with the required POKE, to complete the outline.

The text on a menu generally consists of heading and various choices. I defined a two-dimensional array in line 30 that allows three menus of 12 lines each. Extra daylight on the top and bottom increases readability.

The first four lines of the menu are reserved for headings or titles; 62 of the 64 characters per line are available. The code in line 80 helps you enter the right words in the right place. What you see while you program is what you get when the menu is printed.

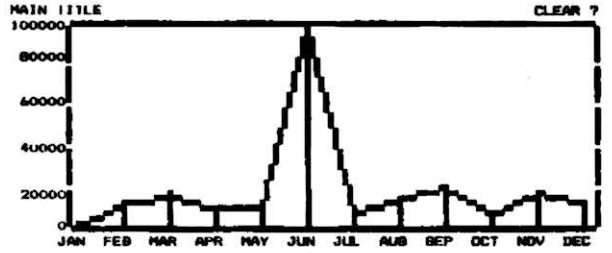

Fig. 5. Bar and line graph from the Program Listing. The actual screen display is narrower.

Line 100 treats the seven choices in a different way. The choices are printed, flush left, in a column near the center of the screen. The array is filled with the choice names, and positioning is left for later. Data statements are read as soon as they are encountered, which makes maintenance easier. The subroutine in line 450 prints the first four elements of the menu array, taking care to avoid the border. The seven choices are then lined up neatly after you specify where the first choice should start.

The pointing cursor is defined by three character strings in line 160. CW$ prints the cursor character and leaves the print position unchanged. CU$ erases the current cursor, and then moves up to write a new one. Likewise, CD$ erases and then moves down and writes.

The subroutine at 470 sets the cursor count, and selects the cursor character and initial cursor position. Line 480 prints the cursor, starts a delay loop and then looks at the RAM byte controlled by the arrow keys. If an arrow key is down, the delay loop continues to its end. If the arrow key is released, the loop ends. The RAM location used by the INKEY$ is zeroed and line 500 starts looking for an up, down or enter key. If an arrow is found and the move is legal, the cursor position and the counter are updated. The cursor stops at the top and bottom of the list. When the enter key is pressed, the subroutine returns with CC, indicating the option selected.

While keyboard polling might seem complex, the test at line 480 lets fast typists kill the loop and hit a key three times to move the cursor three places. Slower typists can wait for the auto repeat. The INKEY$ loop in line 500 is fast enough to catch any keystroke. A PEEK routine is too slow for most typists.

Line 1020 calls the select routine, where CC's contents decide the appropriate program action. The first four choices are dummies, and lines 1040–1070 recall the starting menu. The last three choices are handled in lines 1080–1100 with sequences of simple calls. After a plot is made, lines 1110–1130 form a common routine returning the operator to the starting menu. These last lines could turn into a subroutine

1. Define the total job to be done.

   Print Menu
   Obtain Operator's Choice
   Plot Bar Chart or
   Plot Line Chart or
   Plot Combination Chart
   Wait for command to return to menu

2. Break major functions into conceivable subfunctions.

   Print Menu

   Print Border
   Print Heading
   Print Choices

3. Title and date the program on the first line. Dimension arrays, define variables and load constants using the lower line numbers.
4. Code subroutines to perform the desired subfunction in the general sequence they will be used. Assign medium range line numbers and leave plenty of room between routines. Use dummy data to check all possible limits and build in any required checks. Major subroutines should have one entry and one exit point. Invest a blank line, a description line and a second blank line at the beginning of each routine.
5. Write your application program as a series of subroutine calls with as little special purpose code as possible. Use line numbers well above the subroutines. Use a GOTO to jump over all of the subroutines.
6. Make a list of all variables used in the program.

Fig. 3. Program Sequence

1. Data is stored in a 1-dimension, 12-element array D(12).
2. Data will be plotted by month on the X (horizontal) axis.
3. Plotting area is 116 units wide, from SET locations 12-127.
4. There are 12 markers: one every 10 points on the X axis ranging from SET positions 14–124.
5. Plotting area is 40 units high from SET positions 4–44.
6. Y0 is on the bottom; Y axis is labeled at 6 points.
7. Y axis full-scale and intermediate labels automatically adjust in a 1-2-5 sequence from 1000 FS to 500,000 FS.
8. Y-axis markings are six digits, right-justified. Markings will be printed to the left of the plotting area in positions defined in SC(6) array.
9. Data is automatically scaled to agree with Y-axis scale.
10. Scaled data is clipped as required at plotting area boundaries.

Fig. 4. Subroutine Rules

with any program expansion.

Plotting

Bar and line charts are powerful manager's tools. Trends and cyclical movements of business conditions are easily visualized on graphs, while the same information, in its original format, might not indicate the same situation. Bar charts are fast, but line plots show trends better. Each has its place. Since each presentation has to follow some standard format, I use the rules in Fig. 4 when setting up the subroutines.

Twelve units of data with yearly and weekly results are most appropriate for business applications. Model I and III graphics can't show much more data. The 1-2-5 sequence of Y-axis labels has been the choice of oscilloscope manufacturers and users for years, so it is a reasonable choice for this application.

The subroutine at line 660 handles Y-axis scaling. It scans the data array and makes the variable TM equal to the highest value in the array. TM is then compared against all possible full-scale values. The multiple If...Then...Else statements speed this process dramatically, compared to single statement lines. Line 710 calculates a scale factor (SF) for proper data correction and a scale step (SS) for determining intermediate scale markings.

The subroutine at line 730 draws the plotting screen. It clears the screen, then prints titles on both the top screen line and the X-axis labels on the bottom screen line. The text of the lines is adjusted as required and the formatting allows accurate visualization of the end result. Leave eight characters free at the end of the top line for a prompt and one character free at the end of the bottom line to prevent scrolling.

The code in line 740 shows the slow way to draw an outline. One- or two-character strings similar to the one created in lines 50 and 60 are much faster. Line 750 adds tick marks to the Y-axis and this function could and should be incorporated into a border string. This border never changes, although the markings vary. Line 760 prints full-scale and intermediate markings as specified by variables TT, SS and SC(A).

Plotting bar charts that use the defined format is easy. Line 530 scales each data point and compares the result with the edges of the plotting area. Subtracting the scaled D(A) from 42 corrects the standard TRS-80 Y-axis format that has Y0 at the top of the screen rather than at the bottom. Line 540 plots simple vertical lines without requiring further checks or corrections.

Line charts can get messy when random vectors are involved. Line 560 scales the Y-axis data (but doesn't invert it) and then establishes both X and Y starting and ending points for each vector. The general-purpose line-plotting routine at line 580 then clips and plots each vector. This plotting routine can handle any line and plot any part of the line that passes through the limited plotting area. The Y-axis is corrected for polarity. The limit testing could be simplified since there is no possibility for the X-values to be off-scale, but the full-blown routine can be copied into any application. Simplify it as the application demands.

X1,Y1 is the start of all lines, and X2,Y2 is the end point. Lines of zero length (X2 = X1 and Y2 = Y1) are plotted and all lines are symmetrical within one point. X1 is set to X2 and Y1 is set to Y2 at the end of the routine. Only X2 and Y2 have to be updated to draw continuous vectors. Improve the speed by removing spaces after the routine is running in its original form. The essentially duplicate test lines are faster than using a common subroutine.

Use floating point numbers to end all lines smoothly. Defining all of the key plotting variables in line 30 more than doubles the plotting speed. Using variables for limits rather than constants adds no speed and slows down other routines. This routine is the fastest, noncompiled, nonmachine-language vector generator I have found.

Tackle things one step at a time and it's easy. Now it's your turn (see Fig. 5). ■

John Corbani lives at 2455 Calle Linares, Santa Barbara, CA 93109.

"This routine is the fastest, noncompiled, nonmachine-language vector generator I have found."

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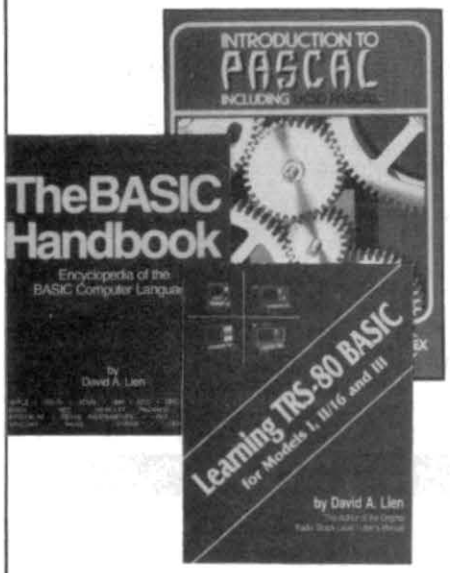

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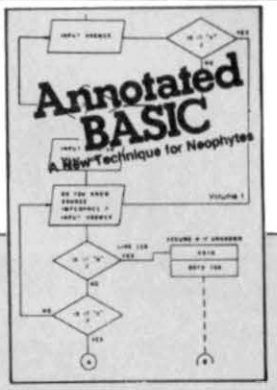

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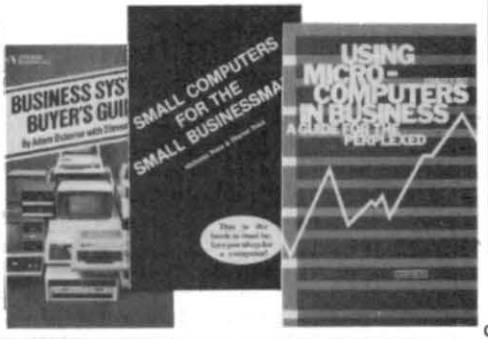

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NEWS THIS MONTH

TANDY TOTABLE

For a Dallas maker of portable Model IIIs, reports of a Tandy carry-computer are more than just rumors.

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TWO MORE IN TANDY FOLD

Makers of Xenix and CP/M-plus are beaming after their DOSes become the latest anointed by Tandy.

PAGE 336

AN APPLE IN EVERY SCHOOL?

Can proponents of the Apple Bill do in 1983 what they failed to do in 1982?

PAGE 340

HARDWARE

Wraps Off Model 12

Somewhere betwixt II and 16 lurks Tandy's latest micro.

Unless one was a careful observer, a single event of microhistoric importance occurred on January 18: Apple Computer Inc. released its flashiest computer to date, the $10,000 Lisa (see box). But another micro was announced that day, with little of the fanfare greeting Lisa's arrival. The other micro was Tandy's Model 12.

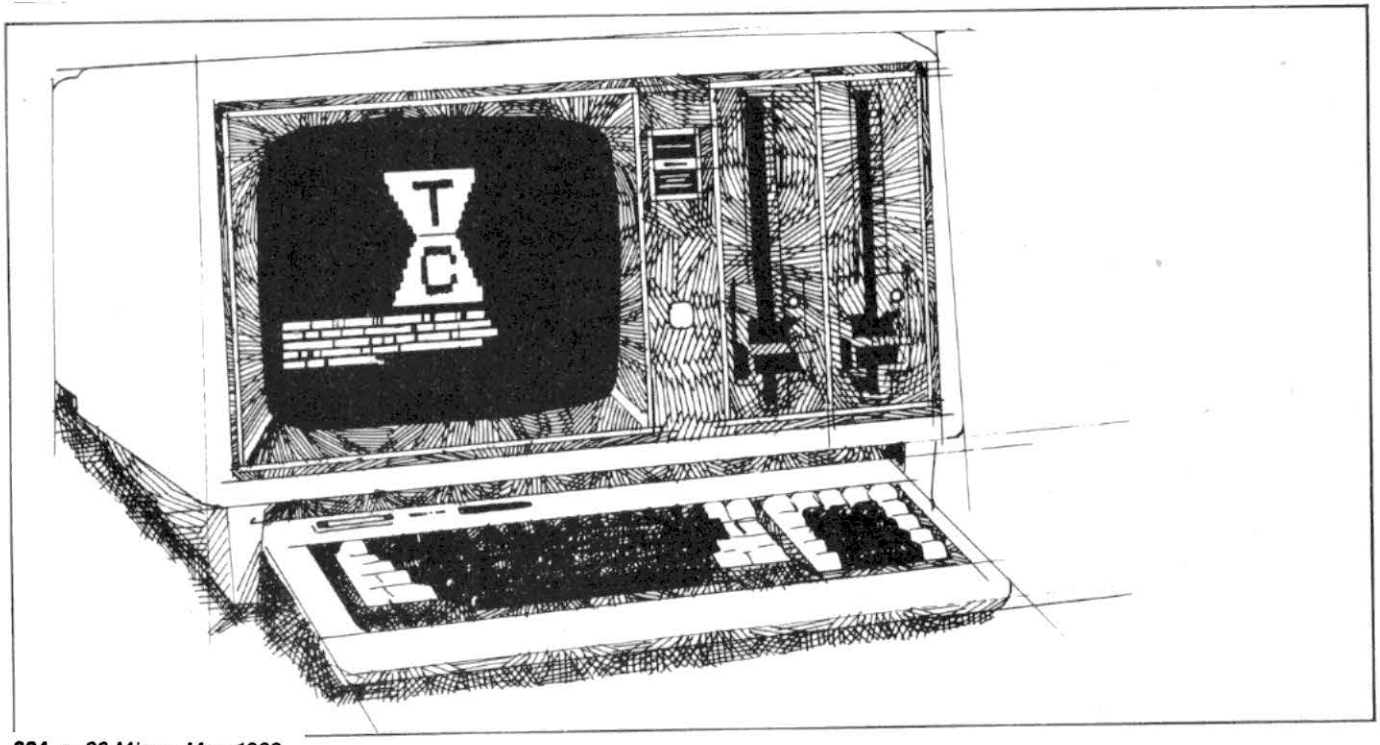
The Model 12 appears to be little more than a Model II with a few bells and whistles added.

It has a Z80A 8-bit microprocessor; 80K of RAM; up to two built-in, slimline, 8-inch disk drives (1.25 megs each); 12-inch green monitor (40 or 80 characters per line x 24 lines); a parallel port, two RS-232C ports, and a disk bay port; and 82-character, detachable keyboard.

An optional feature is a six-slot card cage. Expansion boards can be plugged in the slots. Boards can be bought for VisiCalc memory expansion to 144K and upgrading the 12 to a Model 16 with memory up to 512K.

According to Tandy, the 12 can run all Model II software, including the communications package allowing up to 255 Model IIs to be linked into a network using the Arcnet system.

The 12, priced at $3199 with one drive and $3999 with two, was released in conjunction with a 12-megabyte hard disk. The drive, priced from $2495 to $3495, is compatible with "most" II, 16, and 12 software, Tandy said. ■



Lisa: All the ink flowed its way the day Tandy announced the Model 12.

Apple's new girl knows how to **whistle**

The product of $50 million and 200 man-years of development, Apple Comuter's Lisa is a software-hardware powerhouse aimed at the office environment.

For a tad under $10,000, the Lisa package includes:

- A Motorola MC68000-based microcomputer with 32-bit internal architecture and 16-bit external data-path;
- Three interface ports, two serial and one parallel;
- A 12-inch, black-on-white, high-resolution (364 lines × 720 dots) monitor;
- One megabyte of RAM;
- Two Apple 871 5.25-inch disk drives providing 1.7 megabytes of formatted storage;
- ProFile, Apple's 5-megabyte hard disk; and
- Software for word processing, spreadsheet analysis, graphics, graphic design, data-base management, and project management.

Lisa's screen displays simple pictures of documents, folders, and other familiar things in a typical office. A palm-sized device, called a mouse, is used to point to and manipulate the items. The user controls Lisa intuitively by pointing at and selecting the symbol for file folder, memo pad, wastebasket, or other familiar object.

Once the object is selected, it's used like its real-life counterpart. A file folder can be opened and the contents revealed; documents can be refiled, copied, taken out and changed, put into a new file, or thrown away.

The basic functions in all six of Lisa's integrated software packages operate in the same way.

Transferring information from one application to another is easy with Lisa, Apple said. When writing a cost analysis report, a user can quickly shift from word processing to spreadsheet analysis. He can even "cut out" the spreadsheet and "paste" it into his report.

The software packages included with Lisa include:

- LisaCalc, a spreadsheet program for handling budgets, forecasts, and other row-and-column models;
- LisaWrite, a word-processing program, including a feature allowing users to choose bold, italic, and underlined text via the mouse;
- LisaGraph, a graph display program allowing spreadsheet data to be displayed as bar, line, or mixed graphs;
- LisaDraw, a graphics program allowing users to enhance reports by drawing visuals for them;
- LisaProject, a time-management program permitting a user to keep track of complex deadlines; and
- LisaList, a data-base program.

By allowing Lisa to support the CP/M and Xenix operating systems, and run Basic, Pascal, and Cobol, Apple hopes to encourage independent software vendors to write programs for Lisa. Late this year, Apple will also be providing independents with a Lisa Applications Development Toolkit to help them develop integrated programs for the new machine.

Lisa and a communications package for it, LisaTerminal, are expected to be available this spring. Foreign language versions of Lisa will be introduced worldwide this summer. And networking packages for Lisa will be available late this year.■

HARDWARE

Tandy totable rumored

A report in The Wall St. Journal *draws no comment from Tandy Corporation.*

A report of Tandy's intention to enter the carry-computer market is more than speculation to a company marketing a Model III totable.

Rod Johnson, president of Johnson and Johnson (formerly Adcock and Johnson), told *80 Micro* he expects Tandy to introduce a portable this spring. However, his enterprise isn't fazed by Tandy's predicted move.

"It will be a little brother of what we build," he said of Tandy's totable. "It is not in any way a portable Model III."

"It will have the ability to run some of the programs of [Tandy's] other computers," he said, "but totally compatible? No way."

Johnson's Dallas enterprise has been marketing its micro since last spring. A complete model sells for $2,895; a kit for $795. Tandy's portable is expected to sell for $700.

Word of Tandy's Micro Executive Work Station first appeared in *The Wall Street Journal*'s Technology column by Richard A. Shaffer.

Ed Juge, Tandy's director for computer marketing, told *80 Micro*: "We're not denying the product exists, but we're not commenting on the accuracy of the article."

In Shaffer's column, he described the Tandy tote as a Japanese-made, five-pound computer with full-size keyboard, a screen displaying about a third of a page of text, and built-in programs for word processing and record keeping.

Other built-in programs, Shaffer said, let the micro serve as an appointment book and an automatic telephone dialer and directory.

A spreadsheet ROM pack is also being prepared for the machine, Shaffer wrote.

He noted, "Tandy, which will market the unit in all its 8,500 stores world-wide beginning this spring, is understood to believe that sales of the battery-powered computer could easily exceed $100 million in the first year. That's equivalent to about a sixth of Tandy's computer sales in fiscal 1982."

Tandy, Shaffer added, has ordered 350,000 of the portables from their maker, Kyocera of Japan.

Meanwhile, Johnson and Johnson is phasing out its assembly operations. In three months, it will be selling only kits to convert a Model III to a portable, Rod Johnson said.

However, he explained, purchase agreements may be executed with some large distributors. Those distributors may choose to buy the kits, put them together, and sell assembled machines, he explained.

"Our machine remains the most powerful, most versatile portable on the market," he declared. "You can put it beside anything else and it makes it look like a used sewing machine." ■

SOFTWARE

Welcome Xenix and CP/M!

Tandy extends its blessing and distribution chain to two high-powered operating systems.

Embracing LDOS seems to have whetted Radio Shack's appetite for operating systems made outside Tandy Way. The Fort Worth corporation has announced it will distribute Xenix as a multi-user operating system for its Model 16 and CP/M-plus for its Models II, 12, and 16.

Multi-user Xenix will operate with any Model 16 with 256K of memory and a hard disk.

According to a statement from the makers of Xenix, Microsoft Corporation of Bellevue, WA, the multi-user version of the operating system will be provided free of charge to all Model 16 owners.

All applications software offered by Radio Shack for the Model 16 can be moved to the Xenix system, Tandy said in a statement.

It added it will release several multi-user applications packages for Xenix, including a full line of interactive accounting packages and a high capacity inventory control system.

Radio Shack will also offer a multi-user version of Microsoft's Multiplan—a "second generation" spreadsheet and financial modelling program.

And by mid-year, it will release a single-floppy version of Xenix.

Computer Merchandising Vice President Jon Shirley maintained in a statement the Xenix move would improve the Model 16's standing in the business market.

"The addition of Xenix makes the Model 16 an extremely competitively-priced product for small business applications," he said.

With Xenix, Tandy will offer a development system, including C language for programmers.

Asked if the Xenix move wasn't a bit late, considering Tandy introduced the Model 16 a year ago, Shirley told the computer industry newspaper *Iso World*:

"We don't feel this is too little too late. We've already had good success with the 16. It's done very well. And now we have C, Basic, and Cobol, with a Fortran and Pascal due by mid-year, so it will continue to do well in the small business market."

"We have competition," Shirley said, "but we don't have competition that sells like we do."

Most 68000-based machines are sold directly by manufacturers or individual dealers. Tandy sells its Model 16 primarily through its retail outlets. Tandy's method, according to a recent survey by *Computer Decisions*, may keep it in the top-four firms selling micros to small businesses.

"It's not surprising that Tandy is

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The **INSTANT ASSEMBLER** package includes six separate programs. The assembler itself includes the editor and built-in debugger. The **LINKING LOADER** is included in several versions for different memory sizes. A stand-alone version of the debugger (**MICROMIND**) is also included. **MICROMIND** can be relocated in memory and has commands to single-step, set breakpoints, display or alter registers or memory, find bytes or words, disassemble to screen or printer, convert between hex and decimal numbers, and write SYSTEM tapes. The **INSTANT ASSEMBLER** comes with a comprehensive 65 page instruction manual with many examples.

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INSIDE LEVEL II

The Programmers Guide to the TRS-80 ROMS

INSIDE LEVEL II is a comprehensive reference guide to the Model I and Model III ROMs which allows the machine language or Basic programmer to easily utilize the sophisticated routines they contain. Concisely explains set-ups, calling sequences, and variable passage for number conversion, arithmetic operations, and mathematical functions, as well as keyboard, tape, and video routines. Part II presents an entirely new composite program structure which loads under the SYSTEM command and executes in both Basic and machine code with the speed and efficiency of a compiler. In addition, the 18 chapters include a large body of other information useful to the programmer including tape formats, RAM useage, relocation of Basic programs, USR call expansion, creating SYSTEM tapes of your own programs, interfacing of Basic variables directly with machine code, and special precautions for disk systems. **INSIDE LEVEL II** was reviewed in the April 1982 issue of 80 Micro which said "The book has no flaws; it is a perfect gem." Byte Magazine said "I recommend this book to serious machine language programmers."

Includes updates for Model III. INSIDE LEVEL II $15.95

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STEP80 allows you to step through any machine language program one instruction at a time, and see the address, hexadecimal value, Zilog mnemonic, register contents, and step count for each instruction. The top 14 lines of the video screen are left unaltered so that the "target program" may perform its display functions unobstructed. STEP80 will follow program flow right into the ROMs, and is an invaluable aid in learning how the ROM routines function. Commands include step (trace), disassemble, run in step mode at variable step rate, display or alter memory or CPU registers, jump to memory location, execute a CALL, set breakpoints in RAM or ROM, write SYSTEM tapes, and relocate to any page in RAM. The display may also be routed to your line printer through the device control block so custom print drivers are automatically supported.

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high on the list," a New York consultant told *Computer Decisions*. "Tandy is in competition with stores selling to people who walk out with their machine purchases under their arms."

The consultant added the corner-store approach appealed to small companies, but "you won't get a purchasing agent from a Fortune 1300 company walking into the corner store."

Nevertheless, Microsoft Chairman Bill Gates sees Tandy's embrace of Xenix—an operating system derived from Bell Laboratories' Unix system—as a boon for his firm.

"The large base of Model 16s will more than double the number of Xenix-based systems," Gates said in a statement, "and ensure that many quality multi-user applications will be developed."

Radio Shack's Xenix decision may be an opportune one if one executive's predictions come true. David Callan, president of Callan Data Systems of Westlake, CA, maintained Xenix's big brother, Unix, has a life span reaching far into the future.

Callan: Unix-Xenix systems will keep up with the times.

"One of the reasons that the Unix system is evolving so rapidly as a viable entity in the industry," he said, "is that it is a proven commodity. For the first time in the history of microcomputers, you have a 10-year-old, mature, and reliable operating system which works nicely with the more recently developed 68000 microprocessor."

"In all previous cases," he observed, "you started with an established microprocessor and a primitive operating system which, over a period of time, got better and better. But, by the time the operating systems reached their maturity, the computer's central processing unit, based on the old microprocessor, was obsolete. As far as we're concerned, that can't happen with Unix."

Callan continued: "Unix is written in C language and all the utilities of Unix are written in C. Two years down the road, if and when a new processor comes on line which is superior to the presently used 68000, we simply have to write a new compiler for the operating system, recompile the software that has already been and is actively developed for the 68000, and transport it to the new microprocessor."

"On the other hand," he noted, "if you take a system like the Apple, based on an older microprocessor, the 8086 or 8088, you can't upgrade the CP/M operating system. It's impossible. You're stuck with a lot of limited and, eventually, antiquated equipment."

Tandy, however, will be hedging its bets on the future when it comes to CP/M. A week after revealing its Xenix deal, Radio Shack announced it would also be distributing CP/M-plus for the Models II, 12, and 16.

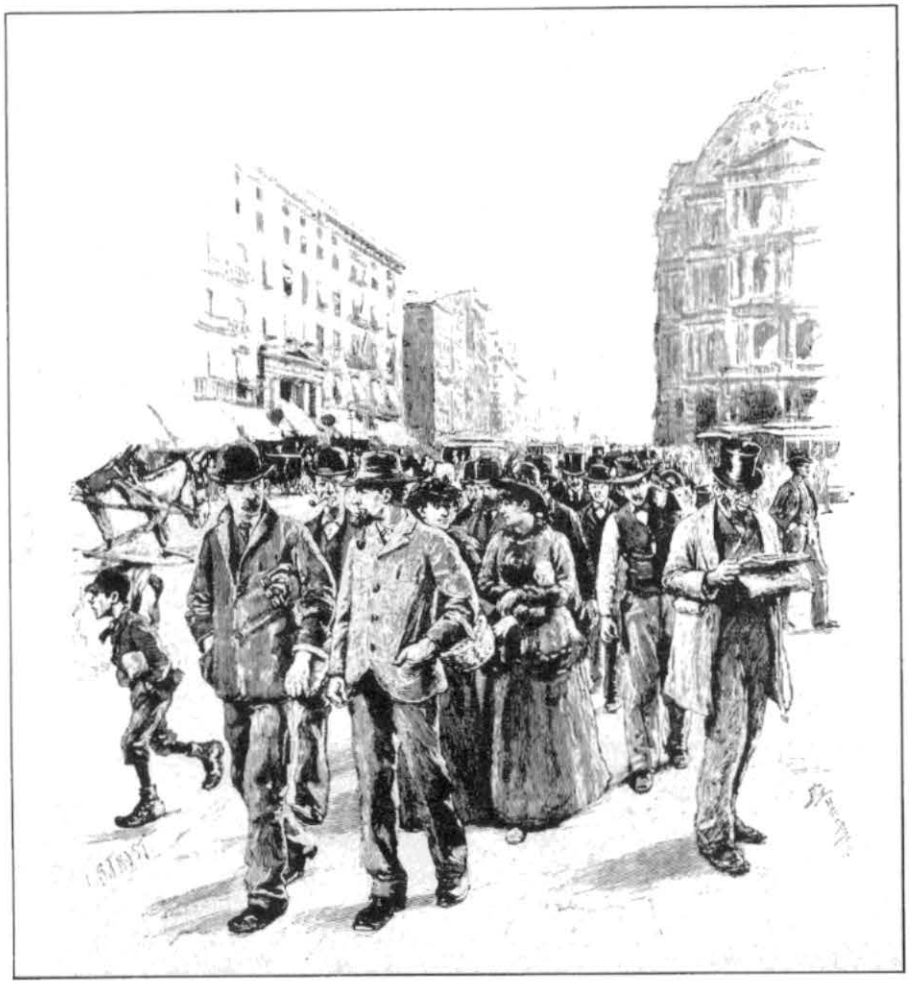
"This agreement is important to us because it unlocks a whole new market for our software products," said John Rowley, chief operating officer of the firm making CP/M, Digital Research. "Radio Shack has made a tremendous contribution to the success of selling microcomputers through retail channels and we are proud to be affiliated with such a leader."

Radio Shack will be selling CP/M for $249.

The operating system is compatible with CP/M 2.2. Version 3.0 supports some 3,000 CP/M programs without modification, according to a statement from Digital Research.

The California firm said CP/M-plus is easy to learn and gives users and software authors a number of features, including a flexible applications program interface and powerful list of utilities. ■

New York Consultant: Tandy sells to people who walk out with their purchases.



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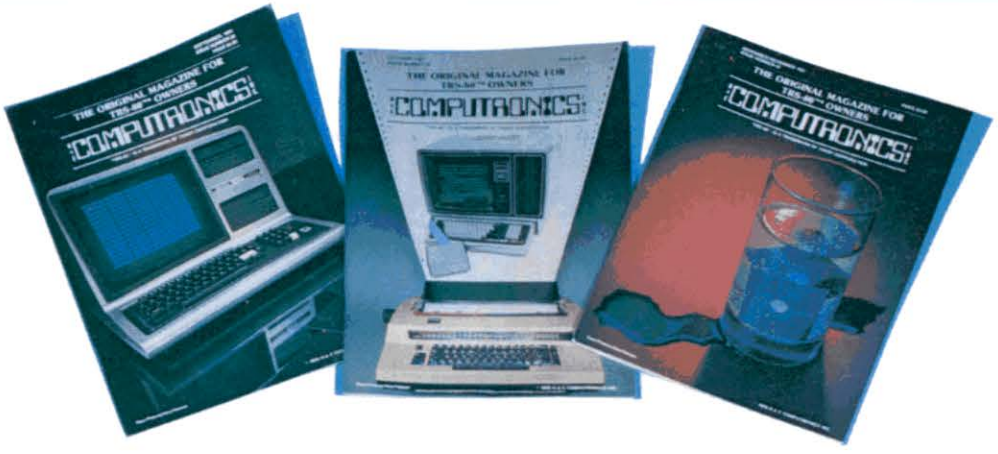

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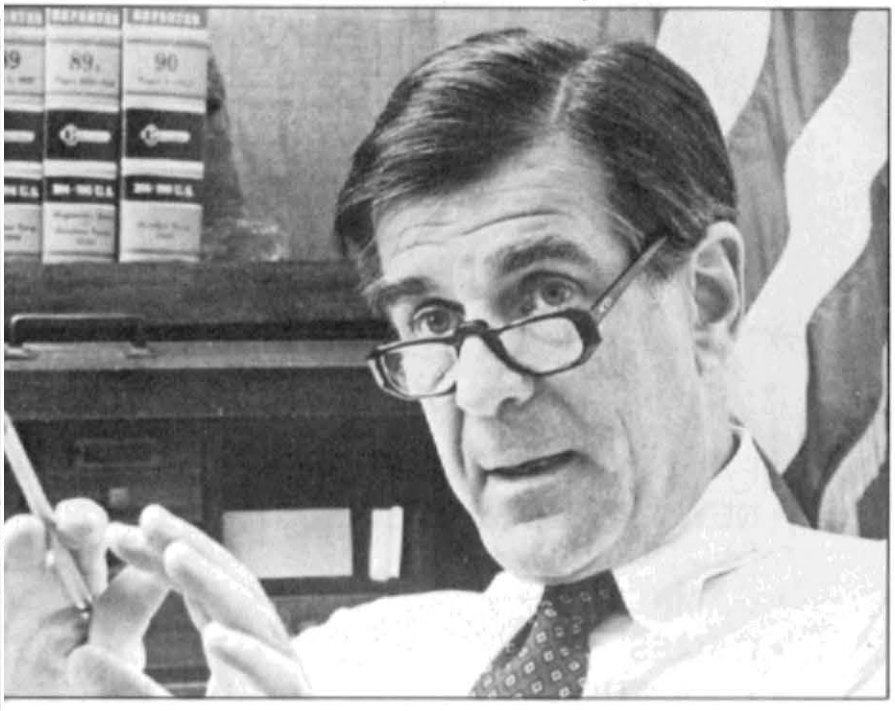
EDUCATION

Apple, apple, everywhere an apple?

In 1982, a bill giving a tax break to computer makers donating hardware to schools died from inertia. Is the same in store for it this year?

BY ALAN ABBEY

SPECIAL TO 80 MICRO



Stark: Benefits outweigh tax losses.

Half of the U.S. Congress liked the taste of the Apple it bit into last year. The House of Representatives voted 323-62 in favor of legislation that would have given Apple Computer Inc., and any other microcomputer maker that wanted to participate, a massive one-year tax break for giving microcomputers to public schools across the country.

The measure, which was dreamed up by Apple chairman Steve Jobs and promoted by California congressman Fortney "Pete" Stark, a Democrat, appears to have an even rosier future in the House this year. The new congressmen elected last November, most of whom are liberal Democrats, have said that they favor spending federal money to improve the technical, math, and science skills of the nation's schoolchildren. They have been nicknamed "Atari Democrats" because of their belief that high-tech education is a key ingredient to leading the economy out of its lengthy slump. The primary reason voiced for the Apple bill is that it would encourage gifts of microcomputers to schools, and that would, in turn, increase the number of people interested and proficient in computer use.

Stark's staff reports an enthusiastic list of cosponsors for the new version of legislation that passed the House last fall. In 1982, the bill had 80 cosponsors. The 1983 measure had 112 of 435 congressmen signed on at last count. Cosponsors add their names to a bill they did not write, but want to go on record as supporting.

The problem this year, as was the case in 1982, will be in the Senate. Both the chairman and the ranking minority member of the powerful Senate Finance Committee, which will review the bill before it goes to the full Senate, have questioned the bill. Without their support, it might never see the light of day.

The bill—now known as the Computer Contribution Act of 1983—has been around for more than a year. It reportedly came to life in early 1982 when Steve Jobs met Pete Stark on a cross-country airplane trip. As they talked, Jobs laid out the scenario: Apple would give each of the nation's 83,000 public elementary and secondary schools one of its Apple II personal computers. Using the full retail price for the machine, related equipment, training manuals, and shipping, that would cost about $2,500 per machine. Multiplied by 83,000, that brings the nationwide total to about $200 million.

Jobs, of course, had something on his mind besides being a good samaritan of historic proportions. The giveaway would provide Apple with an unprecedented amount of visibility and marketing opportunities. Schools probably would want more machines in a year or two, Apple officials admit, and the company hopes they would stick with Apple. In addition, when the time came for a middle-income family to buy a personal computer, kids who had used Apple at school probably could be counted on to tell mom or dad Apple should be the one. Some cynics were heard to whisper Jobs needed to clear out the Apple warehouses to make room for the new Lisa computer debuted last January.

In return for his generosity, Jobs asked for something from Congress: a change in the tax laws so Apple could write off as a deduction the full retail cost of the equipment, and the ability to get that deduction for donations to grade schools. The increased deduction would about double the amount Apple is able to write off under present law.

Stark, whose district includes part of the Silicon Valley, introduced the bill. It made its way through the House, despite analyses that showed the tax break would cost the U.S. Treasury $15 million in 1983 and $21 million in 1984. The legislation would boost the ability of the United States to "compete in the ever more sophisticated world of computers

Scanned by Ira Goldklang - www.trs-80.com

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and high technology," Stark said.

About the only gripe came from Rep. Bill Frenzel, a regular foe of special-interest tax legislation. The bill would give manufacturers an incentive to build more than the market needs, the Minnesota Republican said, "because they can always sell [the surplus] to the government."

On the other side, education lobbying groups, always hungry for more equipment and funding for public schools, pushed for the computers. Their only gripe was the bill had moved along without much involvement on their part.

After passage by the House in late September, the bill went to the Senate, where the same arguments were made in its favor. There, however, it ran into the high-powered opposition of Louisiana Sen. Russell Long, top ranking Democrat on the Finance Committee. "Why should the government provide every school an Apple computer at the expense of the taxpayer?" Long asked.

The bill made it through the Finance Committee, but with considerable modification. The Senate version stretched the tax break to three years, in a move designed to allow other computer makers to get in on the action. The Senate bill also included donations made to libraries and museums that promised to use the computers for educational purposes as deductible at the special rate.

The biggest change cut the additional tax break—Apple's initial incentive—in half. Because it would have added two years, however, the Senate version would have been more costly. Estimates of losses to the Treasury were $14 million this year, $23 million in 1984, $17 million in 1985, and $8 million in 1986. Stark said the revenue losses, regardless of the huge federal deficit, are small compared to the value of improving the computer literacy of the next generation.

The committee pushed the bill out in three days, but the Senate adjourned for the November election campaign without acting on it. When they returned for the lame-duck session, senators were preoccupied with raising the gasoline tax and their salaries. The bill died.

Stark was quick to reintroduce the bill in January. It went back into the legislative hopper on January 6, three days after the new Congress was sworn in. But it did not move quickly. The committees receiving it were busy raising Social Security taxes. The rest of Congress was involved with shredding and rewriting President Reagan's proposed 1984 budget.

Steinhilber: Fulfills narrow need for hardware, but ignores training teachers.

School groups continued to back the bill, but with a difference. This year they saw the opportunity to make a coordinated push for several pieces of legislation designed to improve the math and science skills of the nation's youth. A lobbyist for the National School Boards Association said the Apple bill has some small value by itself. "It would fulfill the narrow need for a bit of hardware," said August Steinhilber, the association's government relations director. "But it doesn't help with training or retraining teachers."

He would rather see it passed as part of a larger package of measures. They include billion-dollar bills to provide funding for training teachers, for buying software, and for upgrading curriculums.

The bill also continued to face the opposition of Sens. Long and Robert Dole of Kansas. Dole, a Republican, is chairman of the Finance Committee. Therefore, he has carte blanche to hold on to a bill for as long as he wants or take it out of circulation.

The bill cannot be declared officially dead until the 98th Congress adjourns just before the 1984 elections. But its time may have passed. The nation's teachers may have to settle for an edible apple on their desks until they can convince the people who run their schools to buy an electronic one. ■

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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	BONDVAL	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	BONDVAL2	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 queueing (waiting line) model
49	CVP	Cost-volume-profit analysis
50	CONDPROF	Conditional profit tables
51	OPTLOSS	Opportunity loss tables
52	FQUOQ	Fixed quantity economic order quantity model
53	FQEOWSH	As above but with shortages permitted
54	FQEOQPB	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	CAP1	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
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66	PRINDPA	Paasche price index
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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
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93	INSFILE	Insurance policy file
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COMMUNICATIONS

War Games

The computers in this movie about near apocalypse are more than just show.

BY ERIC GREVSTAD
80 MICRO STAFF

More and more of today's movie audience is composed of teenagers, and more and more teenagers are becoming computer experts. Combine the kid-computer boom with the 1980s' hottest issue, the nuclear peace movement, and you've got a surefire hit—or at least you've got *War Games*, an MGM-United Artists thriller due this summer.

The film, directed by John Badham (*Saturday Night Fever* and *Blue Thunder*), features a plot that's a mixture of CompuServe and Dr. Strangelove: David, a high-school hacker, decides to tap into a software company's computer to steal its latest games. Using an auto-dial modem and a program that calls numbers for him, he compiles a list of network numbers and starts hunting.

After logging onto a bank and the Department of Motor Vehicles, David reaches a mysterious, uncommunicative outlet. A shot in the dark—typing "List games"—pays off: he gets a screenful of neat, military-sounding game titles. After some more research and fiddling, he finds a password; a game called Falcon's Maze is up and running.

However, the computer involved isn't in a Silicon Valley game room. It's at the North American Air Defense Command headquarters in Colorado, and Falcon's Maze is lighting up NORAD's screens with a simulated attack by the Soviet Union.

Understandably, there's panic at the Pentagon, and the United States almost returns fire before the NORAD experts (led by Dabney Coleman, of *Nine to Five* and *Tootsie*) realize it's not the real thing. The crisis averted, they turn to hunting and interrogating David—but meanwhile, though the first round's over, the computer's still playing the game and tries another strategy, locking out human intervention and beginning a search for the random numbers to launch a first strike against Moscow.

While the screenplay requires David to think of a last-minute patch to prevent World War III, the real making of *War Games* had challenges enough. Computer effects coordinator Steve Grumette, a UCLA engineer turned filmmaker (and owner of one of the first Altairs after its *Popular Electronics* cover in 1975), had to tend 132 video monitors—six from each of 20 display boards run by two CompuPro micros under CP/M, plus a dozen 15-by-10-foot rear-projection screens, filling the command room at the set for NORAD headquarters.

"The technical problem was to synchronize the movie camera, which shoots 24 frames per second, with the computer video, which displays 30," Grumette explained. The answer involved changing the boards' display rate to 24 fps, then connecting them to the camera motor so that the vertical interval was timed to coincide with the shutter closing.

Unlike previous films in which computers have appeared, *War Games*' were working on the set and responding to cues, just like other actors. "This is the first time a display coming from a computer in real time's been used as part of a movie, the first time computers have been used on the set to generate a live image," said Grumette.

Previously, he continued, filmmakers had played video tape of an operating program, or even prepared artwork that was supposed to be a video display. Grumette's job was to supervise a more realistic approach: "They wanted *War Games* to be interactive, to have an actor hit a key and an image appear."

This kept him on the set throughout last fall's shooting: "I had things programmed to cycle automatically, with each of the four keyboard lines (on each

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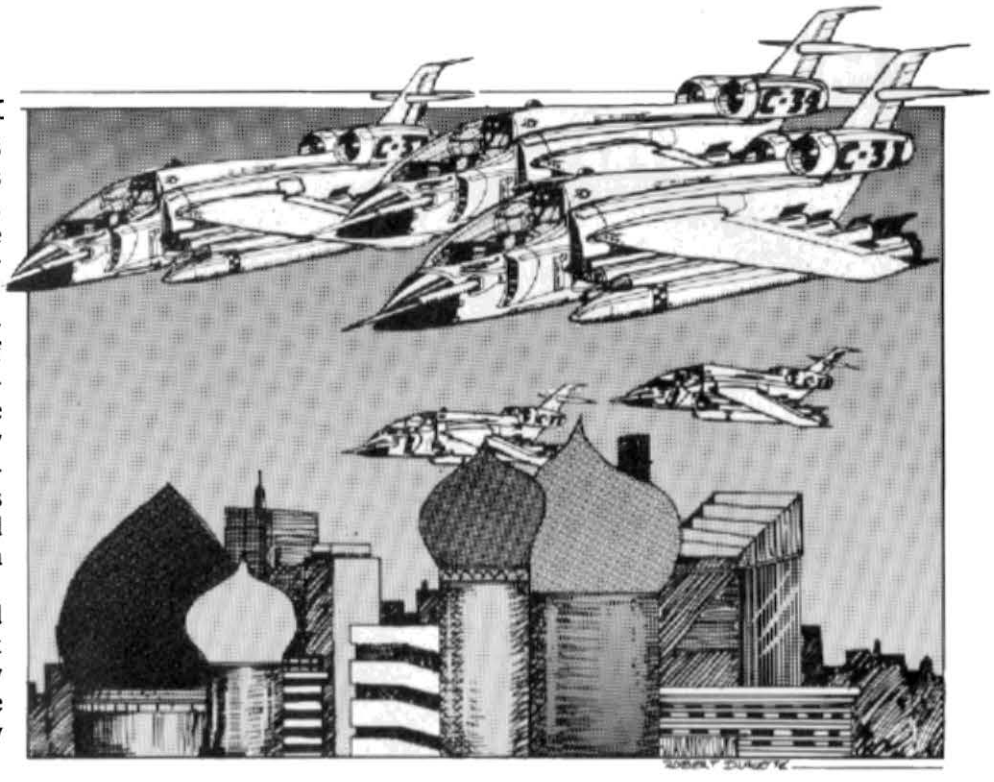
CompuPro) scanning for characters sent in from any of 15 keyboards, unless the producers wanted a special effect. Occasionally there'd be a closeup scene where they had to have some particular data interacting with an actor."

While the visual results are spectacular, especially in the climactic scenes of the NORAD displays showing a top-speed, simulated Armageddon, the high-tech environment apparently didn't inspire the cast. For his programming scenes as David (his computer is an Imsai with one nameplate covered up), actor Matthew Broderick took a typing course on a borrowed Atari.

The scenes looked credible, recalled Grumette, but Broderick still couldn't type: "We rigged a program where any key could be pressed and the correct line would appear, so he could pound away like a monkey and it looked right." ■



PULSE TRAIN

Roach: Tandy's telecommunications moves are not a hedge against losses in microcomputer marketplace.

Tandy's not trading micros for telephones

Are Tandy's recent moves into telecommunications motivated by its slipping share of the microcomputer market? No, according to Tandy head honcho John Roach.

"That's the wrong conclusion," said Roach, in an interview published in *Electronic Business*.

"There's plenty of competition in the microcomputer business, but Tandy believes it should have the broadest possible line of electronics and communications equipment—at least in those areas where it matches our distribution expertise.

"Communications presents a new opportunity. Tandy has a long history of growth. It feels that some of its future growth will come from this segment."

Asked by the business magazine if increased investments of institutional money into the Fort Worth firm indicated high expectations Tandy would do well in 1983, Roach observed:

"I would hope that the institutional market is smart money. I don't really know why we were as active with institutions as we have been. It is a reasonable indication of the confidence of the financial world.... It's not necessarily a short-term indicator—though I'm not saying anything negative about the [last quarter of 1982]. It means a level of confidence in the medium to long term that

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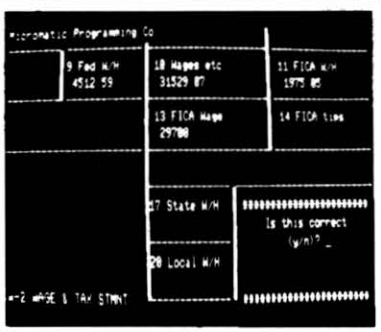

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*** EACH UTILITY PROGRAM IS CALLED UP FROM **BASIC** USING THE SIMPLE BASIC COMMANDS PROVIDED
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- ALLOWS INSTANT ACCESS TO ANY RECORD ON YOUR DISKETTE
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- RECORDS MAY BE INSERTED OR RETRIEVED BY SUPPLYING THE KEY
- RECORDS MAY BE RETRIEVED SEQUENTIALLY IN SORTED ORDER
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- SORT COMMANDS CAN BE SAVED FOR REUSE
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MODEL-I VERSION $20.00
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DISCAT (DISKETTE CATALOG SYSTEM)

- THIS COMPREHENSIVE DISKETTE CATALOGUING/INDEXING UTILITY ALLOWS THE USER TO KEEP TRACK OF THOUSANDS OF PROGRAMS IN A CATEGORIZED LIBRARY. FILE INCLUDES PROGRAM NAMES AND EXTENSIONS, PROGRAM LENGTH, DISKETTE NUMBERS AND FREE SPACE ON EACH DISKETTE. KEEP A COMPLETE CATALOG OF THE DIRECTORIES ON ALL YOUR DISKETTES IN ALPHABETICAL ORDER (SORTED ON EACH DISKETTE) OR COMPLETE ALPHABETICAL LIST OF PROGRAMS ON ALL YOUR DISKETTES)

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- LINK FROM **BASIC** PROGRAM TO ANOTHER SAVING ALL VARIABLES
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- THE ULTIMATE RENUMBERING PROGRAM. RENUMBERS ALL OR PART OF A PROGRAM (ALLOWS PARTIAL RENUMBERING IN MIDDLE OF PROGRAMS)
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COPSYS

- COPY AND VERIFY ALL MACHINE LANGUAGE (SYSTEM) TAPES WRITTEN IN STANDARD FORMAT. IF YOU BUY A MACHINE LANGUAGE PROGRAM, **COPSYS** ALLOWS YOU TO EASILY COPY THE PROGRAM ONTO ANOTHER CASSETTE AS A BACKUP

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IN BUSINESS TIME IS MONEY, AND ONE BACKUP IS WORTH A THOUSAND TEARS.

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- ESSENTIAL FOR EVERY MOD-II OWNER
- RECOVER AND REPAIR FILES AND DIRECTORIES (BY JUST ENTERING A SINGLE COMMAND)
- XCOPY. SIMILAR TO COPY BUT CAN COPY ANY NUMBER OF FILES AT ONE TIME FASTER AND MORE ACCURATE THAN COPY SINCE RECORDS ARE COPIED IN GROUPS RATHER THAN ONE RECORDS AT A TIME. USING XCOPY YOU CAN COPY FILES THAT CAN NOT BE COPIED USING THE COPY COMMAND
- SZAP. PROVIDES THE CAPABILITY TO READ AND MODIFY ANY SECTOR ON A DISKETTE
- XHIT. CAN BE USED TO REPAIR A DISKETTE DIRECTORY
- DCS. DIRECTOR CATALOG SYSTEM IS A UTILITY FOR THE MANAGEMENT OF USER DISKETTES. SETS OF A MULTIPLE DISKETTE DIRECTORY FILE (WITH UP TO 1200 INDIVIDUAL FILE NAMES). ALLOWS SELECTIVELY LISTED OR PRINTED LISTS OF DIRECTORY FILES IN COMBINED SORTED ORDER (FOR EXAMPLE, LISTED ALPHABETICALLY BY DISKETTE, OR A COMPOSITE ALPHABETICAL LIST OF ALL YOUR DISKETTES!)
- DEBUG-II. ADDS SEVERAL FEATURES TO THE PRESENT TRSDOS DEBUG UTILITY INCLUDING SINGLE INSTRUCTION CYCLE, AUTO (LOOP) BREAKPOINTS, SUBROUTINE CALLING, BREAK-KEY DETECTION AND MANY OTHERS

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MODEL-II DEVELOPMENT SYSTEM

- THIS PACKAGE IS A MUST FOR ASSEMBLY LANGUAGE PROGRAMMERS
- INCLUDES THE **MICROSOFT EDITOR ASSEMBLER PLUS** WITH ENHANCEMENTS FOR THE MODEL-II
- A COMPLETE DISASSEMBLER
- SUPERZAP FOR READING AND MODIFY ANY SELECTOR ON A DISKETTE

MODEL-II ONLY $125.00

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- LIST OR PRINT A SORTED CROSS REFERENCE TO ALL NUMBERS OR VARIABLES WITHIN A PROGRAM
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See List of Advertisers on Page 371

our strategy makes some sense."

When does Roach expect an upturn in the economy?

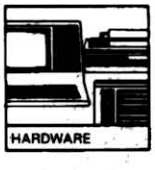
"That's getting to be an everyday question," he said. "We plan to succeed this Christmas season [1982] with or without the economy. While we have had good success, I can't attribute much of it to the economy—yet."

"We have plenty of inventory; we always do," he added. "We believe you can't sell out of an empty wagon.

"In periods of economic uncertainty, we want to be well inventoried and well advertised so we can take maximum advantage of that environment, letting those who are hesitant to stock inventory or to advertise lose [their] market share and not us. We take an aggressive approach to marketing in bad times."

Access: Everything in one package.

The "one-decision" portable



Atari-Commodore-Texas Instruments have tube-whipped you into be-lieving you've got to have one. You're ready for the plunge, but not the bath waiting for you at your friendly neighborhood computer store.

Sixty-four K for $595? Right this way. Let's see. If you're going to do anything with your computer you're going to need disk drives. That's another $500. And software. You can't do anything without software, now, can you? Four-hundred dollars should get you started. How about a printer? That's another $450. Then there's...

That's the scenario one California computer manufacturer believes confronts the potential buyer of a computer. And it's one it hopes will create a market for the 65,000 Access portable micros it will be producing this year.

What sets off Access from other portables? It has a built-in printer (basically an Epson MX-80) and a modem with acoustic coupler and modular-jack connections.

It also weighs 33 pounds (compared to other portables, most weighing less than 27 pounds).

Although admitting the machine was heavy (with its optional battery pack, it weighs in at 36 pounds), Marketing Vice President Harry L. White, at a news conference held in Boston, maintained the advantages of the machine outweighed that disadvantage.

He called the Z80A-based Access a "one decision machine." A novice computerist doesn't have to buy a gaggle of add-ons to get started. Everything—including software—is included in the machine's $2,495 price tag.

The 64K-RAM Access comes with the Perfect Software Inc. bundle: a word-processing program (Perfect Writer), spelling checker with 50,000 word dictionary (Perfect Speller), spreadsheet and financial modeller (Perfect Calc), and a high performance data-management system (Perfect File).

Also in the software package are Fancy Font, allowing a user to print letters in styles like Old English; CP/M 2.2; M-Basic by Microsoft; C-Basic by Digital Research; communications support; and several systems utilities.

Other features include two 5.25-inch slim line disk drives, two RS-232C ports, interface for an 8-inch disk drive, and video output jack for a full-sized monitor. (The 7-inch, amber, 80-column screen built into the machine can try the eyes after a while.)

White said his San Jose, CA, firm takes pains to assure the reliability of its totable.

Access Matrix Corporation "burns-in" its micro for 48 hours before shipping, he said, 24 hours more than most manufacturers burn-in their machines.

Scanned by Ira Goldklang - www.trs-80.com

PULSE TRAIN

Every retailer carrying an Access will be required to offer service, he noted. The machine is easily serviceable, he observed, and can be completely dismantled in 10 minutes.

Asked what the selling price of the Access might be after "discounting," White optimistically replied, "There will be no discounting." He added the firm's dealer contracts contained protective clauses to discourage discounting and selling to mail order houses.

A $2-million advertising campaign is planned for the Access this year, he noted.

He added his firm expected to make 500 Accesses during February, 2,000 in March, and 4,000 a month by April.

CBS-AMBELL test ends

The Ridgewood, NJ, videotext experiment by CBS and American Bell ended last month with encouraging initial findings.

The corporations began the test last September piping a variety of videotext services into 100 homes (*80 Micro*, April 1982, p. 362). Another 100 homes participated in phase two of the experiment started early this year.

In a statement issued by both companies, initial findings from the experiment show:

- Household usage was above expectations;
- All aspects of the service were used by consumers;
- Usage stabilized early in the test and settled into a pattern that remained high; and
- The high level of response indicates videotext could potentially attract substantial revenues from three sources—consumer subscriptions, advertising revenues, and transaction fees.

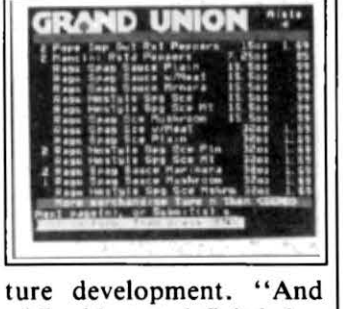
Phase one of the test offered users continuously updated news and information, sports and weather from more than 60 sources, advertising created for more than 100 advertisers by 16 major agencies, home shopping services for more than 30 retailers and direct marketers, an electronic message system, and a personal retrieval package allowing a user to tailor information retrieval to his or her needs.

New services offered under phase two included home banking services, television listings, a shopper's guide, personalized stock portfolio, and an electronic date book.

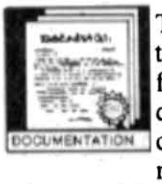
American Bell is testing two types of terminals in the experiment: a one piece set with color CRT and keyboard and another unit that hooks up to a person's TV.

In their final evaluation of the test, the corporations will be eyeing which videotext services are used the most, what kind of advertising is most effective, what products people will buy from the service, what people will pay for videotext, and the cost of creating a widespread videotext service.

"There are unanswered questions about videotext product design, market timing, and revenue flow," observed Harry Smith, CBS vice president for new venture development. "And while videotext definitely has long-range potential, we are learning that it will require extensive technical expertise as well as considerable resources and experience in packaging and distributing programming and advertising in order to develop and broadly market this product in the competitive home information marketplace."



Typesetting by phone takes off



Teletypesetting, the professional production of copy sent via modem from writers with micros and word-processing programs (see *80 Micro*, January 1983, p. 374), is turning into a booming business.

Intergraphics Inc. of Alexandria, VA, which has offered its Personal Publishing service since 1975, gives authors a choice of 190 type styles. As with other teletypesetting services, customers embed font, column width, and similar instruction codes in their ASCII text files before transmitting them, and receive finished copy by mail, United Parcel Service, or overnight carrier.

According to Intergraphics' Annette Graham, the

PULSE TRAIN

firm can accept files sent at 300, 1,200, or 2,400 baud, either to a 24-hour toll-free number or to The Source for later collection. Charges, less shipping, are $2 per 1,000 characters, and orders have ranged from the $5 minimum to a million-character book.

Another firm, Chiles and Chiles Inc. of Richardson, TX, offers a similar choice of baud rates and delivery methods, but boasts 350 styles in 136 sizes (from 4½-to 72-point type, in ½-point increments).

Production manager Bruce Perry quoted an average price of $4 per 1,000 characters, with an $18.50 minimum; for larger fees, Chiles and Chiles will insert typesetting codes and arrange formats for clients, as well as provide layout and paste-up services.

Who uses teletypesetting? Most of Chiles and Chiles' business comes from large corporations preparing such things as annual reports, but Perry said recent ads in microcomputer magazines have brought encouraging response: "We'd never done it before, and we wanted to see whether the micros were interested in it. Our ad drew 12 responses the first week, which indicates that they are."

By comparison, said Graham, most Intergraphics customers produce newsletters or other small publishing jobs, and a large number are software authors in need of documentation. The company has two fonts that produce the ASCII character set; a popular one, rather paradoxically, produces typeset copy that resembles dot-matrix printing.

—ERIC GREVSTAD

"Custer's Revenge" dies with its boots off

"Custer's Revenge" has gone the way of its namesake.

Its manufacturer, American Multiple Industries of Northridge, CA, has stopped producing the adult-oriented video game.

Stuart Kesten, president of American Multiple, told *80 Micro* his firm terminated the game primarily because "it was creating a negative situation around the country."

The game was condemned by American Indian and women's groups, and government bodies in Oklahoma City and Los Angeles (*80 Micro*, February 1983, p. 354).

Detractors of the game claimed it depicted the rape of an Indian woman by General George Armstrong Custer. Kesten denies those claims. "The game was misconstrued," he said. "There was no rape scene in the game."

Two other adult games produced by the firm—"Bachelor Party" and "Beat'em and Eat'em"—were also terminated by American Multiple, Kesten noted. He added American Multiple sold 100,000 copies of each game before halting their production January 1.

American Multiple made the three games for Atari game systems, a fact that prompted the Warner Communications company to sue Kesten's firm. However, in light of American Multiple sacking the games, that lawsuit, filed in federal district court in Los Angeles, will probably be dropped.

Kesten denied statements appearing in the January 24 edition of *Iso World* that American Multiple had been acquired by another firm.

He said his enterprise would continue producing video games but only ones aimed at family entertainment. American Multiple's new games, he noted, would be shipped before the June consumer electronics show in Chicago.

But Custer's death hasn't deterred other smutware purveyors. Rory O'Connor, in his Speaking Softly column in *Iso World*, made this observation about off-color video games:

"The bad news is that for every one that dies, 10 take its place. At the CES [Consumer Electronics Show in Las Vegas], the area devoted strictly to 'adult' movies and video tapes also displayed several games with goals similar to 'Custer's Revenge.' Next year they may have to double the size of that area just to accommodate this garbage."

photo by Robert Fisher

The "adult" section at the Consumer Electronics Show: "Next year they may have to double the size of that area just to accommodate this garbage."

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PULSE TRAIN

Golden Fleece

The Social Security Administration's new computer center has received the dubious honor of winning Sen. William Proxmire's "Golden Fleece" award.

The Wisconsin Democrat bestows the awards on government agencies that do a distinctive job of wasting taxpayers' money.

The administration's new computer center was supposed to cure some of its woes connected with its old system (*80 Micro*), October 1982, p. 389). But Proxmire claimed the change from old to new was fraught with mismanagement.

In 1979, he explained, the administration assembled a top-level, in-house management team to make the change from the old to the new system. The team members—earning an average salary of $41,000—were supposed to do their work without outside help. That was not to be.

In 1980, the administration hired outside help to do what the in-house team had been assigned to do.

The whole business was an overt duplication and needless waste of taxpayers' dollars, a Proxmire aide told *Computerworld*. Either the $6.7 million consultant fee or the $1.5 million for in-house salaries was unnecessary. ■

Old editors never die . . .

END BYTES

Old *80* editors never die; they start new magazines. Former *80 Micro* managing editor **MIKE COMENDUL** is starting *Hi Res*, a magazine for Atari users and looking for writers. He can be reached at Longwood Business Building, Suite B, 755 West Sanlando Drive, Longwood, PA 32750. ■ Old *80* columnists never die, either; they write books. **DAVID BUSCH**, chronicler of a company called KTI, has landed a contract with Prentice Hall for a book on Kitchen Table Inc. Dave says the book will contain some reprints of his KTI columns and new material, including an Eliza program that insults the user and a random program-generator. The book is slated for release during the summer. ■ Speaking of books, **S-A DESIGN PUBLISHING CO.** is looking for experienced and novice writers to produce microcomputer-oriented book manuscripts. Proposals should be sent to Larry Schreib, S-A Publishing Co., 515 W. Lambe, Bldg. E., Brea, CA 92621. ■ And speaking of new magazines, DEC users and architects will be targeted by two publications. A group in Boston plans to start **i/o** for Digital Equipment Corporation personal computers. "If you know *PC* magazine, then you know our approach," the publishers say. The first issue is expected in late June. **McGRAW-HILL** has scheduled for release this month a special annual issue of *Architectural Record* called **THE COMPUTER . . . FOR ARCHITECTS AND ENGINEERS.** The annual will go to 12,000 [Architectural firms identified as million-dollar-plus companies.] ■ Speculation about the TRS-80 **MODEL IV** abounds. One computer manufacturer in Fort Worth says the IVs were rolling off the Tandy assembly lines in January. "I wouldn't buy one of the first 4,000 or so," he says. "There are 30 jumps on the main board. That's a lot of cutting and patching." Other messages on the drum . . . the IV will have 64K; dual 6809-Z80 microprocessors; 24 × 80 green screen; hi-res graphics, including support of color graphics; and two 5.25 thinline, 40-track, double-density, double-sided disk drives. "Any way you slice it," declares one CompuServe doomster, "the Model III is history." ■ Now for **COCO RUMORS** . . . The grapevine says Tandy is preparing a stripped-down Color Computer that will sell for $100. It also says the firm is planning a Color Computer interface. ■ Tandy may be going in the wrong direction with its **WHITE COMPUTERS**. The latest fad among CoCo owners is to strip the paint off the micros, leaving their color machines a shiny black. Very chic! ■ Many a chipster has maligned Tandy software, but the firm's data-base manager **PROFILE** seems to be a winner. Since 1979, Tandy has grossed $10 million from the product. ■ For years, **SCHOLASTIC MAGAZINE** and its publisher, Scholastic Inc., have turned out wholesome products for school children. Now it's turned to video games, including one called **NERD ALERT**. The protagonist, Jocko—"one of the boys"—must keep the nerds—oblong-headed, thick-glassed types—from taking over Nerd High by intercepting their football filled with nerd gas. Does the game encourage kids to bait their "four-eyed," academically-oriented peers? Definitely not! says Scholastic. One reporter observing the children playing the game wrote, "The children seen playing Nerd Alert didn't appear to notice the discrimination." This observer would add: Apparently Scholastic didn't see it either. ■

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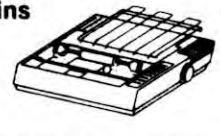

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The GAMER'S CAFE

by Rodney Gambicus

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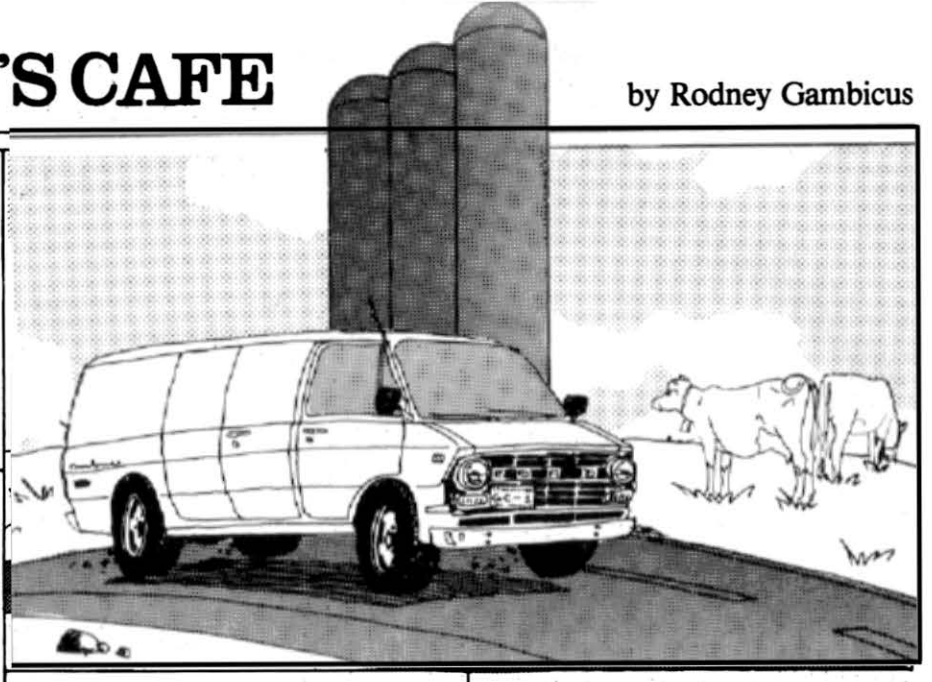

The gypsy life gets on your nerves. Sometimes the atmosphere in the van is all adventure and camaraderie; sometimes, such as when heading south on U.S. 218 toward Iowa City, it's Mad Max playing his Ramones tapes at disk-crashing volume and Mercedes Silver, uncharacteristically for her, acting like a 10-year-old:

"How much longer, Rodney? I cannot stand one more minute with this noise!"

"Pipe down, Merce," Max mellowed. "Stick with me and we'll make it to Broadway."

"We've already been on Broadway," she snapped. "The main street of Wells, MN, population 2,800. It wasn't big enough for Buzz's truck."

True; he'd dropped us off and we'd had to put the Cafe in the shade of a grain elevator and pass the hat for gas money.

"I could be helping Dad at the Radio Shack in Baltimore," Mercedes was snarling. "I could be back at school, and instead I'm stuck in this van with a games freak and a Boswell."

I had to fire up a couple of Model IIIs to get them to stop bickering at each other. When we reached town and found a good space on Clinton Street, Max was lost in the high six figures on Bounceoids and Mercedes was writing one of her binary-code programs, staring at the CRT and tapping zeros and 1's on the keypad. I wish she wouldn't move her lips when she programs.

There were a lot of people around—Clinton Street borders the University of Iowa and we were in front of a bar—but Max and I couldn't get many customers when we put up the awning and set the computers out on the sidewalk.

"There's an Aladdin's Castle arcade in the mall down the block," Max reported. "Looks like we can't compete."

"You know how to attract people in this town?" Mercedes grumbled. She raised her voice to a roar. "How 'bout them Hawkeyes?"

At that, the Cafe was mobbed with back-slapping Iowans, spilling their beer and eager to join in games. The University's football team, Mercedes explained, won the Peach Bowl and the basketballers were nationally ranked. As I later heard her coaching a customer, "Now, concentrate. Imagine the flagships are Hoosiers or Illini."

The Big Board

Alien Defense	91,320	Carl Pflanzer, Gillette, NJ
Armored Patrol	81,000*	Winthrop
Attack Force	153,470	Mark Brinkman, Emporia, KS
Bable Terror	5,734	Mad Max
Bounceoids	2,028,450	Scott McClure, Winter Park, FL
Caterpillar	95,644	Matthew Holmes, Nelson, N.Z.
Chicken	8,922	Halfdan Hansen, Nelson, N.Z.
Cosmic Fighter	199,440	Halfdan Hansen, Nelson, N.Z.
Defense Command	102,490	John Kane, Nelson, N.Z.
Demon Seed	67,530	Mark Brinkman, Emporia, KS
Eliminator	271,300	Dean Mitchell, Edmonton, Alta.
Fortress	187,600	Mark Brinkman, Emporia, KS
Flying Saucer	1,270**	James Oh, Pebble Beach, CA
Galaxy Invasion	7,185,230+	James & Richard Oh, Pebble Beach, CA
Ghost Hunter	41,190	John Kane, Nelson, N.Z.
Jovian	133,320	Mark Brinkman, Emporia, KS
Laserball	72,530	Neil Matson, Panama City, FL
Laser Defense	199,490	Matthew Holmes, Nelson, N.Z.
Liberator	306,300	Rodney
Meteor Mission 2	60,450	James Oh, Pebble Beach, CA
Missile Attack	41,430	John Kane, Nelson, N.Z.
Outhouse	26,650	Halfdan Hansen, Nelson, N.Z.
Pac Attack (CC)	56,235	Andy Lehtola, Mound, MN
Paddle Pinball	861,680	James Oh, Pebble Beach, CA
Robot Attack	14,780	James Oh, Pebble Beach, CA
Scarfman	296,310	Ellen Lackey, Forest, MS
Sea Dragon	147,910++	Mad Max
Super Nova	1,166,640	Mark Brinkman, Emporia, KS
Swamp Wars	39,200	Winthrop
Time Runner	85,865	Mad Max

* Method I. Winthrop racked up 281,000 using Method II.
** Played at the highest level.
+ Solo record: 2,011,000 (Mark Brinkman, Emporia, KS).
++ Novice mode. Max got 69,480 in the expert mode.

Gamer's Cafe readers are invited to submit their high scores, for these and other TRS-80 games. We'll print unvalidated scores, but validated ones (a photo of the screen) will, of course, rank higher in prestige.

* * * * *

Someone from the bar brought out our mail. A Greenwood, MS, gamer wrote *80 Micro*, asking for the name and address of the company that makes Jagdstaffel; he stumped the panel in Peterborough, so they forwarded the question to us. The game sounds World War II-ish, but we've never heard of it. If you tell us, we'll tell Greenwood.

Last month's blitz from New Zealand dashed a lot of scoreboard hopes: Paul Friesen (Manitoba, Canada), Wayne Severson (Hudson, WI), Jim Fowler (Lucasville, OH), and Jane Atkins (Trenton, NJ) sent scores that were eclipsed by the time they reached us. But, as Mercedes said between uncontrollable giggles, a new letter throws down the gauntlet:

Dear Fellow Cafe Habitue,

Better tell Max and Winthrop to watch out! For I, Scott McClure, am out to rip all their high scores to shreds! As an example of my prowess, I enclose my high score of 2,028,450 on Bounceoids. Fact is, I had 23 ships left (I'm serious) but I got bored!

Just in case Max gets lucky and beats my score, I will make the promise that I can triple ANY score he gets, even if that means losing a few nights of sleep!

I HAVE SPOKEN...

Scott McClure
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"Triple my 147,910 on Sea Dragon and we'll talk," said Max.

McClure will have to deal with Carl Pflanzer of Gillette, NJ, who remarks "I am a master gamesman" and proves it with 91,320 on Alien Defense.

And, if you thought the Kiwi Trio was terrifying, look to Pebble Beach, CA, and the Oh brothers: James Oh sends scores for Flying Saucer, Paddle Pinball, and Meteor Mission 2, and teamed with his brother Richard for an unbelievable 7,185,230 points on Galaxy Invasion.

"When we quit we had over 10 ships left," James confesses.

The prospect of multiplayer teams amused Mercedes. She did her Carl Sagan imitation and intoned, "Billions and billions of points." What's next—20-man relays and exponential scores?

* * * * *

The Tech Question that Wouldn't Die: Jim Daniel supplied a patch in the very first Cafe (November 1982), showing how to adapt the Alpha Products joystick to Voyage of the Valkyrie, and Michael Johnson wrote (February 1983) that it didn't work on the Model III. This month, Neil Matson of Panama City, FL, adds that the answer Michael needs is an OUT 236,16 at the beginning of the program.

Neil, in turn, wonders how other scorers get their photos of the screen to come out. He's tried adding more light, changing the brightness, and shooting from different angles, but no luck. How about some camera tips for a future issue?

* * * * *

"I think I broke it," said a sheepish Hawkeye, scuffling his feet and pointing at a PMC that had been running Apple Panic a minute earlier. Mercedes shoved him aside, tried to restart the game, eventually got back into Basic, and stopped cold.

"255 bytes free?" she said, trying to enter a program. "The thing's hung up. It won't take more than one line of code."

"Only one thing to do," said Max. "Have a contest."

Well, we are: All you expert programmers out there, see if you can write a Model I/III game using only one line of Basic ("And no colons," Mercedes suggested, but we overruled her). We'll print the best one, and give a year's subscription to the winner.

Send entries to the Gamer's Cafe, c/o *80 Micro*. We promise Mercedes won't enter—she's starting her work at Johns Hopkins again through a correspondence course, and is busy writing SilverDOS for her master's thesis. It has every conceivable utility, a word processor, spreadsheet, and DBMS, and she's trying to fit it into 900 bytes of high memory.

The other day, she was too intent even to notice when Max turned up the volume on Joan Jett. ■

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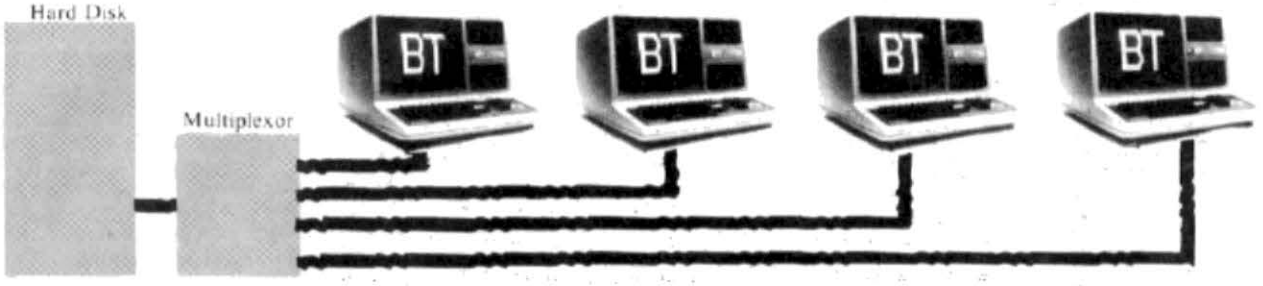

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by Art Huston

Load 80 on DOSPLUS

Since December 1982, Load 80 disks have come with the DOSPLUS 3.3 operating system. This month, I'd like to discuss the ways in which this operating system differs from Model I TRSDOS. (For instructions on using pre- December Load 80s, see *80 Micro* March 1982, p. 385.)

Our advertisements and documentation refer to this operating system as TDOS (TinyDOS). Although incorrect, it is an apt description. The disks contain a scaled-down version of DOSPLUS, and allow Model I owners to boot a disk and use the supplied Basic to run programs. A more complete version of DOSPLUS would, of course, raise the price of Load 80.

All Load 80 disks are double-sided. To access the programs on the other side, simply flip the disk.

Getting Started

Model I users insert the disk in drive zero, press reset and go. The disk is also readable by TRSDOS 2.3 and can be placed in drive 1 and used as a data disk.

Model III owners must use the TRSDOS Convert utility to read the Load 80 disk. This requires two drives; borrow a friend's system if you have only a single drive.

First make a back-up of your TRSDOS disk and use the Purge utility to remove all visible files. Insert the Load 80 disk in drive 1 and the TRSDOS disk in drive zero. Type CONVERT and respond with 1 as Source Drive and zero as Destination Drive. The Load 80 files will be copied onto your TRSDOS disk. Flip the Load 80 disk over and repeat the process.

Model III users don't use the DOSPLUS 3.3 system. They will be happy to learn that Load 80 may soon appear on a disk that boots on both the I and III and transfers the files to a TRSDOS disk.

Different Directories

DOSPLUS displays directories differently than TRSDOS. File names are padded with blanks so that they are always eight characters long. Instead of a slash, a space separates the file name from the extension. For example, the file PROG/BAS is displayed as PROG BAS. When loading, killing or renaming this file, refer to it as PROG/BAS.

When you enter Basic under Model I TRSDOS, you are asked to specify the number of files and the memory size. The former prompt lets you define how many disk files are open at one time, with a default of three. The latter lets you protect high memory, with a "use all available" default.

Under DOSPLUS you must set these parameters from the DOS READY command line. The syntax is:

BASIC file name – F:files – M:memory size

"File name" is the Basic program that loads and runs immediately, "files" is the number of disk files that are opened, and "memory size" is the first protected byte of memory. The defaults are "no program to run," "zero disk files may be opened," and "use all available memory."

If PROG/BAS is a file that opens three disk files and uses a machine-language routine stored in memory starting at 61440, enter Basic with:

BASIC PROG/BAS – F:3 – M:61440

If you enter Basic with fewer than three buffers reserved for Disk I/O, a ?BN error appears.

BACKUP, FORMAT and ONECOPY

Load 80 disks are not protected and the Backup and Format utilities are easy to use. They will not, however, work correctly with some versions of the LNDoubler 5/8 installed in the expansion interface.

We occasionally run low on disk space and delete one or both of these utilities. In this case, you will find the utility on the other side of the disk.

To transfer files to TRSDOS, reset the system with DOSPLUS in drive zero and TRSDOS in drive 1. Use the Copy command to copy the files one at a time to drive 1.

A single-drive, single-file copy is also possible between the operating systems. Boot up using DOSPLUS and type: COPY1 filename. You are prompted when to insert the source, destination and system disks. In this case, the system disk is the DOSPLUS disk. ■

Program	Title	Page	Comments
1	NXTSTEP1/SRC	28	None
2	NXTSTEP2/BAS	28	None
3	NXTSTEP3/SRC	28	Needs EDTASM
4	NXTSTEP4/BAS	28	None
5	NXTSTEP5/BAS	28	None
6	NXTSTEP6/SRC	28	Needs EDTASM
7	NXTSTEP7/BAS	28	None
8	NXTSTEP8/SRC	28	Needs EDTASM
9	NXTSTEP9/BAS	28	None
10	MXDRIVE/SRC	125	Needs EDTASM
11	MINICALC/BAS	140	None
12	NETWORK/BAS	198	None
13	LOADNET/BAS	198	None
14	INTEGNET/BAS	198	None
15	DOTS1A/BAS	218	None
16	DOTS1B/BAS	218	None
17	DOTS2A/BAS	218	None
18	DOTS2B/BAS	218	None
19	DOTS3/BAS	218	None
20	DOTS4A/BAS	218	None
21	DOTS4B/BAS	218	None
22	DOTS5A/BAS	218	None
23	DOTS5B/BAS	218	None
24	LOADSURF/BAS	236	None
25	SURF/BAS	236	None
26	MINEDIT/SRC	290	Needs EDTASM
27	DVORPOKE/BAS	294	None
28	JETBOMB1/BAS	298	None
29	JETBOMB2/SRC	298	Needs EDTASM
30	GOATGAME/BAS	320	None
31	BUSGRAPH/BAS	326	None
32	MAZE/BAS	362	None
33	BARRIER/BAS	362	None

April Load 80 Directory

Scanned by Ira Goldklang - www.trs-80.com

LOAD 80 LOADS EASY

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LOAD 80 BACK ISSUE CASSETTES AND DISKETTES NOW AVAILABLE!

In the April, 1981 issue of 80 Micro we introduced LOAD 80 to save you the time and trouble of typing our programs yourself. LOAD 80 cassette tapes contain dumps of the major program listings in 80 Micro.

If you have not yet ordered any LOAD 80 tapes and wish you had, don't worry. We are now offering a "back issue" cassette program. You can order any LOAD 80 cassette from April, 1981 to date for $9.97. Back issues of 80 Micro are also available with the LOAD 80 cassettes for $3.50. With the complete documentation found in the companion magazine issue, you should have no difficulty loading any of 80's major programs. Back issue disks available from March 1982 to present.

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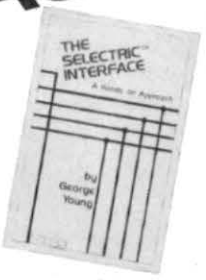
Marcia Stone

THE SELECTRIC™ INTERFACE



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See List of Advertisers on Page 371

LOAD 80

FUN HOUSE

by Richard Ramella

Mazes

Someone's knocking on the door of the Fun House. You can't come in unless you're a kid or a grownup who hasn't forgotten the magic of childhood.

You're OK. Come on in and let's wander through some mazes.

First, let me state clearly and exactly what's ahead.

Maze Generator has Level II and Color Computer listings.

Barrier is a maze game with Level II and Color Computer versions.

Ghost Walls is another maze game available only to you Color Computer folks.

I hope you brought a loaf of bread, because you might have to leave a trail of crumbs to get out of some of these mazes. Ready? Then let's amaze ourselves.

Maze Generator

I'm proud of Maze Generator, even if it isn't too speedy,

The Key Box

Model I and Color Computer
4K RAM
Cassette or Disk Basic
Color or Extended Color Basic

Maze Generator—Level II

```
100 REM * MAZE GENERATOR / LEVEL II *
105 REM * FUN HOUSE / MAY / RICHARD RAMELLA *
110 CLS
120 INPUT "CELLS WIDE (2 TO 21)";A
130 IF A*6>126 OR A<2 THEN PRINT "IMPOSSIBLE": GOTO 120
140 INPUT "ARE YOU GOING TO PRINT ON PAPER (Y/N)";A$
150 IF A$<>"Y" AND A$<>"N" GOTO 140
160 IF A$="N" GOTO 200
170 IF A$="Y" THEN INPUT "WIDE OR NARROW (W/N)";B$
180 IF B$<>"W" AND B$<>"N" GOTO 140
190 IF B$="N" AND A>14 THEN PRINT "MAZE TOO WIDE. 14 CELLS OR FE
WER": GOTO 120
200 INPUT "CELLS DEEP (2 TO 11)";B
210 IF B<2 OR B*4>47 THEN PRINT "IMPOSSIBLE": GOTO 200
220 DIM F(A,B)
230 CLS
240 FOR Y=0 TO B*4 STEP 4
250 FOR X=0 TO A*6
260 SET(X,Y)
270 NEXT X
280 NEXT Y
290 FOR X=0 TO 6*A STEP 6
300 FOR Y=0 TO 4*B
310 SET(X,Y)
320 NEXT Y
330 NEXT X
340 FOR E=1 TO B
350 FOR D=1 TO A
360 F(D,E)=0
370 NEXT D
380 NEXT E
390 J=INT(A/2)
400 K=INT(B/2)
410 X=-3
420 Y=-2
430 F(J,K)=2
440 FOR E=1 TO B
450 Y=Y+4
460 FOR D=1 TO A
470 X=X+6
480 IF F(D,E)=2 GOSUB 540
490 NEXT D
500 X=-3
510 NEXT E
520 Y=-2
530 GOTO 440
540 L=RND(4)
550 IF D-1<>0 AND F(D-1,E)=0 THEN F(D-1,E)=1
560 IF D=A GOTO 570 ELSE IF F(D+1,E)=0 THEN F(D+1,E)=1
570 IF E-1<>0 AND F(D,E-1)=0 THEN F(D,E-1)=1
580 IF B=E GOTO 590 ELSE IF F(D,E+1)=0 THEN F(D,E+1)=1
590 IF L=1 AND D-1<>0 AND F(D-1,E)=1 GOSUB 650
600 IF D=A GOTO 610 ELSE IF L=2 AND F(D+1,E)=1 GOSUB 650
610 IF L=3 AND E-1<>0 AND F(D,E-1)=1 GOSUB 720
620 IF B=E GOTO 630 ELSE IF L=4 AND F(D,E+1)=1 GOSUB 720
630 IF A*B-1=M GOTO 790
640 RETURN
650 IF L=1 THEN F(D-1,E)=2: R=X-3
660 IF L=2 THEN F(D+1,E)=2: R=X+3
670 FOR S=Y-1 TO Y+1
680 RESET(R,S)
690 NEXT S
```

Listing continues

THE PEACH™ WITHOUT FUZZ

The Peach™ is the newest addition to Electronic Protection Devices crop of EMI/RFI Filters/AC Surge Protectors. It eliminates transients such as "spikes" or "glitches" same as The Lemon™, The Lime™ and The Orange™ while simultaneously filtering out "fuzz" or "noise" produced by Elecro Magnetic Interference (EMI) or Radio Frequency Interference (RFI).

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Listing continued

```
700 M=M+1
710 RETURN
720 IF L=3 THEN F(D,E-1)=2: S=Y-2
730 IF L=4 THEN F(D,E+1)=2: S=Y+2
740 FOR R=X-2 TO X+2
750 RESET(R,S)
760 NEXT R
770 M=M+1
780 RETURN
790 X=0
800 Y=RND(B)*4-3
810 FOR Y=Y TO Y+2
820 RESET(X,Y)
830 NEXT Y
840 X=A*6
850 Y=RND(B)*4-3
860 FOR Y=Y TO Y+2
870 RESET(X,Y)
880 NEXT Y
890 IF A$="N" GOTO 890
900 FOR Y=0 TO B*4
910 FOR X=0 TO A*6
920 IF POINT(X,Y)=-1 THEN LPRINT "*"; ELSE LPRINT " ";
930 NEXT X
940 LPRINT
950 NEXT Y
960 GOTO 960
970 END
```

Maze Generator—Color Basic

```
100 REM * MAZE GENERATOR / COLOR BASIC *
110 REM * FUN HOUSE / MAY / RICHARD RAMELLA *
120 CLS
130 PRINT "IF YOU HAVE A LINE PRINTER,"
140 PRINT "DO YOU WANT THIS MAZE COPIED"
150 PRINT "ON PAPER?"
160 PRINT
170 PRINT "ANSWER Y FOR YES, N FOR NO."
180 INPUT X$
190 IF X$<>"Y" AND X$<>"N" THEN CLS: GOTO 140
200 IF X$="N" THEN PRINT "SCREEN PRINT ONLY TO BE MADE."
210 IF X$="Y" THEN QQ=1: PRINT "TURN ON THE PRINTER."
220 PRINT "TAP ANY LETTER KEY WHEN READY."
230 IF INKEY$="" GOTO 230
240 CLS(0)
250 A=10
260 B=7
270 DIM F(A,B)
280 CLS(0)
290 FOR Y=0 TO B*4 STEP 4
300 FOR X=0 TO A*6
310 SET(X,Y,3)
320 NEXT X
330 NEXT Y
340 FOR X=0 TO A*6 STEP 6
350 FOR Y=0 TO B*4
360 SET(X,Y,3)
370 NEXT Y
380 NEXT X
390 FOR E=1 TO B
400 FOR D=1 TO A
410 F(D,E)=0
420 NEXT D
430 NEXT E
440 J=INT(A/2)
450 K=INT(B/2)
460 X=-3
470 Y=-2
480 F(J,K)=2
490 FOR E=1 TO B
500 Y=Y+4
510 FOR D=1 TO A
520 X=X+6
530 IF F(D,E)=2 GOSUB 590
540 NEXT D
550 X=-3
560 NEXT E
570 Y=-2
580 GOTO 490
590 L=RND(4)
```

Listing continues

because it shows the creation of the maze and it creates a logical maze.

A logical maze is one that has an entrance, an exit, all parts reachable, and only one correct path through. In Maze Generator, you will discover that these mazes always have but one way through without doubling back.

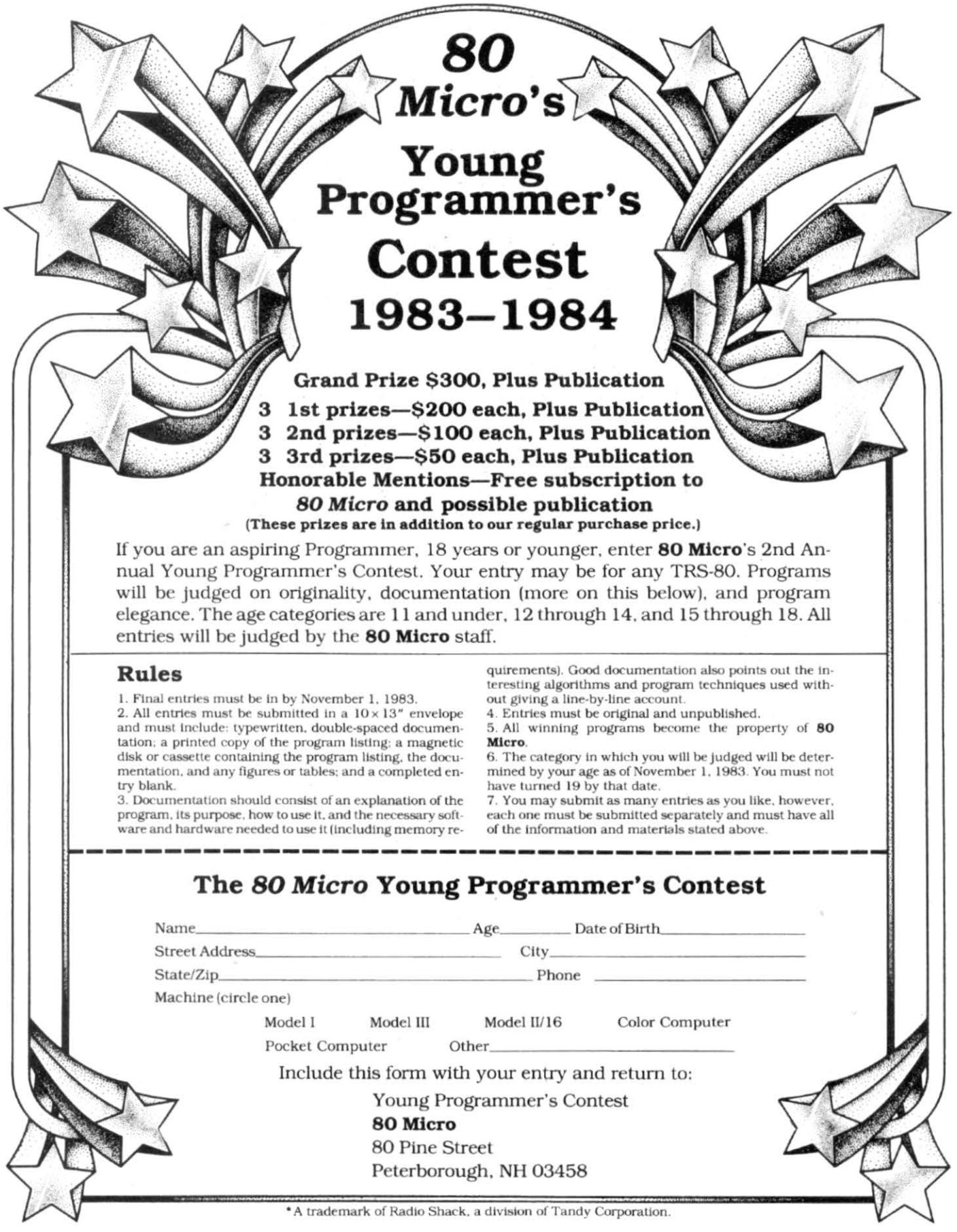
If you have a printer, this program will print your maze on paper. Without a printer, you'll have to be satisfied with seeing it on the screen.

The instructions for Level II and Color versions are all you need to get going. In the Level II listing, the program asks if your printer has wide or narrow paper. Consider the paper narrow if it's 8½ inches across, or wide if it's 15 inches or more across.

In Level II, you are asked how many cells wide and deep you want your maze to be. A cell is each square in the maze. The Level II program will make a maze of up to 21 cells across by 11 cells down. The Color version will automatically give you a 10-by-7 maze because that fills the screen.

Be warned that the more cells a maze has, the longer it takes for the maze to complete itself. While the biggest Level II maze

Fame and Fortune may be yours by entering:



80 Micro's Young Programmer's Contest 1983–1984

Grand Prize $300, Plus Publication

3 1st prizes—$200 each, Plus Publication
3 2nd prizes—$100 each, Plus Publication
3 3rd prizes—$50 each, Plus Publication
Honorable Mentions—Free subscription to *80 Micro* and possible publication

(These prizes are in addition to our regular purchase price.)

If you are an aspiring Programmer, 18 years or younger, enter **80 Micro**'s 2nd Annual Young Programmer's Contest. Your entry may be for any TRS-80. Programs will be judged on originality, documentation (more on this below), and program elegance. The age categories are 11 and under, 12 through 14, and 15 through 18. All entries will be judged by the **80 Micro** staff.

Rules

1. Final entries must be in by November 1, 1983.
2. All entries must be submitted in a 10 × 13" envelope and must include: typewritten, double-spaced documentation; a printed copy of the program listing; a magnetic disk or cassette containing the program listing, the documentation, and any figures or tables; and a completed entry blank.
3. Documentation should consist of an explanation of the program, its purpose, how to use it, and the necessary software and hardware needed to use it (including memory requirements). Good documentation also points out the interesting algorithms and program techniques used without giving a line-by-line account.
4. Entries must be original and unpublished.
5. All winning programs become the property of **80 Micro**.
6. The category in which you will be judged will be determined by your age as of November 1, 1983. You must not have turned 19 by that date.
7. You may submit as many entries as you like, however, each one must be submitted separately and must have all of the information and materials stated above.

The *80 Micro* Young Programmer's Contest

Name_____ Age_____ Date of Birth_____

Street Address_____ City_____

State/Zip_____ Phone _____

Machine (circle one)

Model I Model III Model II/16 Color Computer

Pocket Computer Other_____

Include this form with your entry and return to:

Young Programmer's Contest
80 Micro
80 Pine Street
Peterborough, NH 03458

*A trademark of Radio Shack, a division of Tandy Corporation.

Listing continued

```
600 IF D-1<>0 AND F(D-1,E)=0 THEN F(D-1,E)=1
610 IF D=A GOTO 620 ELSE IF F(D+1,E)=0 THEN F(D+1,E)=1
620 IF E-1<>0 AND F(D,E-1)=0 THEN F(D,E-1)=1
630 IF B=E GOTO 640 ELSE IF F(D,E+1)=0 THEN F(D,E+1)=1
640 IF L=1 AND D-1<>0 AND F(D-1,E)=1 GOSUB 700
650 IF D=A GOTO 660 ELSE IF L=2 AND F(D+1,E)=1 GOSUB 700
660 IF L=3 AND E-1<>0 AND F(D,E-1)=1 GOSUB 770
670 IF B=E GOTO 680 ELSE IF L=4 AND F(D,E+1)=1 GOSUB 770
680 IF A*B-1=M GOSUB 840
690 RETURN
700 IF L=1 THEN F(D-1,E)=2: R=X-3
710 IF L=2 THEN F(D+1,E)=2: R=X+3
720 FOR S=Y-1 TO Y+1
730 RESET(R,S)
740 NEXT S
750 M=M+1
760 RETURN
770 IF L=3 THEN F(D,E-1)=2: S=Y-2
780 IF L=4 THEN F(D,E+1)=2: S=Y+2
790 FOR R=X-2 TO X+2
800 RESET(R,S)
810 NEXT R
820 M=M+1
830 RETURN
840 X=0
850 Y=RND(B)*4-3
860 FOR Y=Y TO Y+2
870 RESET(X,Y)
880 NEXT Y
890 X=A*6
900 Y=RND(B)*4-3
910 FOR Y=Y TO Y+2
920 RESET(X,Y)
930 NEXT Y
940 IF QQ<>1 GOTO 1010
950 FOR Y=0 TO 31
960 FOR X=0 TO 63
970 IF POINT(X,Y)=3 THEN PRINT #-2,"#"; ELSE PRINT #-2," ";
980 NEXT X
990 PRINT #-2,""
1000 NEXT Y
1010 GOTO 1010
1020 END
```

Barrier—Level II

```
100 REM * BARRIER / LEVEL II *
110 REM FUN HOUSE / MAY / RICHARD RAMELLA *
120 CLS
130 U$="U"
140 D$="D"
150 L$="L"
160 R$="R"
170 Y=0
180 FOR X=0 TO 62
190 SET(X,Y)
200 SET(X,Y+28)
210 NEXT X
220 X=0
230 FOR Y=0 TO 28
240 SET(X,Y)
250 SET(X+62,Y)
260 SET(X,Y)
270 SET(X+62,Y)
280 NEXT Y
290 X=2
300 Y=2
310 SET(X,Y)
320 SET(58,26)
330 X$=INKEY$
340 IF X$<>"" THEN C=RND(3)
350 IF X$=U$ AND C=1 THEN B=Y-2: FOR A=X-2 TO X+2: SET(A,B): NEX
T
360 IF X$=D$ AND C=1 THEN B=Y+2: FOR A=X-2 TO X+2: SET(A,B): NEX
T
370 IF X$=L$ AND C=1 THEN A=X-2: FOR B=Y-2 TO Y+2: SET(A,B): NEX
T
380 IF X$=R$ AND C=1 THEN A=X+2: FOR B=Y-2 TO Y+2: SET(A,B): NEX
T
390 RESET(X,Y)
```

Listing continues

runs, you might as well go have dinner.

Many computer games are based on mazes. I hope this gives you some ideas.

Barrier

This is a game in which you travel through an invisible maze. There may be a blocking wall ahead of you or there may not. You never know until you take a step forward.

In both versions, you are the blinking pixel that starts at the top left of the screen. To win the game, you must travel toward and occupy the space of the pixel located to the southwest of the starting position.

In the Level II version, you travel by tapping D for down, U for up, L for left, and R for right.

In the Color version, travel by tapping the four directional (arrow) keys, and you'll possibly go in the direction they indicate.

I say *possibly* because you don't go anywhere if a wall appears. If a network of walls appears that prevents you from reaching the pixel at the southwest of the playing area, you lose. Hit break and start over. You might even find yourself totally boxed in.

Ghost Walls

This is the one that's only for the Color Computer. You Level II folks can skip ahead to the end of the column for a brief preview of June's events.

This program draws a grid. The player pixel is blue, and the pixel you want to reach is orange. The white walls sur-

Continues on p. 368

Listing continued

```
400 IF X$=U$ AND Y-4>1 AND POINT(X,Y-2)<>-1 THEN Y=Y-4
410 IF X$=D$ AND Y+4<29 AND POINT(X,Y+2)<>-1 THEN Y=Y+4
420 IF X$=L$ AND X-4>1 AND POINT(X-2,Y)<>-1 THEN X=X-4
430 IF X$=R$ AND X+4<62 AND POINT(X+2,Y)<>-1 THEN X=X+4
440 SET(X,Y)
450 IF X=58 AND Y=26 GOTO 470
460 GOTO 330
470 C$="WINNER"
480 PRINT @ 0,"   ";C$;
490 FOR A=1 TO 30
500 NEXT A
510 PRINT @ 0,C$;"   ";
520 FOR A=1 TO 30
530 NEXT A
540 GOTO 480
550 END
```

Barrier—Color Basic

```
100 REM * BARRIER / COLOR BASIC *
110 REM * FUN HOUSE / MAY / RICHARD RAMELLA
120 CLS(0)
130 U$=CHR$(94)
140 D$=CHR$(10)
150 L$=CHR$(8)
160 R$=CHR$(9)
170 X=2
180 Y=2
190 SET(X,Y,3)
200 SET(58,26,8)
210 X$=INKEY$
220 IF X$<>"" THEN C=RND(3)
230 IF X$=U$ AND C=1 THEN B=Y-2: FOR A=X-2 TO X+2: SET(A,B,5): N
EXT
240 IF X$=D$ AND C=1  THEN B=Y+2: FOR A=X-2 TO X+2: SET(A,B,5):
NEXT
250 IF X$=L$ AND C=1 THEN A=X-2: FOR B=Y-2 TO Y+2: SET(A,B,5): N
EXT
260 IF X$=R$ AND C=1 THEN A=X+2: FOR B=Y-2 TO Y+2: SET(A,B,5): N
EXT
270 RESET(X,Y)
280 IF X$=U$ AND Y-4>1 AND POINT(X,Y-2)<>5 THEN Y=Y-4
290 IF X$=D$ AND Y+4<29 AND POINT(X,Y+2)<>5 THEN Y=Y+4
300 IF X$=L$ AND X-4>1 AND POINT(X-2,Y)<>5 THEN X=X-4
310 IF X$=R$ AND X+4<62 AND POINT(X+2,Y)<>5 THEN X=X+4
320 SET(X,Y,3)
330 IF X=58 AND Y=26 GOTO 350
340 GOTO 210
350 C$="WINNER"
360 PRINT @ 0,"   ";C$;
370 SOUND 100,1
380 FOR A=1 TO 50
390 NEXT A
400 PRINT @ 0,C$;"   ";
410 SOUND 150,1
420 FOR A=1 TO 50
430 NEXT A
440 GOTO 360
```

Ghost Walls

```
100 REM * GHOST WALLS / COLOR BASIC *
110 REM * FUN HOUSE / MAY / RICHARD RAMELLA
120 CLS(0)
130 U$=CHR$(94)
140 D$=CHR$(10)
150 L$=CHR$(8)
160 R$=CHR$(9)
170 FOR Y=0 TO 28 STEP 4
180 FOR X=0 TO 60
190 SET(X,Y,5)
200 NEXT X
210 NEXT Y
220 X$=INKEY$
230 FOR X=0 TO 60 STEP 4
240 FOR Y=0 TO 28
250 SET(X,Y,5)
```

Listing continues

Coordinated Business Software

D.B. Software Co. announces a new line of coordinated business software designed for the Model III TRS-80. The BASE system consists of a **General Ledger System** with **Accounts Receivable** and **Accounts Payable**. Other modules can be purchased and added as needed.

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Available on cassette only for TRS-80 Models I and III $6.95 each, two for $12.00, four for $21.00.
Learning to Count Money **$19.95.**

Add $1.00 to total order for first class shipment.

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Hicksville, N.Y. 11801

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Listing continued

```
260 NEXT Y
270 NEXT X
280 X=2
290 Y=2
300 SET(X,Y,3)
310 SET(58,26,8)
320 X$=INKEY$
330 IF X$=U$ AND POINT(X,Y-2)=8 GOTO 320
340 IF X$=D$ AND POINT(X,Y+2)=8 GOTO 320
350 IF X$=L$ AND POINT(X-2,Y)=8 GOTO 320
360 IF X$=R$ AND POINT(X+2,Y)=8 GOTO 320
370 IF X$=U$ AND POINT(X,Y-2)=0 GOTO 480
380 IF X$=D$ AND POINT(X,Y+2)=0 GOTO 480
390 IF X$=L$ AND POINT(X-2,Y)=0 GOTO 480
400 IF X$=R$ AND POINT(X+2,Y)=0 GOTO 480
410 C=RND(5)
420 IF C<3 THEN C=1
430 IF X$=U$ AND C=1 THEN B=Y-2: FOR A=X-1 TO X+1: SET(A,B,8): N
EXT
440 IF X$=D$ AND C=1 THEN B=Y+2: FOR A=X-1 TO X+1: SET(A,B,8): N
EXT
450 IF X$=L$ AND C=1 THEN A=X-2: FOR B=Y-1 TO Y+1: SET(A,B,8): N
EXT
460 IF X$=R$ AND C=1 THEN A=X+2: FOR B=Y-1 TO Y+1: SET(A,B,8): N
EXT
470 IF C=1 GOTO 320
480 RESET(X,Y)
490 IF X$=U$ AND Y-4>1 THEN B=Y-2: FOR A=X-1 TO X+1: RESET(A,B):
 NEXT: Y=Y-4
500 IF X$=D$ AND Y+4<29 THEN B=Y+2: FOR A=X-1 TO X+1: RESET(A,B)
: NEXT: Y=Y+4
510 IF X$=L$ AND X-4>1 THEN A=X-2: FOR B=Y-1 TO Y+1: RESET(A,B):
 NEXT: X=X-4
520 IF X$=R$ AND X+4 <62 THEN A=X+2: FOR B=Y-1 TO Y+1: RESET(A,B
): NEXT: X=X+4
530 SET(X,Y,3)
540 IF X=58 AND Y=26 GOTO 560
550 GOTO 320
560 C$="WINNER"
570 PRINT @ 0,"   ";C$;
580 SOUND 100,1
590 FOR A=1 TO 50
600 NEXT A
610 PRINT @ 0,C$;"   ";
620 SOUND 150,1
630 FOR A=1 TO 50
640 NEXT A
650 GOTO 570
```

Continued from p. 366

rounding you might be ghost walls through which you can march. If they are solid walls, they turn orange and you can never get through them. If they are not real, they fade away and you can go right through.

In this game, you can retrace your steps through the path you've opened without danger of new orange walls appearing. As in Barrier, you can be blocked or completely boxed in, in which case you lose. Again, use the four directional keys to travel.

There are two kids at my house, and they tell me with some excitement that school will soon be out for the summer. It seems that the teachers of the world have had all they can stand for this year. In honor of the occasion, the June Fun House will be about summer vacations. ■

Do you have a question about or a problem with a Fun House program? I promise to try to help. Write me, Richard Ramella, at 1493 Mountain View Ave., Chico, CA 95926. You must include a self-addressed envelope with a 20-cent stamp on it. If you write from Canada, send a self-addressed envelope and 30 cents in Canadian coin.

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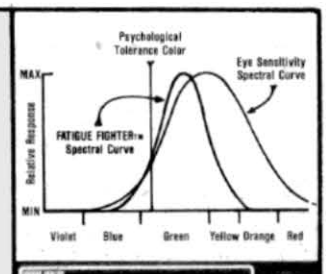

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TAKE II

This column will feature Model II, 12, and 16 conversions of earlier programs. Readers who have converted programs for their own use are encouraged to submit them.

QuickCalc, by Kurt Leafstrand, first appeared on page 114 of the October 1982 issue of *80 Micro*. It was written for a Model I or III, with 16K RAM, and Cassette or Disk Basic. This conversion was submitted by Byron Lott, 913 Inverness Way, Sunnyvale, CA 94087.

QuickCalc gives you an 8-by-14 matrix; the rows are labeled 1–14, and the columns A–H. A flashing cursor first appears in the position A1, and can be moved by using the arrow keys.

Assign a value to a location by positioning the cursor over that location and typing in the value. Remember that QuickCalc recognizes only numeric values. Special commands can be entered by pressing the slash key.

Special Command Summary

- B—Sets the value of the current cursor location to zero.
- Q—Exits the program and returns to Basic.
- N—Restarts the QuickCalc program.
- P—Sends the screen contents to the readied printer.
- D—Lets you delete a row or column. Enter the starting and ending locations of the series to be deleted.
- S—Saves the screen contents to disk or cassette.
- L—Loads a saved screen from disk or cassette.
- H—Provides help on a specified command.
- C—Performs a selectable math function.
- T—Gives the total of the values in a row or column.
- A—Gives the average of the values in a row or column.

(C, T, and A require that you specify the starting and ending locations of the series to be processed, as well as a third location that is to store the results.)

- R—Replicate lets you project a selectable function (+,−,*,/,P), where P stands for percentage, over a series of locations. Enter the value that computes the source location, the source location from which you take the initial value, and the starting and ending points of the computed value's display location.
- G—The graph command switches to the QuickPlot section of the program which will graph a column or a row in a bar-graph form. ■

Program Listing

```
5 REM 09-SEP-82 *BDL MODEL II*
10 REM - PROGRAM QUIKCALC/BAS - 5 DIGIT
GRAPHIC VIDEO VERSION
15 REM ******************
20 REM - INITIALIZATION
25 REM ******************
30 CLEAR1500:ONERRORGOTO865:DIMM(10,20),
Z(20),P(20):S$=STRING$(2,154):X=163:C=1:
R=1:V1$=CHR$(01):V2$=CHR$(02):NF$="SPRDS
HTA"
35 CLS:PRINT@587,"QUICKCALC VERSION 1.0"
;:PRINT@667,"5 DIGIT GRAPHIC ";:PRINT@74
7,"SEPTEMBER, 1982";
40 FORT=2TO21:PRINT@80*T,USING"##";T-1;:
PRINTCHR$(158);:NEXT:PRINT@80,STRING$(2,
32);CHR$(154);S$;" A ";S$;S$;" B ";S$;S$
;" C ";S$;S$;" D ";
45 PRINTS$;S$;" E ";S$;S$;" F ";S$;S$;"
G ";S$;S$;" H ";S$;S$;" I ";S$;S$;" J ";
S$;CHR$(154);CHR$(154);:FORT=2TO21:PRINT
@80*T+74,CHR$(158);USING"##";T-1;:NEXT:F
ORT=1TO1000:NEXT:PRINT@587,STRING$(21,32
);:PRINT@667,STRING$(18,32);:PRINT@747,S
TRING$(15,32);
50 REM ********************
55 REM - MAIN PROGRAM LOOP
60 REM ********************
65 PRINTV2$:PRINT@0,STRING$(80,32);:M1=8
0+C:R$=STR$(R):R$=RIGHT$(R$,LEN(R$)-1):I
FB$<>""THENM(C,R)=VAL(B$):PRINT@0,CHR$(M
1);R$;" = ";M(C,R);ELSEPRINT@0,CHR$(M1);
R$;" = ";M(C,R);
70 PRINT@X,CHR$(188);:PRINT@X+6,CHR$(190
);:FORT=1TO60:A$=INKEY$:IFA$<>""THEN75EL
SENEXT:PRINT@X,CHR$(32);:PRINT@X+6,CHR$(
32);:FORT=1TO60:A$=INKEY$:IFA$<>""THEN75
ELSENEXT:GOTO70
75 IFA$=CHR$(11)THEN80ELSEIFA$=CHR$(10)T
HEN85ELSEIFA$=CHR$(8)THEN90ELSEIFA$=CHR$
(9)THEN100ELSE110
80 IFX<227THEN65ELSEPRINT@X,CHR$(32);:PR
INT@X+6,CHR$(32);:X=X-80:IFB$<>""THENM(C
,R)=VAL(B$):B$="":R=R-1:GOTO65ELSEB$="":
R=R-1:GOTO65
85 IFX>1675THEN65ELSEPRINT@X,CHR$(32);:P
RINT@X+6,CHR$(32);:X=X+80:IFB$<>""THENM(
C,R)=VAL(B$):B$="":R=R+1:GOTO65ELSEB$=""
:R=R+1:GOTO65
90 IFX=163ORX=243ORX=323ORX=403ORX=483OR
X=563ORX=643ORX=723ORX=803ORX=883ORX=963
ORX=1043ORX=1123ORX=1203ORX=1283ORX=1363
ORX=1443ORX=1523ORX=1603ORX=1683THEN65
95 PRINT@X,CHR$(32);:PRINT@X+6,CHR$(32);
:X=X-7:IFB$<>""THENM(C,R)=VAL(B$):B$="":
C=C-1:GOTO65ELSEB$="":C=C-1:GOTO65
100 IFX=226ORX=306ORX=386ORX=466ORX=546O
RX=626ORX=706ORX=786ORX=866ORX=946ORX=10
26ORX=1106ORX=1186ORX=1266ORX=1346ORX=14
26ORX=1506ORX=1586ORX=1666ORX=1746THEN65
105 PRINT@X,CHR$(32);:PRINT@X+6,CHR$(32)
;:X=X+7:IFB$<>""THENM(C,R)=VAL(B$):B$=""
:C=C+1:GOTO65ELSEB$="":C=C+1:GOTO65
110 IFASC(A$)=13ORASC(A$)=11ORASC(A$)=23
ORASC(A$)=24ORASC(A$)=27ORASC(A$)=10ORAS
C(A$)=31ORASC(A$)=9ORASC(A$)=8THEN65
115 IFA$="/"THENPRINTV1$:GOTO225
```

Listing continues

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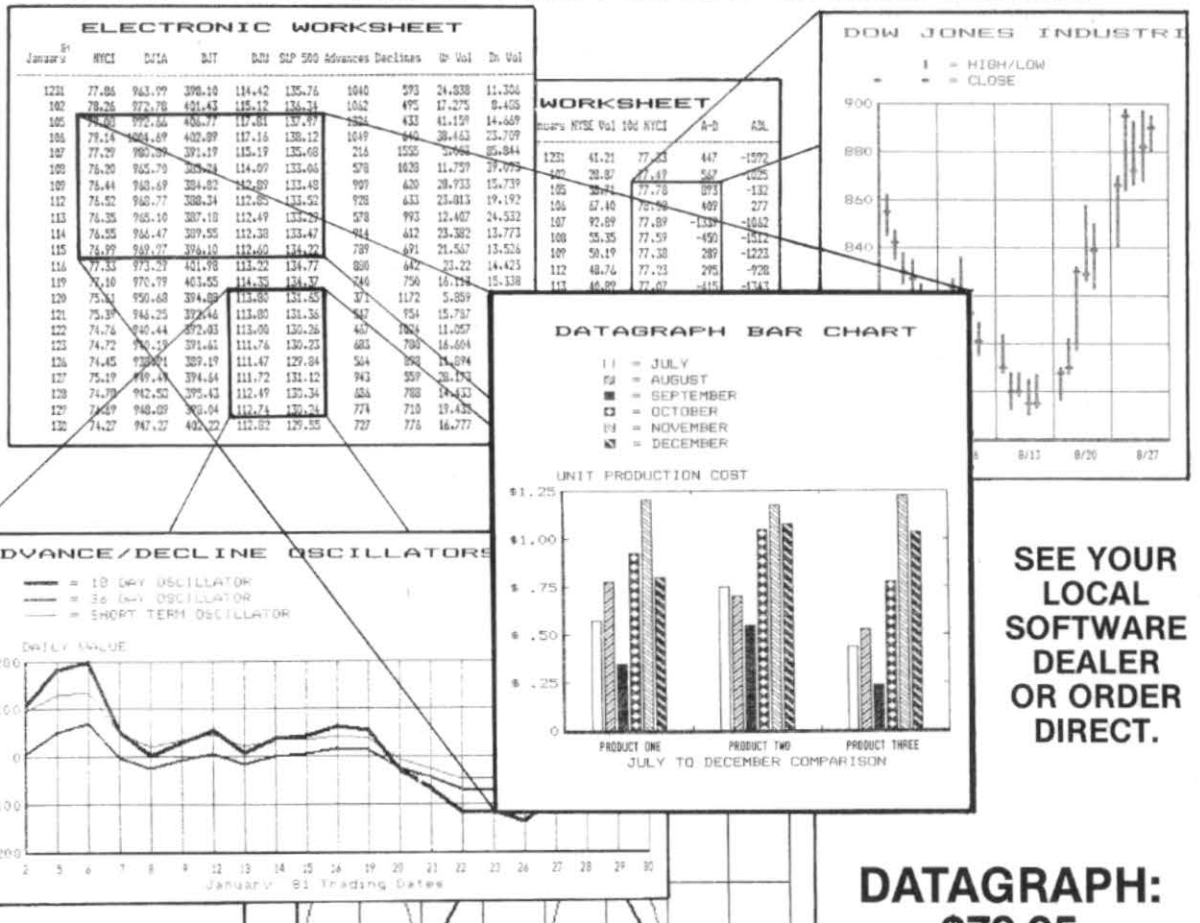

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* HIGH RESOLUTION - 60 x 72 data Points/inch. * LARGE DATA CAPACITY - 1000 Input Data Points per graph. * SELECTABLE GRAPH SIZES - From 1" sq. to 7" x 24" * STANDARD DATA SOURCE - Plots Data from VISICALC or USERS OWN PROGRAMS using the DIF™ Standard Format. * GRAPH FEATURE SELECTION - Fill out Pre-formated Form on VISICALC screen or in users own program. * MINIMAL ENTRY REQUIREMENTS - Enter only name of Datafile and location therein of data to be plotted. * MULTIPLE FUNCTION GRAPHS - Plots over 10 Data Sets per graph. * DATA SYMBOLS - Plots data with user composed symbol shapes. * DATA INTERPOLATION - connects data points with user composed line shapes. * LINE/SYMBOL LIBRARY - Plots each Data Set with different line/symbol shape chosen from 12 line library. * CUSTOM LINES AND SYMBOLS - Has interactive screen-graphics program for composing symbol shapes. * AUTO SCALING - Selects scale values for ease of graph interpretation. User adjustable Mantissa Table. * GRID SELECTION - Prints selectable number of vertical and horizontal grid lines. * CALENDAR SCALE - Optionally prints names of month on horizontal scale. * CURVE SELECTION - Plot each data set with Linear, Stair-Step, or Bargraph curves. * OPTIONAL MIN/MAX VALUES - Extends graph beyond the values of the Data Sets. * DATA SET DESCRIPTIONS - Prints text descriptions of each Data Set in graph legend. * TEXT ENTRYS - Prints graph title, axis labels, and date on graph. * USER FRIENDLY - Checks validity of input data and displays cause of errors. * COMPLETE DOCUMENTATION - Comprehensive 75 page Users Manual with examples covering data preparation, graph feature entry, composing lines and symbols, and technical notes.

USER REQUIREMENTS

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- TRS-80 MODEL I 48K
- TRS-80 MODEL III 48K
- LNW80 48K

DOS
- TRSDOS 1.3, 2.3
- NEWDOS, NEWDOS/80
- DOSPLUS 3.4, LDOS 5.1

DISK DRIVES
- SINGLE DRIVE (NOT TRSDOS)
- DUAL DRIVE (PREFERRED)

GRAPHICS PRINTER:
- MX-80 GRAFTRAX, OR GT +
- MX-100
- LINEPRINTER VIII, DMP 200
- NEC 8023 A-C, C.ITOH 8510
- IDS 460/560, 480, 80/132
- OKIDATA 82/83

++ OTHER VERSIONS IN DEVELOPMENT

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526 DEALER INQUIRIES WELCOME

TRADEMARKS: DATAGRAPH (MICRO SOFTWARE SYSTEMS); VISICALC (VISICORP); TRS-80 (TANDY CORP); DIF (SOFTWARE ARTS INC.); PRISM (INTEGRAL DATA SYSTEMS)

See List of Advertisers on Page 371

Listing continued

```
120 IFLEN(B$)=5THENPRINT@X+1,LEFT$(B$,5)
;:GOTO65ELSEB$=B$+A$:PRINT@X+(6-LEN(B$))
,B$;:GOTO65
125 REM ******************
130 REM - COMPUTE FUNCTION
135 REM ******************
140 PRINT@X,CHR$(32);:PRINT@X+6,CHR$(32)
;:PRINT@0,"COMPUTE - Select Function (+,
-,*,/) ";CHR$(32);
145 A$=INKEY$:IFA$=""THEN145ELSEIFA$="+"
THEN150ELSEIFA$="-"THEN155ELSEIFA$="*"TH
EN160ELSEIFA$="/"THEN165ELSE145
150 GOSUB185:M(D1,D2)=M(A1,A2)+M(B1,B2):
B$=STR$(M(D1,D2)):B$=RIGHT$(B$,LEN(B$)-1
):B$=LEFT$(B$,5):D2=D2+1:X=(D2*80)+(7*D1
):X=X-4:PRINT@X+(6-LEN(B$)),B$;:PRINT@0,
STRING$(80,32);:GOTO65
155 GOSUB185:M(D1,D2)=M(A1,A2)-M(B1,B2):
B$=STR$(M(D1,D2)):B$=RIGHT$(B$,LEN(B$)-1
):B$=LEFT$(B$,5):D2=D2+1:X=(D2*80)+(7*D1
):X=X-4:PRINT@X+(6-LEN(B$)),B$;:PRINT@0,
STRING$(80,32);:GOTO65
160 GOSUB185:M(D1,D2)=M(A1,A2)*M(B1,B2):
B$=STR$(M(D1,D2)):B$=RIGHT$(B$,LEN(B$)-1
):B$=LEFT$(B$,5):D2=D2+1:X=(D2*80)+(7*D1
):X=X-4:PRINT@X+(6-LEN(B$)),B$;:PRINT@0,
STRING$(80,32);:GOTO65
165 GOSUB185:M(D1,D2)=M(A1,A2)/M(B1,B2):
B$=STR$(M(D1,D2)):B$=RIGHT$(B$,LEN(B$)-1
):B$=LEFT$(B$,5):D2=D2+1:X=(D2*80)+(7*D1
):X=X-4:PRINT@X+(6-LEN(B$)),B$;:PRINT@0,
STRING$(80,32);:GOTO65
170 REM ****************
175 REM - INPUT ROUTINE
180 REM ****************
185 PRINT@0,STRING$(50,32);:IFT=1THENPRI
NT@0,"TOTAL. Enter Co-ordinates:";ELSEIF
A=1THENPRINT@0,"AVERAGE. Enter Co-ordina
tes:";ELSEPRINT@0,"Enter Co-ordinates:";
190 GOSUB195:A1=C:A2=R:PRINT"..";:GOSUB1
95:B1=C:B2=R:PRINT"..";:GOSUB195:D1=C:D2
=R:RETURN
195 A$=INKEY$:IFA$=""THEN195ELSEIFA$<"A"
ORA$>"J"THEN195ELSEPRINTA$;:C=ASC(A$)-64
200 Z$="":A$=INKEY$:IFA$=""THEN200ELSEIF
A$=CHR$(8)THENPRINTCHR$(8);:GOTO195ELSEI
FA$<"0"ORA$>"9"THEN200ELSEPRINTA$;:Z$=Z$
+A$
205 A$=INKEY$:IFA$=""THEN205ELSEIFA$=CHR
$(8)THENPRINTCHR$(8);:GOTO200ELSEIFA$<"0
"ORA$>"9"THEN205ELSEPRINTA$;:Z$=Z$+A$:R=
VAL(Z$):RETURN
210 REM ***************************
215 REM - SPECIAL COMMAND ROUTINE
220 REM ***************************
225 T=0:PRINT@X,CHR$(32);:PRINT@X+6,CHR$
(32);:PRINT@0,"Select Special Command (B
,Q,N,P,C,R,S,D,L,T,A,G,H) ";CHR$(32);
230 A$=INKEY$:IFA$=""THEN230
235 IFA$="B"THENPRINT@0,STRING$(80,32);:
M(C,R)=0:B$="":PRINT@X+1,"      ";:GOTO65
ELSEIFA$="C"THENPRINT@0,STRING$(80,32);:
GOTO140ELSEIFA$="Q"THEN245ELSEIFA$="N"TH
ENRUNELSEIFA$="P"THEN265ELSEIFA$="R"THEN
300ELSEIFA$="S"THEN425ELSEIFA$="L"THEN45
0
240 IFA$="G"THEN695ELSEIFA$="H"THEN565EL
SEIFA$="T"THEN475ELSEIFA$="D"THEN505ELSE
IFA$="A"THEN535ELSEIFA$=CHR$(27)THENPRIN
T@0,STRING$(80,32);:GOTO65ELSEGOTO230
245 CLS:PRINT"PROCESSING COMPLETE":PRINT
:END
250 REM *****************
255 REM - PRINT FUNCTION
260 REM *****************
265 PRINT@0,STRING$(80,32);:PRINT@0,"Whe
n printer ready, depress <ENTER>";:INPUT
Q$;:PRINT@0,STRING$(80,32);:PRINT@0,"Top
 of page (Y OR N)";
270 A$=INKEY$:IFA$=""THEN270ELSEIFA$="Y"
THENSYSTEM"FORMS T"ELSEIFA$="N"THEN275EL
SEGOTO270
275 PRINT@0,STRING$(80,32);:PRINT@0,"Whe
n ready to print, depress <ENTER>";:INPU
TQ$;:PRINT@0,STRING$(80,32);:PRINT@0,"Pr
inting QUICKCALC screen contents";:SYSTE
M"SCREEN"
280 GOTO65
285 REM **********************
290 REM - REPLICATE FUNCTION
295 REM **********************
300 PRINT@0,STRING$(80,32);:PRINT@0,"REP
LICATE - Select Function (+,-,*,/,P) ";C
HR$(32);
305 A$=INKEY$:IFA$=""THEN305ELSEIFA$="+"
THEN310ELSEIFA$="-"THEN330ELSEIFA$="*"TH
EN350ELSEIFA$="P"THEN370ELSEIFA$="/"THEN
390ELSEGOTO305
310 B$="":PRINT@0,STRING$(80,32);:PRINT@
0,"Enter value ";:GOSUB660:V1=VAL(B$):GO
SUB185
315 IFB1=D1THEN325
320 V=M(A1,A2):FORT=B1TOD1:M(T,B2)=V+V1:
B$=STR$(M(T,B2)):B$=RIGHT$(B$,LEN(B$)-1)
:V=V+V1:X=((B2+1)*80)+(7*T):X=X-4:PRINT@
X+(6-LEN(B$)),B$;:NEXT:PRINT@0,STRING$(8
0,32);:GOTO65
325 V=M(A1,A2):FORT=B2TOD2:M(B1,T)=V+V1:
B$=STR$(M(B1,T)):B$=RIGHT$(B$,LEN(B$)-1)
:V=V+V1:X=((T+1)*80)+(7*B1):X=X-4:PRINT@
X+(6-LEN(B$)),B$;:NEXT:PRINT@0,STRING$(8
0,32);:GOTO65
330 B$="":PRINT@0,STRING$(80,32);:PRINT@
0,"Enter value ";:GOSUB660:V1=VAL(B$):GO
SUB185
335 IFB1=D1THEN345
340 V=M(A1,A2):FORT=B1TOD1:M(T,B2)=V-V1:
B$=STR$(M(T,B2)):B$=RIGHT$(B$,LEN(B$)-1)
:V=V-V1:X=((B2+1)*80)+(7*T):X=X-4:PRINT@
X+(6-LEN(B$)),B$;:NEXT:PRINT@0,STRING$(8
0,32);:GOTO65
345 V=M(A1,A2):FORT=B2TOD2:M(B1,T)=V-V1:
B$=STR$(M(B1,T)):B$=RIGHT$(B$,LEN(B$)-1)
:V=V-V1:X=((T+1)*80)+(7*B1):X=X-4:PRINT@
X+(6-LEN(B$)),B$;:NEXT:PRINT@0,STRING$(8
0,32);:GOTO65
350 B$="":PRINT@0,STRING$(80,32);:PRINT@
0,"Enter value ";:GOSUB660:V1=VAL(B$):GO
SUB185
355 IFB1=D1THEN365
360 V=M(A1,A2):FORT=B1TOD1:M(T,B2)=V*V1:
B$=STR$(M(T,B2)):B$=RIGHT$(B$,LEN(B$)-1)
:V=V*V1:X=((B2+1)*80)+(7*T):X=X-4:PRINT@
X+(6-LEN(B$)),B$;:NEXT:PRINT@0,STRING$(8
0,32);:GOTO65
365 V=M(A1,A2)"FORT=B2TOD2:M(B1,T)=V*V1:
B$=STR$(M(B1,T)):B$=RIGHT$(B$,LEN(B$)-1)
:V=V*V1:X=((T+1)*80)+(7*B1):X=X-4:PRINT@
```

Listing continues

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5. **Screen widths from 32-255 characters wide. Screen widths can be changed to allow formatting your text as you want.**
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8. ***GRAPHIC CHARACTERS. CopyArt has a built in graphics character generator. Used for typesetting large letters from 3 to 25 times normal size! Yes, you can even print characters down the page as well as across. Black on white or white on black.**
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Listing continued

```
 X+(6-LEN(B$)),B$;:NEXT:PRINT@0,STRING$(8
 0,32);:GOTO30
 370 B$="":PRINT@0,STRING$(80,32);:PRINT@
 0,"Enter value (decimal) ";:GOSUB660:V1=
 VAL(B$):GOSUB185
 375 IFB1=D1THEN385
 380 V=M(A1,A2):FORT=B1TOD1:M(T,B2)=(V*V1
 )+V:B$=STR$(M(T,B2)):B$=RIGHT$(B$,LEN(B$
 )-1):V=(V*V1)+V:X=((B2+1)*80)+(7*T):X=X-
 4:B$=LEFT$(B$,5):PRINT@X+(6-LEN(B$)),B$;
 :NEXT:PRINT@0,STRING$(80,32);:GOTO65
 385 V=M(A1,A2):FORT=B2TOD2:M(B1,T)=(V*V1
 )+V:B$=STR$(M(B1,T)):B$=RIGHT$(B$,LEN(B$
 )-1):V=(V*V1)+V:X=((T+1)*80)+(7*B1):X=X-
 4:B$=LEFT$(B$,5):PRINT@X+(6-LEN(B$)),B$;
 :NEXT:PRINT@0,STRING$(80,32);:GOTO65
 390 B$="":PRINT@0,STRING$(80,32);:PRINT@
 0,"Enter value ";:GOSUB660:V1=VAL(B$):GO
 SUB185
 395 IFB1=D1THEN405
 400 V=M(A1,A2):FORT=B1TOD1:M(T,B2)=V/V1:
 B$=STR$(M(T,B2)):B$=RIGHT$(B$,LEN(B$)-1)
 :V=V/V1:X=((B2+1)*80)+(7*T):X=X-4:B$=LEF
 T$(B$,5):PRINT@X+(6-LEN(B$)),B$;:NEXT:PR
 INT@0,STRING$(80,32);:GOTO65
 405 V=M(A1,A2):FORT=B2TOD2:M(B1,T)=V/V1:
 B$=STR$(M(B1,T)):B$=RIGHT$(B$,LEN(B$)-1)
 :V=V/V1:X=((T+1)*80)+(7*B1):X=X-4:B$=LEF
 T$(B$,5):PRINT@X+(6-LEN(B$)),B$;:NEXT:PR
 INT@0,STRING$(80,32);:GOTO65
 410 REM ****************
 415 REM - SAVE FUNCTION
 420 REM ****************
 425 PRINT@0,STRING$(80,32);:PRINT@0,"Ent
 er name for DATAFILE";
 426 INPUTNF$:NF$=NF$+"/DAT":PRINT@0,STRI
 NG$(80,32)
 427 PRINT@0,"Saving data on disk as "NF$
 430 OPEN"O",1,NF$:FORA9=1TO10:FORA0=1TO2
 0:PRINT#1,M(A9,A0):NEXT:NEXT:CLOSE:GOTO6
 5
 435 REM ****************
 440 REM - LOAD FUNCTION
 445 REM ****************
 450 PRINT@0,STRING$(80,32);:PRINT@0,"Ent
 er name of DATAFILE to be loaded";
 451 INPUTNF$:NF$=NF$+"/DAT":PRINT@0,STRI
 NG$(80,32)
 452 PRINT@0,"Loading "NF$" DATA from dis
 k"
 455 OPEN"I",1,NF$:FORA9=1TO10:FORA0=1TO2
 0:INPUT#1,M(A9,A0):NEXT:NEXT:CLOSE:GOTO8
 05
 460 REM *****************
 465 REM - TOTAL FUNCTION
 470 REM *****************
 475 T=1:GOSUB185:T=0:IFA1=B1THEN485
 480 T=0:FORQ1=A1TOB1:T=T+M(Q1,A2):NEXT:D
 2=D2+1:M(C,R)=T:X=(D2*80)+(7*D1):X=X-4:B
 $=STR$(T):B$=RIGHT$(B$,LEN(B$)-1):B$=LEF
 T$(B$,5):PRINT@X+(6-LEN(B$)),B$;:PRINT@0
 ,STRING$(80,32);:GOTO65
 485 T=0:FORQ1=A2TOB2:T=T+M(A1,Q1):NEXT:D
 2=D2+1:M(C,R)=T:X=(D2*80)+(7*D1):X=X-4:B
 $=STR$(T):B$=RIGHT$(B$,LEN(B$)-1):B$=LEF
 T$(B$,5):PRINT@X+(6-LEN(B$)),B$;:PRINT@0
 ,STRING$(80,32);:GOTO65
 490 REM *****************
 495 REM - DELETE FUNCTION
 500 REM *****************
```

Listing continues

Listing continued

```
505 PRINT@0,STRING$(50,32);:PRINT@0,"DEL
ETE.  Enter Co-ordinates:";:GOSUB195:A1=
C:A2=R:PRINT"..";:GOSUB195:B1=C:B2=R:IFA
1=B1THEN515
510 FORQ1=A1TOB1:M(Q1,A2)=0:X=((A2+1)*80
)+(7*Q1):X=X-4:PRINT@X+1,"      ";:NEXT:P
RINT@0,STRING$(80,32);:GOTO65
515 FORQ1=A2TOB2:M(A1,Q1)=0:X=((Q1+1)*80
)+(7*A1):X=X-4:PRINT@X+1,"      ";:NEXT:P
RINT@0,STRING$(80,32);:GOTO65
520 REM ********************
525 REM - AVERAGE FUNCTION
530 REM ********************
535 A=1:GOSUB185:A=0:IFA1=B1THEN545
540 A=0:F1=0:FORQ1=A1TOB1:A=A+M(Q1,A2):F
1=F1+1:NEXT:A=A/F1:M(D1,D2)=A:B$=STR$(M(
D1,D2)):B$=RIGHT$(B$,LEN(B$)-1):B$=LEFT$
(B$,5):X=((D2+1)*80)+(7*D1):X=X-4:PRINT@
X+(6-LEN(B$)),B$;:GOTO65
545 A=0:F1=0:FORQ1=A2TOB2:A=A+M(A1,Q1):F
1=F1+1:NEXT:A=A/F1:M(D1,D2)=A:B$=STR$(M(
D1,D2)):B$=RIGHT$(B$,LEN(B$)-1):B$=LEFT$
(B$,5):X=((D2+1)*80)+(7*D1):X=X-4:PRINT@
X+(6-LEN(B$)),B$;:GOTO65
550 REM ****************
555 REM - HELP FUNCTION
560 REM ****************
565 PRINT@0,"HELP - Select which of the
following: B,Q,N,P,C,R,S,D,L,T,A,G ";
570 A$=INKEY$:IFA$=""THEN570ELSEPRINT@0,
STRING$(80,32):IFA$="B"THEN580ELSEIFA$="
Q"THEN585ELSEIFA$="N"THEN590ELSEIFA$="P"
THEN595ELSEIFA$="C"THEN600ELSEIFA$="R"TH
EN605ELSEIFA$="S"THEN610ELSEIFA$="D"THEN
615ELSEIFA$="L"THEN620
575 IFA$="T"THEN625ELSEIFA$="A"THEN630EL
SEIFA$="G"THEN635ELSE570
580 PRINT@0,"<B>LANK - Clears the conten
ts of the current cursor position.";:GOT
O640
585 PRINT@0,"<Q>UIT - Exits the QUICKCAL
C program and returns to BASIC.";:GOTO64
0
590 PRINT@0,"<N>EW SCREEN - Clears the s
creen and restarts the program.";:GOTO64
0
595 PRINT@0,"<P>RINTER OUTPUT - Outputs
screen to printer for hardcopy.";:GOTO64
0
600 PRINT@0,"<C>OMPUTE - Performs a math
 function with two Co-ordinates.";:GOTO6
40
605 PRINT@0,"<R>EPLICATE - Performs a ma
th function on a series of Co-ordinates.
";:GOTO640
610 PRINT@0,"<S>AVE - Saves the screen c
ontents on disk.";:GOTO640
615 PRINT@0,"<D>ELETE - Allows you to de
lete a series of co-ordinates.";:GOTO640
620 PRINT@0,"<L>OAD - Loads a previously
 saved screen from disk.";:GOTO640
625 PRINT@0,"<T>OTAL (SUMMATION) - Adds
a series of co-ordinates together.";:GOT
O640
630 PRINT@0,"<A>VERAGE - Finds the avera
ge of a series of co-ordinates.";:GOTO64
0
635 PRINT@0,"<G>RAPH - Displays a row or
 column graphically on the screen.";:GOT
```

Listing continues

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Listing continued

```
0640
640 A$=INKEY$:IFA$=""THEN640ELSE65
645 REM **********************
650 REM - VALUE INPUT ROUTINE
655 REM **********************
660 PRINTCHR$(01);
665 A$=INKEY$:IFA$=""THEN665ELSEIFA$=CHR
$(13)THENPRINTCHR$(02);:RETURN
670 IFA$=CHR$(08)THENPRINTCHR$(08);:B$=L
EFT$(B$,LEN(B$)-1):GOTO665
675 PRINTA$;:B$=B$+A$:GOTO665
680 REM *************
685 REM - QUICK PLOT
690 REM *************
695 CLS:FORT=1TO20:P(T)=0:Z(T)=0:NEXT:PR
INT@0,"--- QUICKPLOT Version 1.0 ---";
700 PRINT@160,"GRAPH - Select a column o
r row (C OR R) ";
705 A$=INKEY$:IFA$=""THEN705ELSEIFA$="C"
THENK=1:PRINTA$;:GOTO710ELSEIFA$="R"THEN
K=2:PRINTA$;:GOTO720ELSEGOTO705
710 PRINT@320,"Enter column you wish to
graph (A - J)";
715 A$=INKEY$:IFA$=""THEN715ELSEIFA$<"A"
ORA$>"J"THEN715ELSES=ASC(A$)-64:FORQ=1TO
20:P(Q)=M(S,Q):Z(Q)=M(S,Q):NEXT:GOTO735
720 PRINT@320,"Enter row you wish to gra
ph (1 - 20) ";
725 A$=INKEY$:IFA$=""THEN725ELSEIFA$<"0"
ORA$>"2"THEN725ELSEZ5$=A$:PRINTA$;
730 A$=INKEY$:IFA$=""THEN730ELSEIFA$<"0"
ORA$>"9"THEN730ELSEZ5$=Z5$+A$:PRINTA$;:S
=VAL(Z5$):Z5$="":FORQ=1TO10:P(Q)=M(Q,S):
Z(Q)=M(Q,S):NEXT:GOTO735
735 CLS:FORX=170TO1770STEP80:PRINT@X,CHR
$(158);:NEXT
740 PRINT@1771,STRING$(60,144);:IFK=2THE
NPRINT@1852,"A     B     C     D     E
   F     G     H     I     J";:NE=10ELSE
PRINT@1851,"01 02 03 04 05 06 07 08 09 1
0 11 12 13 14 15 16 17 18 19 20";:NE=20
745 F=0:FORN=1TONE-1:IFP(N)>P(N+1)THENGO
SUB755
750 NEXT:IFF<>0THEN745ELSE760
755 F=1:S1=P(N):P(N)=P(N+1):P(N+1)=S1:RE
TURN
760 Q2=1:FORX=0TONE:PRINT@1920-(80*Q2),U
SING"######.##";P(NE)*(X/NE);:Q2=Q2+K:NE
XT:X=1772:IFNE=10THENIN=6ELSEIN=3
765 L=1:Q3=1:FORW=1TONE
770 Z2=(Z(W)/P(NE)*19)+1
775 P3=X-(80*Z2):P3=P3+80:IFX=P3THENX=X+
IN:NEXTWELSEFORP=XTOP3STEP-80:PRINT@P,CH
R$(158);:NEXTP:X=X+IN:NEXTW
780 PRINT@0,STRING$(80,32);:PRINT@0,"Sel
ect Control Function (A,Q,P,R) ";CHR$(32
);
785 A$=INKEY$:IFA$=""THEN785ELSEIFA$="Q"
THENCLS:PRINT"PROCESSING COMPLETE":PRINT
:ENDELSEIFA$="P"THEN830ELSEIFA$="A"THEN6
95ELSEIFA$="R"THEN805ELSEGOTO785
790 REM **********************
795 REM - RECONSTRUCT DISPLAY
800 REM **********************
805 CLS:FORT=2TO21:PRINT@80*T,USING"##";
T-1;:PRINTCHR$(158);:NEXT:PRINT@80,STRIN
G$(2,32);CHR$(154);S$;" A ";S$;S$;" B ";
S$;S$;" C ";S$;S$;" D ";
810 PRINTS$;S$;" E ";S$;S$;" F ";S$;S$;"
 G ";S$;S$;" H ";S$;S$;" I ";S$;S$;" J "
;S$;CHR$(154);CHR$(154);:FORT=2TO21:PRIN
T@80*T+74,CHR$(158);USING"##";T-1;:NEXT
815 FORX=1TO10:FORY=1TO20:IFM(X,Y)=0THEN
NEXT:NEXT:B$=STR$(M(1,1))ELSECP=((Y+1)*8
0)+(7*X):CP=CP-4:B$=STR$(M(X,Y)):B$=RIGH
T$(B$,LEN(B$)-1):B$=LEFT$(B$,5):PRINT@CP
+(6-LEN(B$)),B$;:NEXT:NEXT:B$=STR$(M(1,1
))
820 X=163:C=1:R=1:GOTO65
825 GOTO825
830 PRINT@0,STRING$(80,32);:PRINT@0,"Whe
n printer ready, depress <ENTER>";:INPUT
Q$;:PRINT@0,STRING$(80,32);:PRINT@0,"Top
 of page (Y OR N)";
835 A$=INKEY$:IFA$=""THEN835ELSEIFA$="Y"
THENSYSTEM"FORMS T"ELSEIFA$="N"THEN840EL
SEGOTO835
840 PRINT@0,STRING$(80,32);:PRINT@0,"Whe
n ready to print, depress <ENTER>";:INPU
TQ$;:PRINT@0,STRING$(80,32);:PRINT@0,"Pr
inting Bar-Graph of data"
845 SYSTEM"SCREEN":GOTO780
850 REM **********************
855 REM - ERROR PROCESSING
860 REM **********************
865 PRINT@0,STRING$(80,32);:FORT=1TO10:P
RINT@0,"*** ENTRY ERROR ***";:FORQ=1TO50
:NEXT:PRINT@0,"***                ***";:FOR
Q=1TO50:NEXT:NEXT:PRINT@0,STRING$(80,32)
;:C=1:R=1:X=163:B$=STR$(M(1,1)):RESUME65
```


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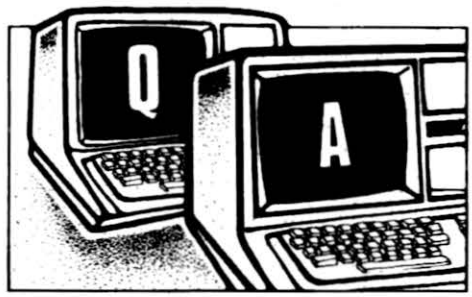
FEEDBACK LOOP

by Terry Kepner



Send any questions or problems dealing with any area of TRS-80 microcomputing to Feedback Loop, *80 Micro*, 80 Pine St., Peterborough, NH 03458.

My first problem is with Doughflo from Alphanetics. It's a great program, but is rendered useless by the back-up protection. It doesn't make sense to have the ability to change categories at will if back-up copies can't be made. In addition, it would be foolhardy to enter month after month of financial data without being able to back up the data.

Readers should be warned of this back-up restriction. After paying almost $100 for a program, I feel I should be permitted full, unrestricted use of it, while being fully aware of the copyright laws.

My second problem is with the Epset program from Computer Shack. This program simply doesn't work! I've written to the company twice and haven't received a reply. I recently returned the disk to them requesting they either provide assistance or correct the faulty disk. I can bear with a manufacturer that's having a product problem, but to be ignored is unforgivable.

E.S.
York, ME

I tried to locate Alphanetics in *80 Micro*'s advertiser list but was unsuccessful, so I can't give you any advice from them on how to back up your data. I find it incredible that a financial program doesn't let you back up your data. What you should do is write-protect your program disk and try to get the data stored on a formatted disk in drive 1. This disk should be easy to back up, leaving the program disk still protected. If they have indeed protected the data from back-up, then the product is useless for any serious financial use.

I did reach Computer Shack and asked about Epset. The sales representative said that he hasn't heard of any other complaints about Epset and looked in their records for your letters. He told me that he was unable to find your correspondence, and asked that you write directly to him to resolve the situation (Laine A. Reynolds, Computer Shack, 1691 Eason, Pontiac, MI 48054, 313-673-8700).

I'm having problems with RS-232 communications on my Model I. I have all RS equipment: Model I Level II, RS-232 interface (26-1145), telephone interface (26-1171), communications package (26-1149), and RS terminal package on tape.

I've used the telephone interface on Model IIIs at the store, and it works fine. I've also tried the store's Model I with my RS-232 and with a new RS-232 which resulted in the same problem. The computer store then let me use their Model I with my software and with their new software. That didn't help either.

When I short pins 2 and 3 together, nothing is echoed back to the CRT.

Any help you can give me is appreciated.

R.R.
Wenatchee, WA

Your problem is probably the connection between the RS-232 board and the expansion interface. Unfortunately for Model I owners, all the connections between the EI and anything else are done via tin/lead-coated contacts. These contacts are subject to oxidation. Even contacts that appear sealed (that is, the plug fits firmly over the edge-connector, as at the EI to CPU connector) gradually deteriorate until data is lost and the contacts have to be cleaned.

The connector between the EI and the RS-232 is a special problem because the connector is bolted in place over the EI circuit board, and to the RS-232 board. Cleaning them is no small chore. You must disassemble the EI case to get at the EI/RS-232 connection and remove the RS-232 board from the EI/RS-232 connection before you can get to the corroded contacts. Clean the contacts with isopropyl alcohol and Q-tips.

Occasionally you'll have to use very fine emery paper to sand off the rough spots on the circuit board contacts but make sure you don't leave any fine metal particles floating around inside the case, or you'll damage the EI. Complicating the entire problem is the fact that the RS-232 board gets hot while you're using it and will eventually warp, pulling away from the contacts in the middle of the connection.

There are two ways to correct this problem. The first solution is simple: Unscrew one of the screws by about three turns and try your software (shorting pins 2 and 3 together to echo to the screen). If you don't get a response, try loosening the other screw a few turns, and repeat the procedure. If you still have problems, wiggle the board a bit and experiment with the screws, tightening and untightening them until you get a response. If your RS-232 board works at all, you'll eventually get a result. The drawback with this solution is that you have to fiddle with the board every time you want to use it.

The second solution requires getting a small bar of wood or insulated metal, placing it over the RS-232/EI contacts and bolting it in place with the RS-232 screws. The bar prevents the board from bending in the middle over the contacts. Making the bar and drilling the holes in it are the hard parts, especially if you use a metal bar.

This, however, still leaves you with the problem of determining whether or not your RS-232 board is functioning properly when you want to use it. I wrote a short machine-language program for my disk system that scans the RS-232 switch settings and tells me what the switch settings are (baud rate, word length, etc.) and whether or not there's a status fault with the board. If there is, I have to wiggle the RS-232 board one more time. I usually grab the RS-232 cable and the EI/CPU cable connectors and flex the EI circuit board by pressing down on each connector. A word of warning: Don't press too hard or you'll ruin your EI.

Scanned by Ira Goldklang - www.trs-80.com

I'm interested in connecting my Model III to the outside world through the 50-pin I/O bus, but I've found that this isn't as easy as I thought. Could you give me an example of a short listing that would input one byte through the I/O data pins?

G.C.
Ft. Lauderdale, FL

I'm afraid I'm not very well versed in the intricacies of real world interfacing through the 50-pin bus. However, if you'd like more information on how to do this refer to Elliot K. Rand's three-part series, "TRS-80 Real World Interfacing," published in the October, November, and December 1981 issues of *80 Micro*.

Also available are The Blacksburg Group books: *TRS-80 Interfacing—Volume I* (#21633), and *TRS-80 Interfacing—Volume II* (#21739). They can be purchased from The Blacksburg Group, P.O. Box 242, Blacksburg, VA 24060, 703-951-9030.

The only difference between the Model I and Model III bus ports is one control signal, which the Model III technical manual explains.

I wish to format the source listings from Model III Level II Basic so as to: move the listing to the right on the page to allow for three hole punches, number the pages, leave top and bottom margins, print TIME$ in the headings and print the disk file name in the heading.

Do you know how I can intercept LLIST output? I've searched through the ads of 80 Micro *for such a program, and wonder why someone hasn't done this already.*

J.W.
Chattanooga, TN

First, several people have published such a program. KVP, sold by the now-defunct TSE, formatted listings; Instant Software sold one for the Model I; *80 Micro*, February 1980, p. 120, has a listing formatter written in Basic, another Basic program in February 1981, p. 214, and still another Basic program in October 1981, p. 374. In addition, several other magazines have printed routines to do what you want.

If you want to write a routine yourself, you'll first need *Model III ROM Commented* from Soft Sector Marketing Inc. (P.O. Box 340, Garden City, MI 48135, 800-521-6504, $22.50). The next step is to get *Microsoft Basic Decoded & Other Mysteries* by James Farvour, from IJG Computer Services (1953 West 11th St., Upland, CA 91786, 714-946-5805, $29.95), which explains how Basic works.

The last step is the hardest: Intercept the information being sent to the printer by placing the address of your routine in place of the ROM LLIST routine's address in the printer device control bytes located at 4026H and 4027H.

Now whenever information is sent to the printer, it goes to your routine and not to the ROM routine. IJG's book will give you the information about how Basic works, what ROM routines are available, how to use them, and a complete disassembly of the MicroSoft ROM in the Model I. The SSM book will show the disassembly of the Model III ROM, which is 90 percent the same as the Model I, but what little differences there are, are crucial.

I upgraded my Model I Level II computer to disk. I got TRSDOS 2.3 as my operating system because it's the Model I standard and is reasonably priced. The drive I have has 40 tracks, and I can't get more than 35 tracks with TRSDOS.

I used Super Utility to format all 40 tracks, but TRSDOS won't access the additional five tracks. Is there any patch that enables TRSDOS to access these extra five tracks?

K.S.
Pittsburgh, PA

I know of no patch that allows TRSDOS 2.3 to operate as a 40-track system. I can come up with two solutions: either buy a 40-track DOS, or patch TRSDOS yourself.

I suggest that you buy a new DOS. For your needs, MULTIDOS from Cosmopolitan Electronics Corp. (5700 Plymouth Road, Ann Arbor, MI 48105, 313-668-6660, $99.95) is probably best. MULTIDOS is closest to TRSDOS 2.3 in operation and use, and is less expensive than all the other DOSes. It's not as complex as LDOS or NEWDOS80, and uses the same syntax as TRSDOS 2.3, unlike DOSPLUS. You can use it almost immediately, with only minor changes from TRSDOS. MULTIDOS is also the only DOS capable of reading everyone else's DOS, and it operates with 35-, 40-, 77-, and 80-track drives, single- and double-density. It includes a Basic that takes up less memory than TRSDOS Basic, but gives you many more features.

The other choice, patching TRSDOS 2.3 for 40-track operation, is very time consuming and costs almost as much as buying a new DOS. First you'll need to buy *TRSDOS 2.3 Decoded & Other Mysteries* from IJG ($29.95, see previous letter in this column for address) to find out where you'd have to patch TRSDOS 2.3 (find all the references for 35-track and change to 40). Next, buy an editor/assembler program to disassemble the Backup and Format routines, and search through them to determine where patches are needed for 40-track operation.

Radio Shack's Series I Editor/Assembler costs $34.95, and the IJG book is another $29.95. By the time you add in your time, you could've bought MULTIDOS. Even if you only patch TRSDOS 2.3 and use Super Utility for formatting and backups, the time spent patching the 2.3 combined with the uncertainty of whether you made all the patches needed will more than make up the difference in cost.

I have an IBM Selectric typewriter, Model 745, complete with transistor drivers and solenoids so that it can be used as a printer.

Can you help me find information for building or buying an interface to use this Selectric with my TRS-80?

D.K.
Collinsville, CT

The only information I could find on interfacing the IBM Selectric with computers is George Young's book *The Selectric Interface, A Hands-on Approach* (Wayne Green Publications, Peterborough, NH 03458, 603-924-9471, ISBN 0-88006-051-4, $12.97). This book explains how to construct an interface between 6502, 8080, or Z80 computers and IBM Selectric models 2740, 2980, and Dura 1041 I/O Writers. Both hardware and software discussions are included, as well as a PC board layout (photo ready). While the book describes interfacing for the 2740, 2980, and Dura 1041 only, the techniques discussed should give you a handle on how to design an interface for your own unit.

My Model I has a Disk 80 Interface from Micromint, one TEAC 40-track disk drive, and a RS LPVII. I recently discovered a problem with the Disk 80 Interface that I would like to pass along to other Disk 80 users.

The Disk 80 Interface has the parallel printer port on a separate board from the main memory and disk logic interface board. The power supply is on the printer port board.

The problem is this: I purchased the Alpha Products joystick, which plugs into the interface bus connector (J# on the Disk 80 Interface) and found that the joystick didn't work. Subsequent testing reveals that the Basic command INP(0) returned a value of zero—something was grounding the data bus lines. Disconnecting the interval ribbon cable between the main PCB and the power/printer PCB made the joystick work as it should (INP(0) returned a value of 255).

The Disk 80 schematics indicated that eight 1k resistors were connected from the ground to the data bus lines (D0–D7). By removing these resistors (labeled R4–R11), the Alpha Products joystick worked without affecting the performance of the printer port.

I'm not sure of the function of the terminating resistors R4–R11. Why are they included?

H.C.
Minneapolis, MN

The resistors provide reliability. The design of the standard RS interface leaves the expansion bus lines floating, terminated neither high nor low. Thus the data lines are extremely sensitive to extraneous electromagnetic noise, such as that from the address lines located beside the data lines. This sensitivity makes the RS Expansion Interface difficult to deal with; some EIs have to be modified by adding the buffered cable modification, or the MUX modification, or both before data operation is reliable.

The Disk 80 removes this sensitivity by tying the data lines low, thus preventing them from picking up extraneous noise. The resistors also protect the internal chips of the Disk 80 from overload when too many nonbuffered circuits are attached to the data lines. The chips driving the data lines are designed to directly drive only two or three other chips, when the lines are left floating. Driving more than the specifications allow eventually burns out the ICs.

If you want to connect more than that, or if the data lines have been tied low, you have to add buffer chips that supply additional current to the data bus lines. This means you have to have an external power supply for your add-on device. Most add-on devices are properly buffered, have their own power supply and don't even notice the resistors on the data lines. Only devices that depend on the floating condition of the data lines, or are directly powered by the data lines, are affected by the resistors. Since the Alpha Products joystick doesn't have a power supply, its power comes directly from the data lines. In the Disk 80 the resistors ground out the data lines and prevent the joystick from operating.

For reliability in your computer, you shouldn't remove the resistors. To use an unbuffered device in your computer, connect the data lines to your 5-volt power supply line by using a 470-ohm resistor for each data line. This ties the lines high, giving you more reliability than leaving the lines floating. At the same time it also lets the data lines directly power unbuffered devices.

I'm working on an Assembly-language program that uses the disk as a virtual storage memory device. To do this, the disk must be addressed by track and sector, which bypasses TRSDOS completely.

My problem is that I can't seem to code a loop tight enough to read all the data in a sector. I can do it with single-density Model I disks, but not with Model III disks (either single or double density).

E.J.M., IV
Emporia, KS

I'm not an expert on machine language disk I/O, but what you should do is buy *TRS-80 Model I Disk Interfacing Guide* by William Barden Jr. (80-Northwest Publishing, 3838 South Warner St., Tacoma, WA 98409, $5.95) and *Machine Language Disk I/O & Other Mysteries* by Michael J. Wagner from IJG Computer Services, see previous letter for address. Barden's book applies only to the Model I, and Wagner's book is for both the Model I and Model III.

If you have a Model I, I'd suggest you get both books. Barden's book is much smaller than Wagner's, but uses different wording in the explanations. Wagner's book provides much more detail in hardware, software and specific techniques.

With these two books, you should be able to easily transfer blocks of information from the disk to memory, and back again. Good luck.

I'm writing my own data base. I first wrote it in Basic, but then taught myself machine language. I'm converting some of the program's functions to machine language to speed it up.

My current problem is saving data from memory to the disk. I read each location into a string, then write the string into a sequential disk file, but very slowly. I timed the save at over seven seconds for each string. I know there must be a better way, but what is it?

P.M.
Woodville, WI

Yes, there is a better way. In fact, there are several ways. First, you can get the IJG book *Basic Faster and Better & Other Mysteries* by Lewis Rosenfelder (see previous letter for their address, $29.95). This book offers many different routines that speed up Basic programs considerably, especially those with ASCII strings.

Second, you can get *Machine Language Disk I/O* (see previous letter), which shows you how to write disk I/O routines that may even bypass the string-loading method you currently use.

Third, you can get a Trashman, a machine-language program from Prosoft (Dept. G, Box 560, North Hollywood, CA 91603, 213-764-3131, $39.95) that speeds up string garbage collection by 90 percent or more (where most of the time is spent in your string-build routine).

Fourth, you can get Faster, another machine-language program from Prosoft ($29.95). This program analyzes your Basic program while it's running and tells you how to reorganize vari-

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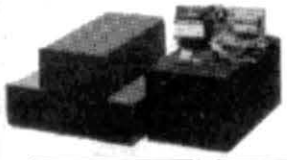

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ables to increase program speed from 20–50 percent.

I hope these suggestions help.

I use my Model I to run machine-language programs assembled by the RS Series I Editor/Assembler. I want to be able to patch into the ROM code of the Level I at more than just the places listed in the EDTASM manual. Where can I get a listing of the Level I ROM?

Also, isn't there some way to implement a USR subroutine jump from Basic by inserting machine code somewhere in memory? Or do I have to upgrade to Level II?

J.J.W.
Columbus, IN

I don't know of any listing of the Level I code. The only thing I can suggest is to write a machine-language routine to scan and disassemble the ROM. Does anyone else have a disassembly of the Level I ROM for J.J.W.?

I also don't know how you'd implement a USR routine in Level I. Usually, when programmers want to use machine language in a program, they define a new command and place it in the DOS verb command list. Putting the command in the program automatically calls the machine-language program. I have no idea if this method will work for you, especially since the Level I ROMs aren't designed to be expanded. Does anyone have any suggestions?

In the September 1982 issue there was a letter from someone who had had trouble with Radio Shack's Checkers 80 program. You gave him the stock answer with regard to unloadable tapes, but I suspect that that isn't the problem. I've also had some difficulty with that tape. I purchased two unloadable tapes and neither would load.

Since I'm also from Alabama, there may be some validity to the answer that the problem is a bad lot of tapes. I would appreciate your checking the situation out.

Incidentally, I have several other prerecorded tapes from Tandy and other companies that load with no problems.

J.M.
Auburn, AL

Since you have the same problem as M.M. of Alabama, you're probably right about the bad tape lot. Radio Shack has no idea what the problem is. The only solution is to send the tape directly to Radio Shack, explain the problem, and ask for a replacement tape from their warehouse in Texas.

Your answer to L.G. (October 1982) clarified many questions I had about the assembler. One thing, however, is still unclear: How do you arrive at the decimal values to POKE into the Basic program?

Another thing that confuses me is how to use the cassette port for sound output. Can you explain this to me?

Lastly, when I boot up and get the MEM SIZE? prompt, I don't know what to do. So far I've been unable to load and execute any Basic program with a large amount of POKE instructions. I know I have to set MEM SIZE to use machine language, but I don't understand how. I have a Model I Level II computer.

J.B.
Laurel, MD

To get the value to use in a POKE instruction, all you have to do is translate the machine-language code, which is in base 16, to normal decimal. For example, C9 is the hexadecimal code for RET (return). The value to POKE in a Basic program would be 201. To get the decimal value to use, simply multiply the first hexadecimal digit by 16 and add the second digit to it. In this example C is hexadecimal notation for 12, 9 is 9, so the answer would be $12 * 16 + 9$. If you don't want to bother calculating all the Z80 opcodes into decimal, get the October 1980 issue of *80 Micro*. It has a listing of all the opcodes and their decimal equivalents.

Sound generation is relatively simple. Normally your cassette port sends sound blips to your tape recorder that represent program bits. If you've ever listened to the tapes, you heard the signals generated by this cassette routine. Using machine language you can control the port directly, and use it to make just about any noise you want by varying the number and speed of bits sent out.

The MEM SIZE prompt asks for the address of the highest byte of RAM to be used by the Basic interpreter. Normally, by pressing enter, you tell Basic to use all RAM up to the very top of available memory. In a 16K computer this top-of-memory address is 32767. Basic begins building its variable tables, string memory, and other tables at the top of memory. Specifying an address less than the top-of-memory prevents Basic from using the memory above that address. If, for example, you answer MEM SIZE with 32000, Basic is restricted to RAM addresses below 32000. The addresses between 32000 and 32765 (inclusive) are reserved for direct machine language use. (Note: the top two memory addresses, 32766 and 32767, are used by Basic regardless of the MEM SIZE setting.)

How much memory you need to reserve depends on the size of the machine-language routine in your Basic program. Calculate the size of your routine (each byte POKEd requires one memory location) and subtract that number from 32767 (for 16K machines).

By the way, make sure that the machine-language routine is designed to run at the location you're putting it. A routine written to operate at FF00 (65280) usually won't work at 7F00 (32512) unless it's been written to be relocatable.

I'm writing an Assembly-language program. I need a random number generator between zero and five. Is there a simple way to do this?

C.P.
Colchester, CT

How can random numbers be generated in machine language? Is there a subroutine in ROM that can be called? If so, what is its address and how can it be used?

A.C.
Sunnyvale, CA

Generating random numbers in machine language isn't easy, and an exact explanation is even harder. The best I can do is refer you to the routine used by the Level II ROM, which is only a pseudo-random number generator (the number only appears random and can be made to repeat the same sequence over and over again).

The routine used in the ROM uses the Z80 refresh register. The Random com-

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mand causes the contents of the refresh register to be stored in location 40ABH (40AAH to 40ACH are used to store the 24-bit random seed number). To get a random integer number between 1 and X, put X in the HL register pair, call 14CCH and then call 0A7FH. The result is in the HL register pair, and in locations 4121H and 4122H. If you want a single-precision number between zero and 1, call 14F0H. The result is stored in locations 4121H–4124H in binary coded decimal format.

For more information on the exact code used in the ROM for random number generation, get either *Micro-Soft Basic Decoded* from IJG Computer Services (see elsewhere in this column for the address, $29.95) for the Model I ROMs decoded, or *Model III ROM Commented* from Soft Sector Marketing (6250 Middlebelt Road, Garden City, MI 48135, 313-425-4040, $22.50) if you have a Model III computer. Both versions have the code beginning at 14C9H.

Mumford Microsystems (Box 400-E, Summerland, CA 93067, 805-969-4557, $15.95) sells *Inside Level II: A Programmer's Guide to the TRS-80 ROMs* which has all the information you'll need to access ROM math routines without problems. Warnings are provided for those routines where errors will return you to the Level II Basic interpreter. Information on the Model III is included as well.

While IJG's book also gives information on using the ROM routines (*Model III ROM Commented* gives only the disassembly), the information isn't as thorough as it is in *Inside Level II*. If you're really interested in using the ROM routines in your computer, get the relevant disassembly book and *Inside Level II* for the explanations on the math routines.

My Model III puts out tremendous RFI interference on FM radio. Since other members of my family like to listen to the radio at night, this is a serious problem. I have a 48K cassette system with 200 ns extra chips, and the computer is eight feet from the radio.

C.D.W.
Wilmington, DE

I have a cassette-based Model III that has a tremendous RFI problem. The interference becomes worse when I use my recorder. The RS manual suggests moving either the computer or the TV, but in the small space I have, it isn't possible.

I've tried covering the unit with aluminum foil and grounding the cover, but it had no visible effect on the TV interference. While I don't watch TV and use the computer simultaneously, my husband has a fit when I fire it up and he's watching the TV. Help!

Details: the computer and the TV are in separate but adjoining rooms. They're not on the same electrical circuit. The TV antenna is in the attic above the computer, about five feet away. The interference is stronger on some channels than on others. Lower

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channel numbers such as 4 and 5 are greatly affected, while 7 and 9 are less affected. Interference is strongest on channel 5.

D.G.
Rixeyville, VA

RFI is the bane of TRS-80s, and the hardest problem to cure satisfactorily. The best solution is distance. Doubling the distance between the computer and the receiver (TV or radio) makes all the difference in the world, but many times that's simply not practical.

One thing to consider is the cable running from the antenna to the receiver. If you're using the standard twin-wire 300 ohm cable, it'll pick up lots of RFI from the computer. To cut down on this, switch from the 300 ohm cable to a 75 ohm shielded cable. The 75 ohm cable will require that you use a 300 ohm to 75 ohm converter at the antenna, and a similar transformer at the TV. If possible, ground the 75 ohm cable by putting in a grounding block (RS #15-909) in line with the cable and grounding it to a water pipe. This will eliminate the possibility of the TV antenna cable picking up RFI from the computer. With the cable fixed, try locating the antenna further away from the TV. Every inch helps.

If you don't have an outside antenna, or you can't move it any further, you'll have to tackle the problem at its source. The problem is made slightly easier if you have a Model III rather than a Model I. First, paint the entire inside of the case with aluminum paint, and connect it to the computer's signal ground. Next, get a ferrite core ring (about 2–3 inches in diameter) and wrap the cassette cord around the metal of the ring four or five times. Attach this ring, via a wire, to the aluminum interior of the computer case.

If you still have problems with RFI, your only choice is to build a Faraday cage around the computer. This means lining the walls, floor, and ceiling of the room with wire mesh and grounding it to a metal water pipe. It makes for a rotten decor, but should eliminate the problem. Also, don't forget to put wire mesh over the door and windows (they can be movable as long as you solder them to the rest of the mesh).

I'm afraid that these are the only solutions available right now. Let me know how it goes.

Pinch hits may cause tapes to stop loading at the end of a program.

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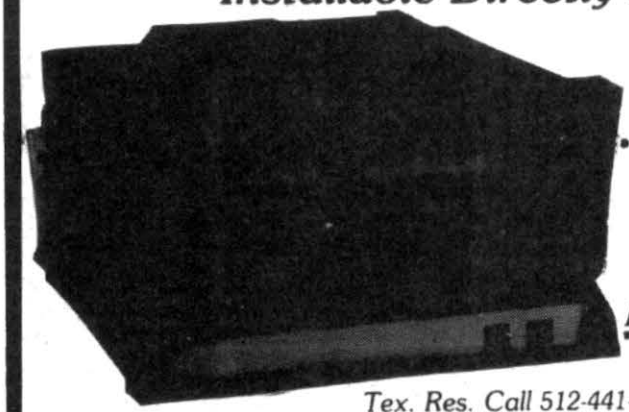

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offshoot is, unlike baseball, no hits but loss of runs (Lemons Tech Services, 325 N. Highway 65, P.O. Box 429, Buffalo, MO 65622, 417-345-7643).

V.L.
Buffalo, MO

Sounds interesting. What computers will it work with?

My original TRS-80 Model III came with 16K of RAM. I bought and installed another 32K of RAM, all 200 nanoseconds. I can load programs into that area (PRINT MEM gives me 48082), but I can't POKE any number above 32767 without getting an OV error. Help!

R.F.
Medfield, MA

Nothing is wrong with your computer or its RAM. The difficulty lies with your use of the POKE command. The format of the command is: POKE address, data. Valid numbers for the address must be in the range of −32766 to +32767, and valid numbers for the data must be in the range of 0–255. Basic is designed to accept the positive address numbers as corresponding to the first 32767 memory locations, thus POKE 32000,255 will put the decimal value 255 into memory location 32000.

The negative address numbers are used to specify memory locations between 32768 and 65535. This is slightly more complex since you must calculate the negative number corresponding to the address you want to POKE data, with −32768 being memory location 32768, and −1 being 65335. The formula to use: POKE (address −65536), data. For example, to POKE data into memory address 48344: (48344 − 65536) = −17192. So use POKE −17192, data. A formula which will work for all addresses is: POKE address + (address>32767)*65536, data.

This odd usage is needed because the ROM integer routine that checks for proper values uses signed integer notation and is restricted to the range of −32768 to +32767 (and uses two 8-bit words, one 16-bit register). Rather than use up more ROM space to write another integer-checking routine just for the POKE command, RS added a couple of lines of code to the POKE command to use signed integers.

The OV error you received stands for overflow error, meaning you used a number too large for the precision in which you were operating.

I've enclosed screen prints of a program's menu that I would very much like to obtain. The copyright logo shows "Smith Finance Systems, copyright 1979 by R. Smith." The program was written for the Model I TRS-80. Any information you can obtain is greatly appreciated.

A.F.
Woodland Hills, CA

Unfortunately, I can't find a listing for Smith Financial Systems in any of my resource books. Does anyone else have an idea of how we can find the author/publisher/source of this program? It seems to be a very complete general ledger program.

I'm requesting information on how to hook up a Sperry-Remington SR101 to my Model I that has no expansion interface. Is there a cable I can use to make it act like a printer?

M.G.
Parma Heights, OH

I can't find anything about connecting an SR101 to the Model I. The first step in checking out the possibilities is to determine what kind of input the SR101 requires (check with the manufacturer).

If it uses an RS-232, you'll need to buy an RS-232 hookup for your Model I and a program to covert the LPRINT command to send data to the RS-232 rather than to the parallel port. If it uses a parallel port, you may be able to use the printer cable from Radio Shack for Model Is without an expansion interface. In either case, it won't be easy to get all the information you need. Can anyone else help? ■

Terry Kepner is a free-lance writer and programmer, and the vice president of Interpro. He's been writing about microcomputers since 1979.

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The Toshiba uses a 24 pin print head (Epson and Prowriter use only 9 pins), along with three built in typefaces. These include High speed printing (as shown in the first paragraph), High quility Elite printing (this paragraph) and a second high quality called courier (as shown in the remainder of this ad).

By using the the Toshiba in the printing of this ad we hope to show you the actual quality thats possible with this great new printer. Such quality makes it ideal for all types of word processing. You can print a rough draft at 200 CPS (characters per second), make your corrections, and then change one letter in your printer command line and then print at high quality 100 CPS. By sending us a certified check, this printer can be yours for only 1850.95, all other forms of payment $1995.95.

PROWRITERS $399.95 NEW!!

Now the #1 selling low priced dot matrix is even lower priced. The Prowriter with its 1 year guarantee porportional spacing, 120 CPS printing, and excellent quality is only $399.95 with a certified check. All other forms of payment $429.95. This includes our special book on using the Prowriter with the TRS-80. (**NOTE:** Color Computer users an additional $59.00 gives you all the cables and converters you need.)

PRINTER HELPER

Only..... **$29.95**

Works with C. Itoh Prowriter, NEC 8513, DMP 80, or the Epson with Graphic Trax plus.

Lets you print TRS-80 block graphic's and screen dump graphics. Lets you send 14 commands to the printer from dos or basic with 1 keystroke.

Lets you set up your printer so on powerup it will be in any configuration you want. Example: you could power up in the compressed mode with the left margin set at 15.

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C. ITOH or NEC..... **$9.99**
Epson MX 80..... **$7.99**

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Special white with laser cut edges. The perf's rip off this paper with a super fine edge, looks like cut paper. 18lb. paper 2700 sheets a box, after perf's are ripped off the paper is standard 8½ X 11. **$39.95/bx**

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↙See List of Advertisers on Page 371

MODEL III DRIVE KITS

DON'T BE FOOLED. COMPUKIT USES THE HIGHEST QUALITY PARTS AVAILABLE. ALL DRIVE KITS CONTAIN 32K OF MEMORY,ASTEC SWITCHING POWER SUPPLY,A DRIVE CONTROLLER BOARD THAT WORKS WITH ALL MODEL III OPERATING SYSTEMS,FACTORY MOUNTING BRACKETS,A MANUAL THAT IS EASY TO USE,TANDON DISK DRIVES,AND DOSPLUS3.4 (a $150. value)

DRIVE KIT WITH ONE 40trk DISK DRIVE $479.

DRIVE KIT WITH TWO 40trk DISK DRIVES $699.

DRIVE KIT WITH TWO DOUBLE SIDED DISK DRIVES $899.

TANDON DISK DRIVES

bare/with case and power supply

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TM100-2 DS 40trk $299./$349.

TM101-4 DS 80trk $329./$379.

2 DRIVE CABLE $24.95

MODEL III SYSTEMS

ONE DRIVE 48K $1495.

TWO DRIVE 48K $1695.

DOUBLE HEADED TWO DRIVE SYSTEM $1895.

OPTIONS (RS232C-$69.),(GREEN PHOSPHUR CRT $89)

COMPUKIT DOCTOR $29.95

by Jim Penny

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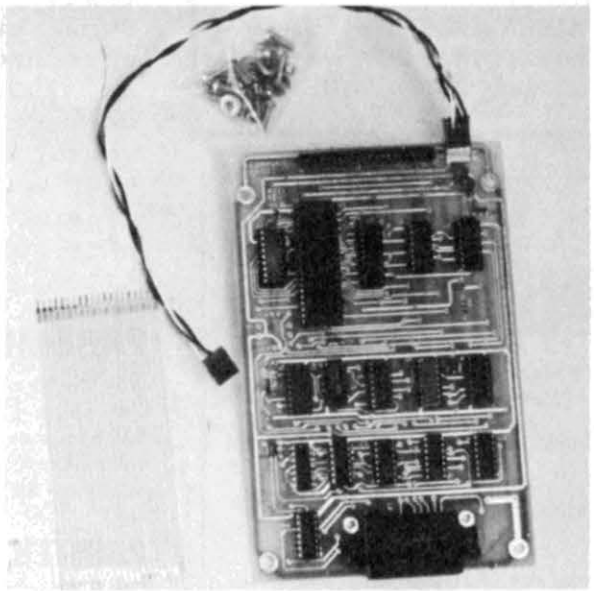

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HOUSTON, TEXAS 77059

455

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$1295.

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MODEL I SYSTEM
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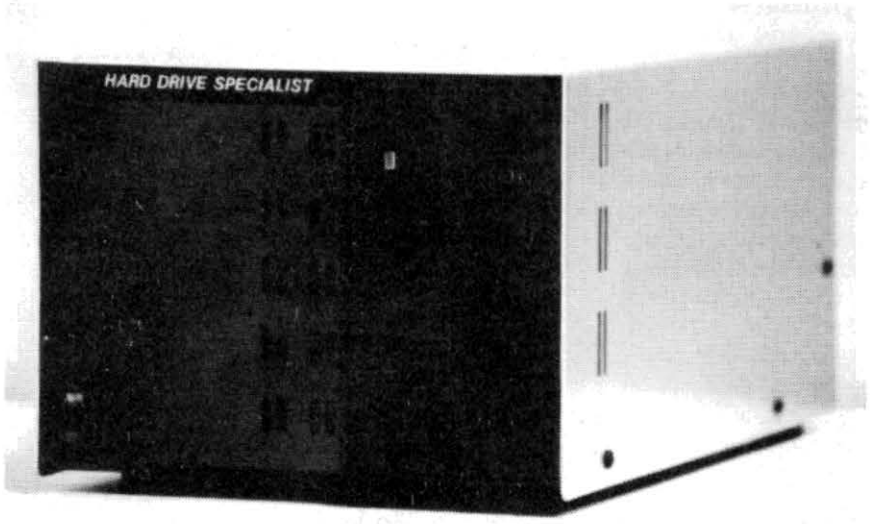

It's no secret. We have a huge quantity contract to bring you the highest quality system at the lowest price available. The combination of Tandon Hard Drives and Western Digitals error checking and correcting Hard Drive Controller Board create the back bone of the Hard Drive Specialist System. The balance of the interfacing is by one of the oldest Engineering teams in the Model III/ Hard Drive business. These Systems have been in testing since the September of 1981 and have proven to be reliable and fault free.

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5 Megabytes $1295.	5 Megabytes $895.
10 Megabytes $1495.	10 Megabytes $1095.
15 Megabytes $1695.	15 Megabytes $1295.

All prices include our 120 day warranty and shipping anywhere in the U.S.A. .Compatible with DOSPLUS 4.0 and 3.5 . Model I option add $50.

HARD DRIVE SPECIALIST

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or visit our showroom at 16206D Hickory Knoll Houston, Texas

NEW PRODUCTS

edited by Eric Grevstad

Model 16 Xenix

Radio Shack has chosen Microsoft Corp.'s Xenix as the standard operating system for the Model 16, letting the 256K, hard-disk-equipped micro support one or two additional terminals simultaneously. Each user can operate a different applications program or share the same programs, data, and peripherals.

The Xenix system will be supplied to all Model 16 owners and included in new production. Radio Shack plans to introduce several multi-user software packages, as well as the C language and a version of Microsoft Basic, for Xenix; a floppy-disk-based Xenix for single-user operation will appear later in the first half of 1983.

Reader Service ✓550

Dot-Matrix Printer Family

Infoscribe Inc. offers a line of five dot-matrix printers built around a noise-reducing foam chassis. All offer lowercase descenders, underlining, subscripts and superscripts, and print 10, 12, or 16.5 characters per inch at a line spacing of six or eight lines per inch.

The Infoscribe 500 ($1,530) prints 75 correspondence-quality characters per second, speeding to 150 cps for data processing; the 1000 ($1,895) operates at 100 or 200 cps, and adds dot-addressable graphics.

The 1100 ($2,295) adds a 40-cps business-letter mode and a variable 7-by-9, 14-by-9, or 19-by-18 matrix. The 1200 ($2,495) prints up to eight colors with a four-color cartridge ribbon, and the high-speed 1500 ($2,995) runs at 200 cps for correspondence, 400 cps for data processing.

Each printer features a bi-directional, logic-seeking printhead, and is available with serial or parallel interface (the 1200 and 1500 have both). They are available from Infoscribe, 2720 South Croddy Way, Santa Ana, CA 92704, 714-641-8595.

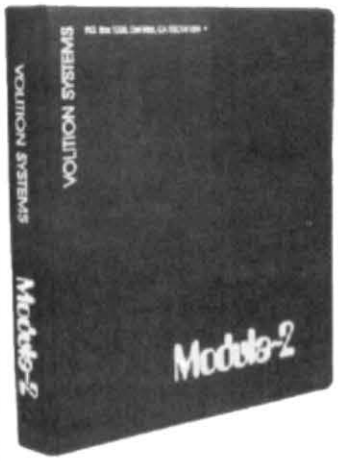
Reader Service ✓555

Boot the Model II

Systems Enhancement Engineering's Boot Error Eliminator (SeeBee) unit is an electronic interface that prevents destruction of system-disk data if the Model II is initialized while the disk expansion unit is turned off.

Normally, the Model II user who forgets to turn on the expansion unit or inadvertently turns it off during system use is rewarded with a dc boot error and lost data.

Infoscribe 1100



Modula-2 User's Manual

The SeeBee unit plugs between the computer and the disk drive cable, eliminating the problem.

It sells for $59.95 plus $3 shipping and handling from Systems Enhancement Engineering, P.O. Box 40215, Indianapolis, IN 46240, 317-844-8817.

Reader Service ✓554

Modula-2 Manual

A 264-page manual, featuring a tutorial, definitions, and Niklaus Wirth's own 48-page monograph on the new language, introduces readers to Modula-2.

Wirth, creator of Pascal, designed Modula-2 to replace his earlier language in a wide range of real-world applications. Its structure allows the development of large, complex systems, using standard software modules that serve functions normally provided by an operating system and utilities.

The manual's publisher, Volition Systems, claims that Pascal programmers can become comfortable with the language in a few hours, and proficient within a week. Besides the tutorial, the $35 book includes sections defining the standard library modules and a machine-specific implementation guide.

The manual and additional sources of information, such as Wirth's book *Programming in Modula-2* ($16), are available from Volition Systems, P.O. Box 1236, Del Mar, CA 92014, 619-481-2286.

Reader Service ✓566

Life in the Fast Lane

Revolution, a menu-driven game for the Color Computer, goes beyond lap times and lap records to simulate the actual experience of being a race driver.

In addition to discussions with the team and choosing cars and tracks to race on, Revolution offers the player the opportunity to create and save new tracks. Fast, high-resolution machine-language graphics show the action; lap records are stored and retrieved automatically.

The game requires joysticks; it sells for $24.95 (32K disk version) or $22.95 (16K cassette) from Inter + Action, 113 Ward St., New Haven, CT 06519, 203-562-5748.

Reader Service ✓558

A Clearer Profile

Plus Explained is a package of 75 helper sheets, printed on both sides and punched with three holes, for insertion into the Profile III + manual. Fitting between the original manual pages, the sheets explain and expand on Radio Shack's instructions. Two 17-by-22-inch wall charts show where the program goes, why, and what commands to use.

The package sells for $12, and the charts alone for $2, from Crest Software, 2132 Crestview Drive, Durango, CO 81301, 303-247-9518.

Reader Service ✓560

Talk to the TRS-80

Mike Rigsby (see "Voice-Controlled Typewriter," *80 Micro*, December 1982, p. 72), has published *Verbal Control With Microcomputers*, a 312-page guide to teaching your micro to recog-

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).

# STRINGS	SECONDS DELAY NORMAL	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

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.

ATTENTION SOFTWARE PUBLISHERS:
Trashman may be licensed for use with your packages. Call for details.

(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."**

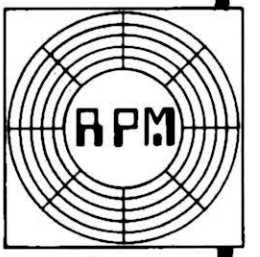
FASTER runs on the TRS-80 Models I and III, 16-48K tape or disk, and all major operating systems. **$29.95**

"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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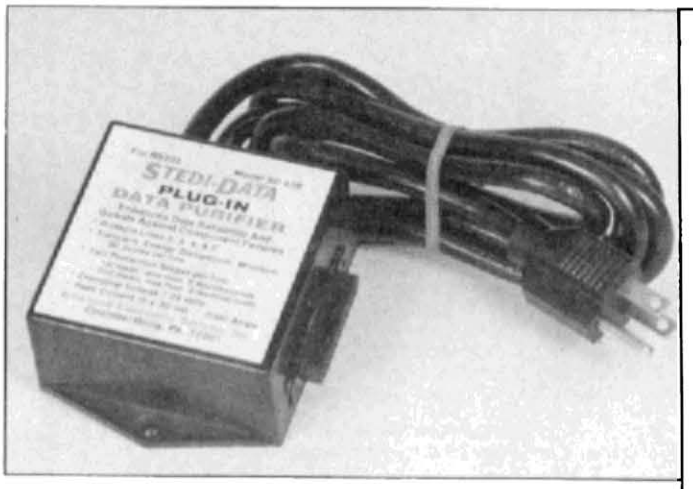
✓See List of Advertisers on Page 371



Stedi-Data

nize and respond to spoken commands.

Assuming no special electronics knowledge or advanced programming experience, the book moves from simple routines that present a screen display of a spoken word to a program that allows no-hands operation of printers or other devices. Each program and hardware project is fully annotated and mapped.

The book sells for $18.95 (hardcover) or $11.95 (paperback). The programs, designed for the 16K Level II Model I, are available on a ready-to-run disk ($34.95) that can be converted for the Model III.

For more information, contact Tab Books Inc., Blue Ridge Summit, PA 17214, 717-794-2191.

Reader Service ✓551

Safer Data Transmission

The Stedi-Data unit protects computers, modems, and printers using the RS-232 interface from voltage transients and other interference. It plugs into any RS-232 equipment using the standard 25-pin "D" connectors, and stops pulses within 0.5 nanosecond to ensure accurate transmission and reception.

Two models are available: the SD428 ($149.50) for hardwired communications systems, and the SD828 ($249.50) for modem-based systems. For more information, contact National Field Sales Inc., P.O. Box 230, Broomall, PA 19008, 800-345-1280.

Reader Service ✓574

Graphics Master

Graphics Master offers Level II Basic users an efficient way of adding graphics to their programs. It features an etch-a-sketch routine to create designs of any size, a conversion routine that stores up to 32 different designs in Basic REM lines, and a 900-byte machine-language routine that displays the designs at high speed.

Designs and their display routine can easily be appended to any Basic program. Moving or animated designs can overlap or cross each other; artistic choices include optional wraparound and black/white or left/right reversal.

The program runs on the Level II Model I with 16K or more memory. With demo program and manual included, price is $24.95 from Stanton & Sons, 1130 20th Ave. East, Seattle, WA 98112, 206-324-1512.

Reader Service ✓568

Print Your Checks

A new line of continuous fanfold checks offers small businesses the opportunity to write checks on any tractor-, pin-, or friction-feed printer capable of printing 10 characters per inch.

The checks are the universal 9½-inch computer form width and are folded three to a page. An accompanying program, Checkbook-Checkwriter II, allows printing of a single check as well as batch printing of monthly or even erratically scheduled checks with a few keystrokes. The program prints the check stub for a permanent record, as well as creating data files for later reference.

The program is written in Basic and takes about 12K of memory; it is available for both the Model I/III and the Color Computer. A package including checks, cassette, and dual-windowed envelopes costs $59.95 (200 checks) or $79.95 (500 checks) from Synergetic Solutions, 4715 Shepherd Road, Mulberry, FL 33860, 813-646-6557. Disk versions of the package are $2 extra.

Reader Service ✓577

First Draft, Second Draft

Compare is a utility that studies two specified Basic programs on disk and displays or prints lines that differ. It is easier, faster, and more accurate than comparing printouts for documenting program changes.

You can choose to compare the complete programs, or limit the scan to a block of line numbers. Compare can list unchanged as well as changed lines; the comparison is given in titled, paged form.

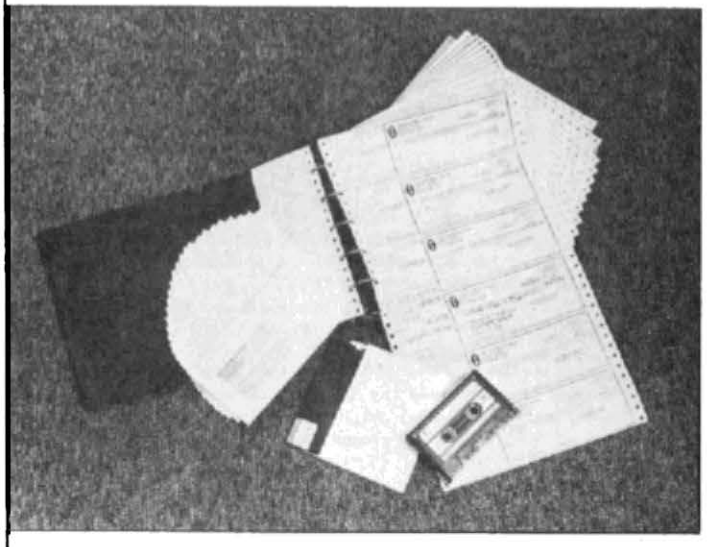
The utility is supplied on cassette for transfer to disk; it requires 32K on either the Model I or III. Price is $24.95 from Data Associates, Box 882, Framingham, MA 01701.

Reader Service ✓573

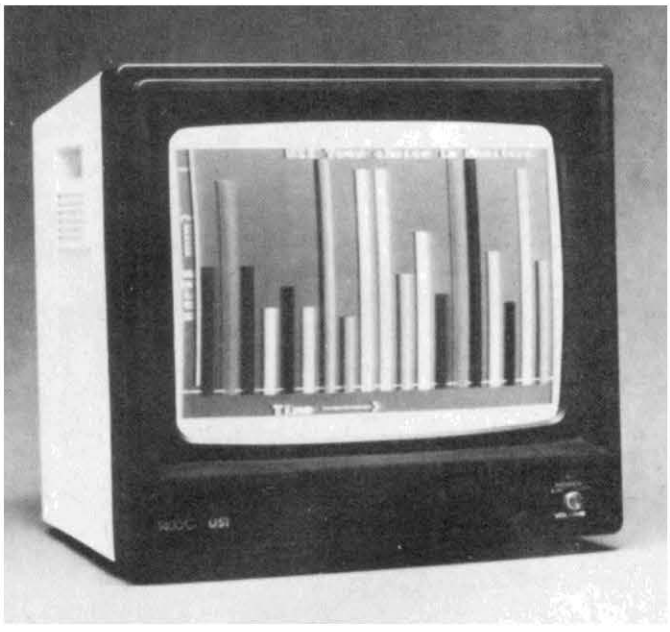
Satellite Tracker

Pathfinder III is a 48K Model III program that will track any circular-orbit satellite from anywhere in the world in real time on a world map. It can track two satellites simultaneously, printing all data tables, and give a summary of orbital characteristics and predicted orbits between specified dates.

The program comes with tracking data for OSCAR-8, NOAA 6 and 7, and the RS 3-8 series of satellites; there is room on the disk for your own data base of orbit infor-



Fanfold Check System



USI Color Monitor

mation. It sells for $34.95 plus $2 shipping and handling (California residents add 6 percent sales tax) from Computer Applications, 3628 A Court, Oxnard, CA 93033, 805-644-9327.

Reader Service ✓563

Composite Color Monitor

Designed specifically as a high-quality display for personal and business computer use, USI International's new 14-inch composite video color monitor eliminates the process of converting the computer's video signal to a form that a television can receive and then back to a video signal. The result is better image quality and low distortion.

The $399 monitor features an 80-column, 24-line display in seven colors. It is burned in for 100 hours and reinspected before shipment.

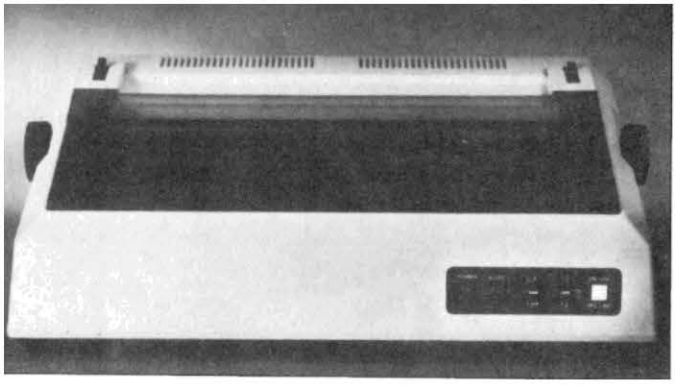
It is sold by USI Computer Products, 71 Park Lane, Brisbane, CA 94005, 415-468-4900.

Reader Service ✓565

C. Itoh A-10

The A-10, a complement to C. Itoh's F-10 daisy-wheel printers (40-cps Starwriter and 55-cps Printmaster), runs at 18 cps and costs approximately $995.

The printer's 100-character plastic wheel maintains uniform print quality. A universal power supply is standard, with parallel or RS-232C interface available; the unit also offers a choice of friction feed or bidirectional tractor feed.



Itoh A-10 Daisy-Wheel

The A-10 stands six inches high and weighs 29 pounds. It is sold by C. Itoh Electronics Inc., 5301 Beethoven St., Los Angeles, CA 90066, 213-306-6700.

Reader Service ✓569

New Software Club

It had to happen: a Program of the Month Club, with members offered a feature program and three alternate selections each month from the categories of Education, Games, and Personal and Finance.

The programs are selected from a variety of sources, and sold to members for $14.95 and up. There is a $5 initiation fee.

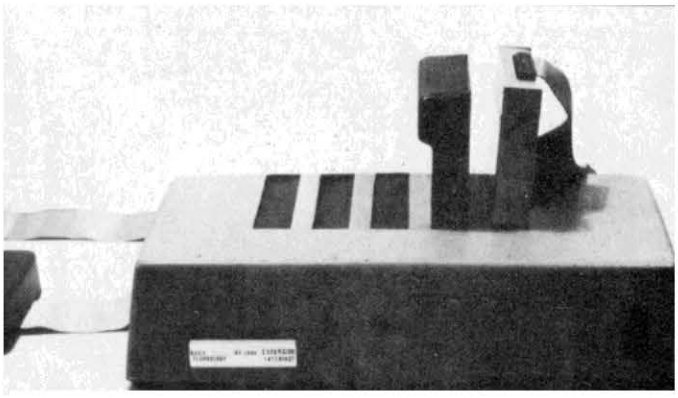
The club is a service of The Software Connection, P.O. Box 141319, Dallas, TX 75214.

Reader Service ✓576

Color Computer Expansion

Basic Technology (P.O. Box 511, Dept. S, Ortonville, MI 48462, 313-627-6146) offers two hardware additions for the Color Computer.

The BT-1000 expansion interface is a five-slot bus extender that lets users add additional serial or parallel ports, disk controllers, or other compatible cartridges. It connects to the cartridge slot, and features an internal power supply, memory decoding, gold edge connectors, and four 24-pin RAM/ROM sockets. Price is $270 ($300 with 8K of static RAM installed).



Color Computer Interface

The BT-1020 ($109) is a real-time clock/calendar that adds date and time to files, programs, and reports. It features a 100-year calendar, 12/24-hour select, and automatic leap year and daylight savings compensation. The clock plugs directly into the cartridge slot or the BT-1000; an internal NiCad battery will maintain operation for two weeks when the unit is unplugged.

Reader Service ✓575

Model II Print Utility

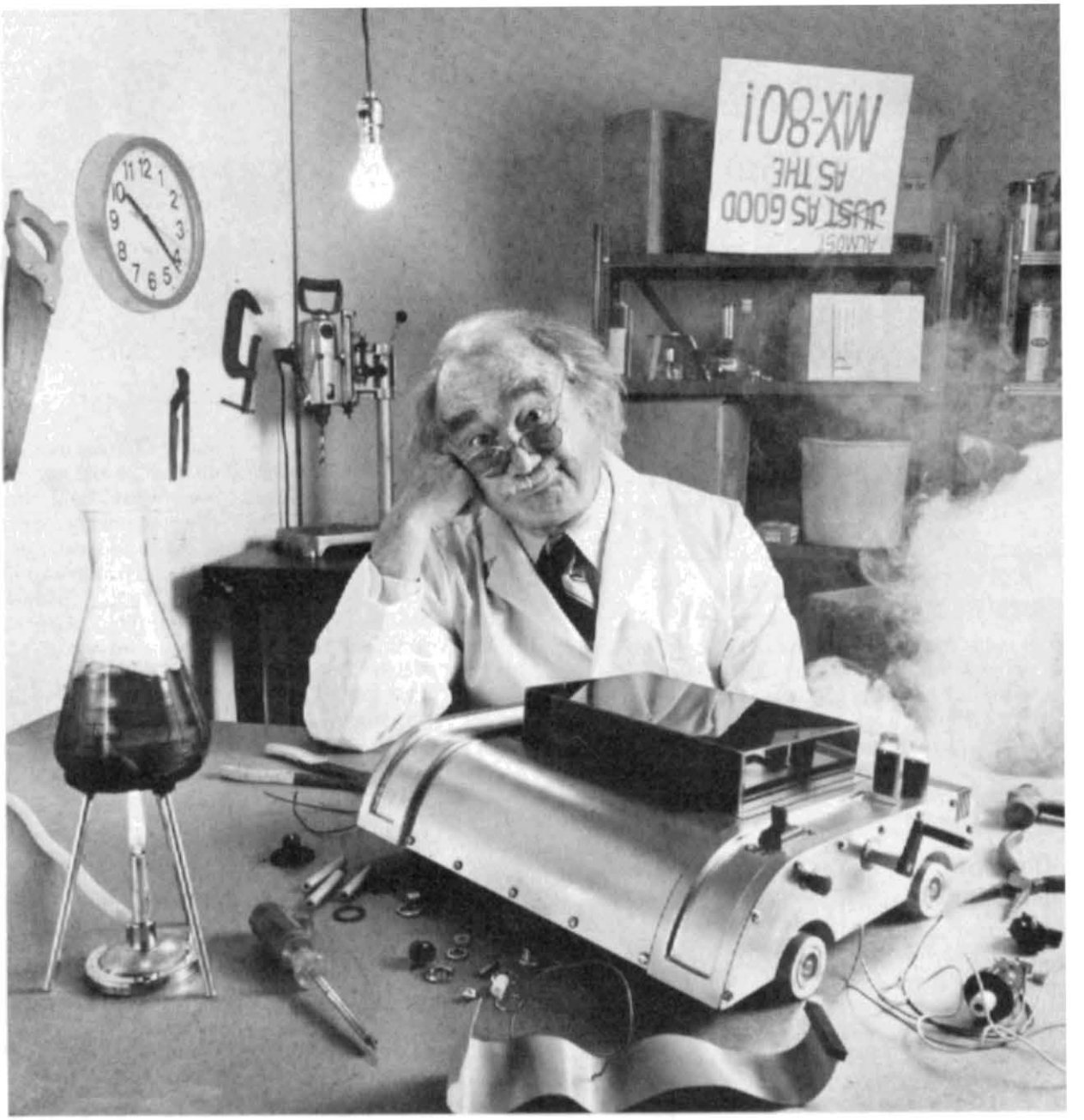
PRTPRO is a Cobol utility that allows the selective printing of pages from Model II listing files (/LST).

The $35 program includes the RM/Cobol source code, a visual table of contents, Assembly-language loading program, forms set-up program, and 8-inch disk with TRSDOS-format listing file.

For more information, contact Tremont Associates, 212 Tremont Ave., Absecon, NJ 08201, 609-646-1896.

Reader Service ✓561

Continues on p. 398



For everyone who's tried to top the MX-80, bad news. We just did.

Epson.

The Epson MX-80 is the best-selling dot matrix impact printer in the world. It has been since its introduction. And despite the host of imitators it spawned, no one has been able top it. Until now.

FX-80: Son of a legend.
The new Epson FX-80 is far more than just doo-dads added on to last year's model. It's the most astonishing collection of features ever assembled in a personal printer.

For starters, it's fast: 160 CPS. And clean. All the print quality Epson is famous for in a tack-sharp 9x9 matrix.

But that hardly scratches the surface.

Create your own alphabet.
With the new FX-80, you aren't limited to ASCII characters. You can create your own. Any character or symbol that can be defined in a 9x11 matrix can be added to the FX-80's already impressive library of type styles and stored in its integral 2K RAM.

So you can create "Sally's Gothic" or "Tom's Roman" just by downloading and modifying standard characters. Or you can create a custom set from scratch. Either way, you can store up to 256 new characters. And if you don't need a new alphabet, the RAM functions as a 2K data input buffer.

Who knows graphics better than Epson?
Nobody, that's who. And if you don't believe it, witness the FX-80.

With a 12K ROM capacity, the FX-80 gives you a few things the others don't. For example, not one, not two, but *seven* different dot addressable graphic modes are program selectable. And can be mixed in the same print line. Everything from 72 DPI (dots-per-inch) Plotter Graphics to the 640 dots per line resolution designed to match the remarkable monitor clarity of the Epson QX-10 personal computer.

And *that* is in addition to an astonishing array of 136 different user-selectable type styles including Proportional, Elite and Italic as well as the more conventional faces you get on other printers.

Hard-to-beat hardware.
The FX-80 has all the hardware features you've come to know and love on the MX Series: logic seeking, bidirectional printing, the by-now-famous disposable printhead, and more.

The FX-80 features an adjustable pin platen or optional friction/tractor feed, so you can use fanfold, roll or sheet paper ... backwards or forwards. The FX-80 even gives you reverse paper feed.

And if you're printing forms, the FX-80 has a feature you're gonna love: a function that allows you to tear off the paper within one inch of the last print position.

Be the first on your block.
We'd be willing to bet that the FX-80 — like the MX-80 — will have its share of imitators. Don't be fooled. To make sure you get the genuine article, rush down to your local computer store right now and let them show you everything the FX-80 can do.

And while you're there ... ask them to show you how it works with our computers.

97

EPSON

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See List of Advertisers on Page 371

MicroSpooler

Continued from p. 395

MicroSpooler

Consolink Corp. (formerly Compulink Corp.), manufacturers of the Sooper-Spooler intelligent printer interface, has introduced MicroSpooler, a smaller buffer measuring 6½ by 2½ by 9¼ inches.

The unit comes with 16K of memory, factory- or user-expandable to 32K or 64K; it supports multiple copy functions, printing pause, and independently selectable baud rates for serial applications. A status readout indicates the amount of information stored or number of copies awaiting printout.

Prices start at $199, depending on interface configuration, from Consolink Corp., 1840 Industrial Circle, Longmont, CO 80501, 800-525-6705.

Reader Service ✓552

Bar Codes for Business

Tamco Inc. (10854 Gorsuch Road, Galena, OH 43021, 614-864-5700) offers software that lets businesses produce their own bar code labels using a TRS-80 and one of Radio Shack's DMP series dot-matrix printers.

Depending on the printer used, 400 to 1,800 Code 39, Codabar, or Interleaved Two of Five labels can be generated per hour. The labels meet the LOGMARS standards required of suppliers to the Department of Defense.

The two-disk software package for the Models I or III costs $625; a Model II version is $695. Packages including the Skan-A-Matic D-2 bar code reader, or complete systems with computer and printer, are also available.

Reader Service ✓579

CP/M for 16

The CP/M-68K operating system gives the Model 16 and upgraded Model II compatibility with the vast library of CP/M 2.2 software.

Easy context switching allows the user to go from CP/M-68K to CP/M 2.2 and vice versa. While under the new system, the Z80 processor acts as an I/O slave, freeing the 68000 from mundane tasks.

Support utility programs and a 68000 assembler are provided, and a C compiler is available. For more information, contact TriSoft, 4102 Avenue G, Austin, TX 78751, 512-454-5980 or 800-531-5255, ext. 784.

Reader Service ✓581

Dominate the World

In Supreme Ruler, an advanced simulation for the 16K Models I and III, leaders of competing nations struggle to balance their budgets and topple their rivals. Each ruler must deal with the business of setting tax rates, subsidizing industry, and feeding the populace, as well as assembling an army and attacking other countries.

The battle can include up to nine nations, in any combination of humans and computer opponents. A 40-page "President's Handbook" gives tips.

The game costs $18.50 (cassette) or $20.50 (disk), plus $2 shipping and handling. It is sold by JMG Software International, P.O. Box 598, Falls Station, Niagara Falls, NY 14303 or 710 Upper James St., Hamilton, Ontario, Canada L9C 2T5, 416-389-6086.

Reader Service ✓557

Color Chords

Mu**sic, a music program for the 16K Extended Basic Color Computer, allows up to four simultaneous notes without additional hardware. Its range is over four octaves; supported features include two selectable voices, tempo adjustment, and reserve storage for 2,000 notes.

The $19.95 cassette is available from Saffron Software, 5306 Birch Grove Drive, San Jose, CA 95123.

Reader Service ✓564

Automate Your Modem

The Answer is a device that allows any 300-baud manual modem to be operated in an auto-answer mode. It answers incoming calls after the selected number of rings, maintains the connection as long as the calling modem is on line, and hangs up when digital communication is complete.

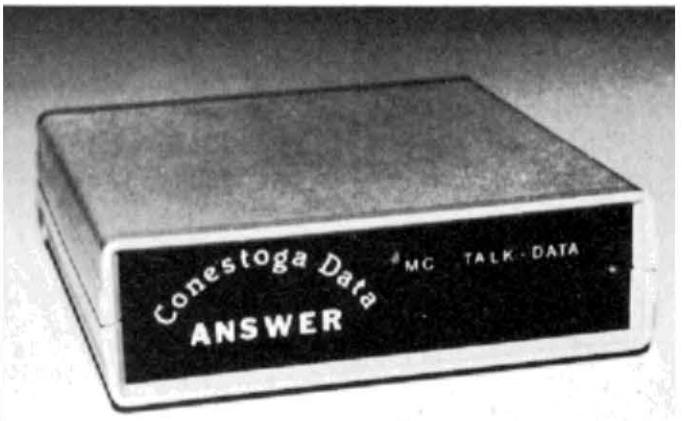
Normal telephone operation for either acoustic or direct-connect configurations is not affected; an internal ring indicator beeps for incoming calls, and an LED gives visual confirmation of communication. All components for easy installation with any computer are included.

Price is $69.95 from Conestoga Data Inc., 8403 121st Place North, Largo, FL 33543, 813-531-8517.

Reader Service ✓580

Shark Treasure

You are a scuba diver, looking to raid the hold of a



The Answer for Modems

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LAZY WRITER NEWSLETTER

SPECIAL EDITION

INTRODUCING LAZYFONT . . .
FOR FANCY TYPE FONTS AND GRAPHICS

Now users of the Lazy Writer Word Processing System can easily create and print type fonts and graphics, if they're using a dot matrix printer with bit plot graphics capability. LAZYFONT, the latest addition to the LAZY family, simply replaces the regular printer driver used with Lazy Writer. A few simple commands in text tell the program which fonts to use, and the fonts are pulled off disk when printing. All regular Lazy Writer printer commands can be used.

The LAZYFONT package includes a program for creating the fonts, which lets you draw characters on the screen, then save them to disk. You can draw any sort of character, including logos and pictures. A bonus for users who don't want to draw their own fonts is that you can use GEAP/DotWriter fonts with this program.

LAZYFONT is available from AlphaBit Communications for $49.95. The present version works only with the Epson MX-80 or MX-100 with Graftrax or Graftrax Plus. Versions for other dot matrix printers will be available soon.

A FIRST IN PROPORTIONAL SPACING

Use any print wheel with Lazy Writer's new proportional spacing program for the Qume Sprint 5 or C. Itoh F10 Daisy Wheel printer. Even lets you make up your own spacing and impression table! Qume wheels come in different sequences (arrangement of characters on the spokes); Lazy Writer owners can use all nine proportional typefaces of the WPS sequence without special hardware.

This revolutionary product is available from AlphaBit Communications, Inc. for $49.95. You're reading a sample now, printed with the TITLE typeface.

****

NOW DO FORM LETTERS WITH LAZY WRITER !

Many businesses do regular mailings to clients or potential customers. Personalized letters get more attention than "Dear Sir". Now users of the popular Lazy Writer Word Processing System can merge names from a mail list with their text, and have use of all the Lazy Writer printer commands. Smart features so new they don't have a name yet. LAZYMERGE is $44.95.

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ALPHABIT COMMUNICATIONS, INC. 13349 MICHIGAN AVE DEARBORN, MI 48126
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26-1585	Business Checkwriter	149.95
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26-1591	Scripsit Dictionary	149.00
26-1592	Profile III +	199.00
26-1594	Desktop/Plan 80	199.00

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↙142

sunken Spanish galleon. You are also prey for packs of hungry sharks, waiting to chomp anything that attempts to enter their territory. Can you dodge the jaws and get the gold?

Shark Treasure is an action graphics game for the Color Computer. It costs $21.95 (cassette) or $26.95 (disk) from Computerware, Box 668, 4403 Manchester Ave., Encinitas, CA 92024, 619-436-3512. Add $2 shipping and handling.

Reader Service ↙553

Super Drivers

PowerSoft has introduced a trio of drivers allowing SuperScripsit to be used with non-Radio Shack printers.

PowerDriver/P, for the Prowriter 8510, supports eight pitch sizes, including two sizes of proportional print. PowerDriver/F, for the Starwriter F-10 daisy-wheel, supports 10-pitch, 12-pitch, and proportional modes. PowerDriver/E, for the Epson MX-80 and MX-100 with Graftrax or Graftrax-Plus is a package of three drivers supporting four pitch sizes each.

All drivers allow underlining, sub- and superscripts, and other word-processing options; each is supplied on a self-booting, unprotected disk that also contains patches for running SuperScripsit under LDOS.

Each is $29.95 from PowerSoft, 11500 Stemmons Freeway, Suite 125, Dallas, TX 75229, 214-484-2976.

Reader Service ↙559

School Administrators' Software

Addison-Wesley has announced its Micro-Education Support Series of programs, designed to cut paperwork and improve efficiency for school administrators.

Bursar, an accounting system, keeps track of all income generated by a school's student activities and maintains financial records for each team or club. It requires no accounting experience to operate.

Equip is an inventory program that stores each piece of equipment's description, manufacturer, model, serial number, cost, and location; it can organize and sort inventory according to room location, subject area, equipment category, and so on.

The Purchase program simplifies purchase of new equipment; it prints requisition forms, compiles totals, and prepares purchase orders and delivery schedules.

The three programs are available for the Models I and III. Each is $195 including manual from Addison-Wesley Publishing Co., Computer Software and Applications, Reading, MA 01867, 617-944-3700.

Reader Service ↙556

Tallymaster

Tallymaster is a financial-management package designed to fill the gap between a bookkeeper's journals and spreadsheet programs. Designed for people responsible for budgets and sales, it lets revenues and expenses be placed in up to 702 categories.

The program is menu-driven; a help command displays information on any of 21 topics. Users can sort and merge files, and select ranges of categories to be changed or reported. Arithmetic functions allow simple sales projections.

Tallymaster is supplied on disk for the 48K Models I and III. It sells for $79.95 from Prosoft, Box 560, North Hollywood, CA 91603, 213-764-3131.

Reader Service ↙582

Dual-Mode Dot-Matrix

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D-92 Dot-Matrix Printer

have enabled Data Impact Products to reduce the price of their D-92 dual-mode, modular printer to $399.

The printer offers both a 7-by-9 matrix font for high-speed data processing and an 11-by-9 font for near letter quality. It features six different character sizes, 100 cps bidirectional printing, friction paper feed, and an 800-character buffer, and prints 40, 48, 66, 80, 96, or 132 upper- or lowercase characters per line.

The D-92's modular design lets users add options such as RS-232C interface, adjustable tractor feed, dot-addressable graphics, 2K buffer, and 9,600 baud. It is available from Data Impact Products Inc., 745 Atlantic Ave., Boston, MA 02111, 800-327-1525.

Reader Service ✓567

Model I/III Payroll

Super-P/R, a general-purpose payroll system, includes employee departments, machine-language sorts, and a comprehensive report generator. Earnings and deduction categories are user-definable; base rates for each employee can be established for all categories.

Utilities are included for converting either Radio Shack Disk Payroll or Data Train Payroll files for use with Super-P/R. The system is supplied on three single-density disks with 150-page manual; it sells for $225 from Microcomputer Applications, 3485 Mock Orange Court South, Salem, OR 97302, 503-364-1090.

Reader Service ✓562

Real World Interface

The BCP Real World Interface consists of a real-time clock, 16-channel analog/digital converter, eight temperature transducers, four relays, and an alarm. It lets any 16K Level II Model I or III be used for home security, energy monitoring, or similar applications.

The standard kit costs $528 from Basic Computer Products, 3185 Elm, Grand Junction, CO 81504.

Reader Service ✓570

Sfinks and Thor

William Fink (Suite 24-B, 1105 North Main St., Gainesville, FL 32601) has revised his Model I/III chess program and added a Reversi/Othello game to his inventory.

In addition to all the features of the Sfinks 3.0 chess game, Sfinks 4.0 offers the ability to save a game in progress, to output the current board position to a printer, and to display the program's evaluation of its position. It requires 48K of memory and sells for $49.95 on disk.

Thor Reversi, written by Sylvain Quin, features eight levels of play, problem set-up capability, and position save and restore for game analysis. The game requires 16K and costs $34.95 on disk or cassette.

Reader Service ✓572

$25 Color Spreadsheet

The C.C. Calc spreadsheet for the 32K Color Computer supports arithmetic operations including exponentiation, summation, and formula duplication. It prints reports in regular or narrow format, and extra-wide reports can be printed in sections.

Special features include hidden formulas, a screen printer, and user-specified decimal place. C.C. Calc can share files with other programs through a standardized data-exchange format.

The program costs $25 on disk or cassette from Transformation Technologies, 194 Lockwood Lane, Bloomingdale, IN 60108.

Reader Service ✓578

DIFFERENT TRACK

Photo Not to Scale

This month's unusual-items spotlight features a candidate for New Products Photo of the Year: Statguard Conductive Floor Finish, an anti-static floor wax that eliminates the need for protective mats.

Ensuring zero charge generation and continuous static protection, the high-luster liquid "can be applied by hand, mop, or automated equipment to any hard surface or sealed flooring," according to the manufacturers (Charleswater Products Inc., 93 Border St., West Newton, MA 02165, 617-964-8370).

A one-gallon bottle will cover up to 2,000 square feet; dance-hall owners can order five-gallon pails or 55-gallon drums.

Reader Service ✓571

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.*

YOU WILL NEVER AGAIN HAVE TO WASTE TIME WAITING FOR YOUR PRINTER.

MICROBUFFER ALLOWS YOU TO PRINT AND PROCESS SIMULTANEOUSLY.

Microbuffer will instantly increase your efficiency — and eliminate the frustration of waiting for your slowpoke printer.

Now you can simply dump your printing data directly to Microbuffer and *continue processing*. Microbuffer accepts the data as fast as your computer can send. It stores the data in its own memory buffer, then takes control of your printer.

THERE IS A MICROBUFFER FOR ANY COMPUTER/PRINTER COMBINATION.

Whatever your system, there is a specific Microbuffer designed to accommodate it.

FOR APPLE II COMPUTERS, Mircobuffer II features on-board firmware for text formatting and advanced graphics dump routines. Both serial and parllel versions have a power-efficient low-consumption design. Special functions include Basic listing formatter, self-test, buffer zap, and transparent and maintain modes. The 16K model is priced at $259 and the 32K, at $299.

FOR EPSON PRINTERS, Microbuffer/E comes in two serial versions — 8K or 16K (upgradable to 32K) — and two parallel versions — 16K or 32K (upgradable to 64K). The serial buffer supports both hardware handshaking and XON-XOFF software handshaking at baud rates up to 19,200. Both interfaces are compatible with standard Epson commands, including GRAFTRAX-80 and GRAFTRAX-80+. Prices range from $159 to $279.

ALL OTHER COMPUTER/PRINTER COMBINATIONS are served by the stand-alone Microbuffer In-line.

The serial stand-alone will support different input and output baud rates and different handshake protocol. Both serial and parallel versions are available in a 32K model at $299 or 64K for $349. Either can be user-upgraded to a total of 256K with 64K add-ons — just $179 each.

SIMPLE TO INSTALL.

Microbuffer II is slot-independent. It slips directly inside the Apple II in any slot except zero.

Microbuffer/E mounts easily inside the existing auxiliary slot directly inside the Epson printer.

The stand-alone Microbuffer is installed in-line between virtually any computer and any printer.

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CP/M**

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