MICROpendium

Covering The TI99/4A Home Computer And Compatibles

Volume 3 Number 5 **June 1986** **$1.50 per copy**

GENEVE

see page 12

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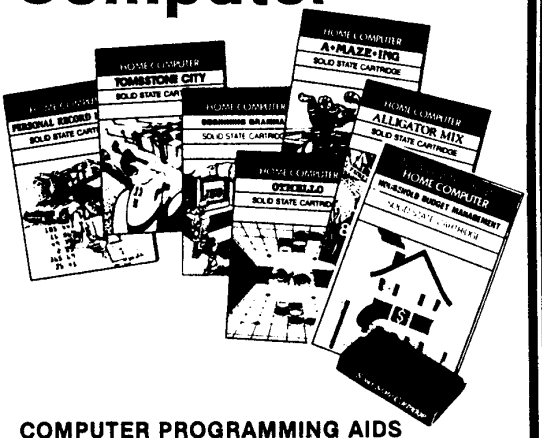

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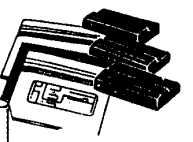

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All correspondence should be mailed to MICROpendium at P.O. Box 1343, Round Rock, TX 78680. We cannot take responsibility for unsolicited manuscripts but will give consideration to anything sent to the above address. Manuscripts will be returned only if a self-enclosed, stamped envelope is included.

All editions of MICROpendium are mailed from the Round Rock (Texas) or Smithville (Texas) Post Office. Subscriptions are $15 for 12 issues, delivered via third class mail. In Canada, add $3.50. Subscribers in the United States who wish first class delivery may also add $3.50 to the basic subscription price.

Mailing address: P.O. Box 1343, Round Rock, TX 78680
Telephone: (512) 255-1512
Source: TI4596

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—Review of Macro Assembler
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—Window calculator from FAS-Tran

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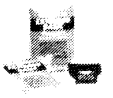

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Comments

Just not enough room

There just doesn't seem to be enough space to publish everything we'd like. After squeezing everything in that we could this month, we're had to leave out a review of the Horizon RAM Disk and of the RAG Software Macro Assembler. Actually, we've got two pieces on the RAM disk, one a review of the completely assembled model and another about the RAM disk kit. We're crossing our fingers that both will see print next month, for sure one will, as will the review of the Macro Assembler.

But that's not all that we haven't been able to get in. There are a lot of products that we find useful and schedule for review but keep putting off. Among these are the PEP program by Intelpro, which is designed to take data from one computer system and send it to another system (from a TI99/4A, for example, to an IBM-PC). I've tried the program and found it to be easy to use. It is one of the few over-documented pieces of software I've seen. In fact, looking at the documentation has the effect of intimidating the would-be user, when the program's operation is essentially transparent to the user. I hope to publish a review of it in the future, but for those looking for a program that allows one computer type to "talk" to another, it certainly fills the bill.

Reviews of Submarine Commander, Computer War and River Rescue are also planned for the near-term, whenever that is. For now, my favorite is Submarine Commander, following by River Rescue. Submarine Commander is a reasonably good simulation of submarine warfare, with three levels of difficulty. Playing a single game can easily take an hour. There's a lot going on to keep one involved.

River Rescue is a fast-moving game that requires above-average hand-eye coordination. The object is to rescue people from one side of a river and deposit them to safety on the other side. One uses a speedboat to do this, while dodging alligators, snakes and debris. Slow down too much and a tank will appear to shoot you out of the water. Go too fast and you'll crash into the riverbank or a floating tree. Both have good sound effects and graphics and are available at a reasonable price from Tenex and Arcade Hardware.

Computer War makes use of multiple screens and is as fast-moving as I can handle. In fact, it's too challenging for me at this point.

There are dozens of other programs we haven't been able to review, as well as hardware. And more seems to be on the way. It seems the harder we pedal the fartherer behind we get.

MYARC MAKES PROGRESS

Myarc Inc. has finally announced its new computer, called Geneve. There's a brief story about it on page 12. We hope to have more next month. Myarc has hired a general manager who promises to keep the company on schedule with its products, and so far he's right on target. The new machine is priced under $500 and offers tremendous potential for TI users. An 80-column TI-Writer will take some adjustment on my part, but I'll try anything once. (Speaking of reviews, a evaluation of Myarc's Extended BASIC Level IV is also in the works.)

Myarc has received criticism for announcing its projects long before development has ended and production has begun. (It's not the only company to do this.) This has several consequences, one of which is skepticism from users when the promised products fail to appear. This used to be an industry-wide practice, which has lost favor, but for small companies such as Myarc which are trying to maintain a market among home computer users it is virtually a necessity to keep its future projects in the public eye. To fail to do so would leave users with the impression that the company is not developing any new products and thus cause them to look elsewhere. The home computer market has taken a lot of knocks in the past 3-4 years and Myarc, among others, shouldn't be criticized too harshly for trying to keep a good thing going.

ON FREEWARE

Not every product submitted for inclusion in our Freeware listing actually makes the list. There are some that aren't getting in because the authors are requiring payment of $10 or more for their products. There's nothing wrong with seeking payment per se, but since most of the Freeware authors offer their products gratis it's unfair to include the profit-oriented products in the listing (not to mention that these "pay first" Freeware offerings may be competing with products advertised in MICROpendium). Incidentally, we didn't have enough space to fit all the Freeware additions, the remainder will be noted next month.

ODDS AND ENDS

It's just about impossible to get this magazine to the printer before the middle of the month, so anyone who has had dreams of receiving, say, the July edition in June like most other monthlies will just have to find something else to fantasize about. Such an event would be a fantasy, though it didn't start out that way. Those who subscribe via first class mail will continue to receive MICROpendium near the end of the cover month. Others will receive them either at the end of the cover month or the first week or two of the following month. The only way we could change this would be to put out a quickie 24-page issue and hope that we could get ahead of ourselves, or to skip one month entirely and change, say, the July cover date to August.

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—JK

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An example of the speed is a benchmark program that appeared in the January, 1985 issue of Compute Magazine: "MSX is Coming" by Tom Halfhill. The program does a bubble sort on an array of 150 elements. The times in minutes:seconds are:

SST *Expanded Basic* (Integer Arithmetic)	0:31	Apple II plus	6:24	TRS-80 Color Computer	8:01
		Apple IIC	6:33	Commodore 16	8:35
SST *Extended Basic* (Floating Point Arithmetic)	2:05	Commodore Vic-20	6:34	Commodore Plus/4	8:36
		IBM PC jr.	6:59	Atari 800XL	8:55
IBM PC	5:45	Commodore 64	7:02	Atari 800	9:00
Goldstar MSX	6:20	Commodore 8032	7:16	TI 99/4A Basic	12:58

Many commands will be directly compiled, however some changes will be required to compile an existing program.

The following is a list of commands found in the ***SST*** *EXPANDED BASIC COMPILER*.

Floating point: + - * / ABS ATN COS EXP INT LOG SIN SQR TAN LET INPUT IF INTER FLOAT DIM

Integer: + - * / ABS LET INPUT IF PRINT FOR-NEXT DIM DISPLAY FLOAT INTER COLOR CHAR VCHAR GCHAR KEY CLEAR PEEK PEEKV LOAD POKEV OPEN CLOSE LINKER SCRON PRINTAT INPUTAT RESETAT INSTRINGA OUTSTRINGA POS SEG VAL LEN SOUND ADDSTRING STR CHR ASC FLOATIN FLOWOUT SUBIN SUBOUT PLOTMODE PLOTCHR PLOT GPLOT USING UNUSE SIG JOYST SPRITEMODE SPRITEA MOTIONA SCHARA PATTERNA COLORA LOCATEA POSITIONA MAGNIFYA DELSPRITEA DISTANCEA COINCA SCREEN SCROLL RANDOMIZE RND SCREENON USERA-USERE

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Feedback

Author responds to 4A Flyer review

I am the programmer of 4A Flyer, a software product you recently reviewed in the May issue. Thank you for the lengthy review. It is obvious that your software instincts are exceptional.

The review, itself, was precisely on track with the concept, functionality and essence of 4A Flyer. It is, indeed, a "simulation" of a simulation and was never intended to be anything else. The deficiencies and strengths of 4A Flyer were outlined in your review and I applaud your perceptions. The only factor you were lacking in the review was the birth of 4A Flyer. Please allow me to explain.

In mid-January of 1986, Triton contacted me concerning the development of a so-called flight simulator. Their only basis of comparison was the Microsoft Flight Simulator for the IBM Personal Computer, so they had a great number of "I would like" ideas for the software content. For marketing's sake, the cartridge was to be restricted to 8K of ROM code. The only RAM allowed was the 200 bytes of free CPU RAM located within the 4A.

My first reaction to this was quite negative. A lengthy design phase was then established and an outline of what exactly the software could perform was drawn up. All that is in 4A Flyer was set forth in that design. The element of realism was to be included in the software, provided that space allowed for it. This was not to be the case.

When the design was finished, I approached Triton about programming costs and scheduling. My intent was to have the software finished by late June or early July. This, unfortunately, was not Triton's idea. In order to make the spring catalog, they had to have completed, debugged code and documentation by April 1, 1986. As you can see, that left me eight weeks. I needed help.

At this point, I knew that I could not complete the software alone. I pulled in a brilliant mathematical programmer, Michael Archuleta, to complete the sections which would allow the realism of flight to be added. This entails 3-D to 2-D rotation and translation. I provided Mike with the design and he began work immediately.

Mike used the algorithms found in a book by Bruce Artwick of Sublogic to accomplish this task. It took him nearly six weeks of work to translate the algorithms to the 4A. Although they ran in his small environment, the biggest job was still ahead: making his routines fit into my code.

At the six weeks point, I had completed most of the graphic work, input routines, sound effects, gauge control and "link" routines. Mike and I worked an entire weekend adding his routines to the software. Although they had worked by themselves, several errors were uncovered which were traced directly to the algorithms in Artwick's book. In essence, Mike's work was worthless. You can probably see that there was no time to give it a second chance. The software was due in a week and a half.

At this point, I had to resort to my backup plan which, coincidentally, encompassed all the things you listed as deficiencies. In that respect, your review was as fair as could possibly be. I appreciate your honesty to the 4A users.

To make a long story short, I had eight weeks to create 8K of code. I am surprised that 4A Flyer made it out the door. It was the most difficult project I had ever worked on and the most detrimental to my sanity and home life. I can understand the sophisticated user being somewhat disappointed, but think of the thousands of users who have never pondered the essence of flying. In principle, my "simulation's simulation" does cover the basics and should be entertaining to novice users.

There is hope, however, for those like you who want more from this so-called "dead" computer. Mike and I will be working on the 32K version of the flight simulator in which we hope to add the dimensions of realism back into the software. This project should take us over one year to complete, but it will be done the way a flight simulator should be done.

Once again I thank you for your review and the consideration you gave its deficiencies and strengths. Perhaps the next revision will add credibility to its name.

John M. Phillips
Allen, Texas

Disk controller quirk explained by reader

In response to the letter in the May Feedback column from Glenn D. Knight, the reason that the CorComp disk controller acts as it does is that the controller takes control before the power up routine is completed.

Some modules have a power up routine, which will never be executed if you select the module from the CorComp menu. By Millers Graphics' own admission, that was not the smartest thing to do, but those of us who have CorComp controllers must live with it. In addition to the TEII module not recognizing the SPEECH file name, there are other modules that require the power up routine. Two that I know of are the Tax/Investment Record Keeping Module and Chess. Both have a garbaged up initial display when selected from the CorComp menu. I am sure there are others also.

Dick Lauhead
St. Paul, Minnesota

Foundation card user seeks assistance

Over the months, I have had numerous questions about my Foundation CP/M card.

Unfortunately, the company went out of business and their ability and desire to help their former customers is typical of a dead company. I do know that many people did purchase the card. Has MICROpendium received any response, from its March appeal for CP/M users? Did you get enough names in order to compile any listing

(Please turn to Page 10)

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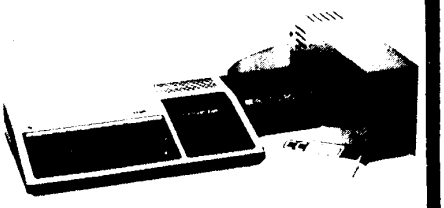

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Feedback

(Continued from Page 8)

of users of the card that are willing to share information?

Al Osorio
East Northport, New York

Unfortunately, no, but we will repeat the appeal here.—Ed.

These should be happy days

As of this writing I am a member of the L.A. 99er Computer Group in Torrance, and by our next meeting I will become a member of the San Fernando Valley 99er Computer Group in Sherman Oakes and the TICO (Texas Instruments Club of Oxnard) in Oxnard.

Why, you ask? Well, remember "way back when," before your first disk drive, when cassette tape was all you had for storage? Or how about before Extended BASIC, Editor/Assembler, Pascal, Logo, Pilot and C, when all you had was BASIC as a programming language? Or maybe you might remember just when you decided to buy some commercial software when suddenly there became an option for obtaining the program.

Two questions come to mind. Why are we members of a users group in the first place? And why do so many people in these groups labor countless hours to help one another? The answers should be clear; to learn, grow and share information and ideas.

So how long can it last without giving to those who support our machine the encourage they need and deserve? Let's face it, it is possible that some TI users groups might eventually find themselves without users in the future (frightening thought). This might be made possible through the lack of support on the part of the developers, a byproduct made possible through the lack of support on the part of the users. Whatever the future may hold for the 4A in the years to come, I plan to look back upon these "Happy Days" of the 4A and feel proud of the kind of participation and support that I have tried to show.

Let's continue in the best interest of our machine for the sake of our education, growth, friendships formed, and the continued longevity of our hobby!

Steven D. Mehr
President, Tri-Valley 99ers
Thousand Oaks, California

Article corrected

Thank you very much for your article on FairSoft and the BasicSort program.

There was only one small inaccuracy in the text. I think that you maybe misunderstood something that I said to you on the telephone, maybe because I did not express myself clearly. While it is certainly true that I personally have extensive experience with IBM computers, systems and programs, and have designed and developed many a product for these machines, FairSoft is a new company and BasicSort is our first product.

Andreas L. Dessoff
FairSoft Inc.
Fairfield, Connecticut

Amputation works

I was pleased to find John P. Gallagher's catalog program using the Triple Tech clock (April 1986).

My version of Triple Tech uses 1 for Monday, 2 for Tuesday etc., so that I had to modify lines 350 through 410 accordingly. Also, the program kept insisting that I had not inserted a disk or closed the gate! Finally I amputated the sub-routine commencing with line 1270 and references to it in lines 660 and 670. The program seems to run fine without this feature.

Richard R. Hay
San Diego, California

Wants chips in P-box

All these new P-box cards (64/128/512K memory, Triple Tech, Disk Controller, etc.) and the GRAM Kracker are nice.

However, what I would like to see is a P-box card that would allow you to take the chips from a number of cartridges (XBASIC, Editor/Assembler, TI-Writer, Multiplan, Terminal Emulator II, Speech Editor, Disk Manager, etc. and the Speech Synthesizer) and install them in the P-box. The card would be set up in such a way that when the P-box and console were turned on, a menu would be brought up that would allow access to any chip on the card. A card of this type would reduce the need for the Navarone "Widget" by 90 to 100 percent and the use of the cartridge port by 75 to 90 percent.

So if some electronics genius out there could design and build such a card at a reasonable cost, I would be one of the first in line to purchase it.

Bob Walter
Wheaton, Illinois

Word processer, data base cross sought

I am a preacher and I am looking for a way to store my sermon illustrations on my TI.

Basically this is how I want to do it. I want to file stories and quotes under subject headings, e.g. God's love or Forgiveness. Then all I would have to do is type in my subject heading and voila!

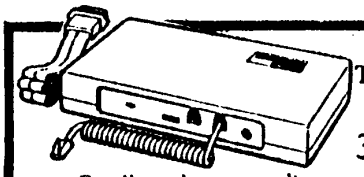
I was told that I needed a program that is a blend between a word processor and a data base. Also, a friend of mine has an Apple and his program that does this is called "Idea Manager" or something like that.

I hope that you or your readers can help me.

George Price
First United Methodist Church
Spur, Texas

A database/word processor would be useful to many users. We'd like to see some ideas on this subject from readers and programmers.—Ed

The Feedback column is for readers. It is a forum to communicate with other readers. The editor will condense excessively lengthy submissions where necessary. We ask that writers restrict themselves to one subject for the sake of simplicity. Our only requirement is that items be of interest to persons who use the TI99/4A home computer. Mail Feedback items to: MICROpendium, P.O. Box 1343, Round Rock, TX 78680.



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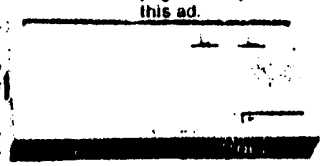

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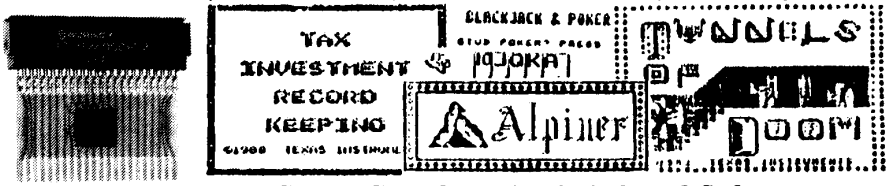

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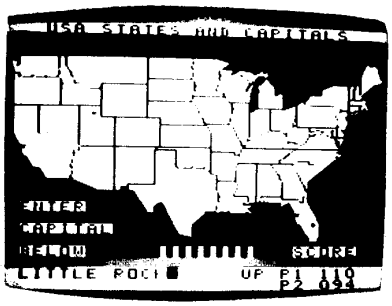

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'Geneve' from Myarc makes debut at CES

Myarc's new computer, the "Geneve," made its debut at the recent Consumer Electonics Show.

The long-promised new computer from Myarc features TI-Writer in 80 columns and will support any program in TI assembly language written to specifications for TI, according to John Keown of Myarc.

"A few software authors played some tricks and their programs won't work on it," he notes.

Keown said the company would modify Myarc 128K and 512K cards to be compatible, for any registered owners.

The computer features an IBM PC XT-style keyboard as standard with 640K RAM patches for TI-Writer and Microsoft Multiplan, 80-column display, BASIC 3.0 and a MS-DOS operating system, he noted. It uses a TI 9995 processor chip operating at 12 MHz.

It will have a program to copy existing cartridges, he notes.

Keown says the hex cable to the peripheral expansion box has been replaced, with the keyboard now connecting directly to the P.E. box.

The computer runs "between three and six times faster than the 99/4A, depending on the mode," he says. "The graphics mode is superior to Atari."

It has mouse support and RGB support, Keown says. He says Myarc will be "introducing very shortly an RGB composite 80-column monitor for under $250."

Suggested list price for the computer is $495. The company was planning to ship out beta-test boards in early June to "prime software developers" so they can upgrade their software, Keown says. Orders are being taken now for a shipment date of July 30.

Keown says he has been hired recently to "handle the business end" for Myarc and says he is enforcing strict quality control and deadline policies.

The computer also has separate function keyhs, 128K of VDP RAM, supports 40 and 80 column display modes and includes speech. According to Myarc, it is compatible with Myarc, TI and CorComp disk controller and RS232 cards.

Freeware update

FILE READER, DISK MACHINE 1002

Steve Patterson of 2351 Ragan Wood, Toledo, Ohio 43614, is offering File Reader 1002 and Disk Machine 1002 for $7. He supplies the disk, mailer and postage.

File Reader 1002 is a 16K Extended BASIC version of Rapid Scroll with a number of new features, including a disk cataloger and a save file option, among others. The program can load any type of file into memory—display/variable, display/fixed, internal/fixed and internal/variable.

Disk Machine 1002 is a 16K disk and file management program that includes such functions as diskette catalog, sweep a disk, delete a file, convert a file, combine two files and run a program. The file converter allows users to convert any type file to another type (excluding programs). The combine two files function allows the user to combine any two files regardless of type into a single file.

EE BONDMASTER

EE Bondmaster allows the user to store information on variable interest

(Please turn to Page 32)

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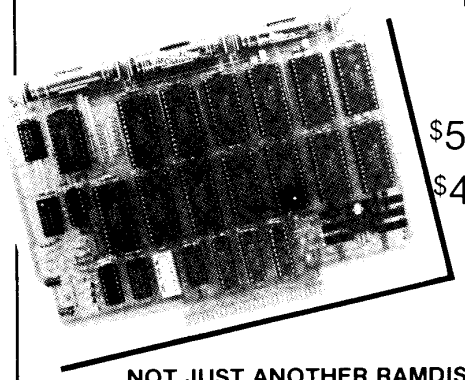

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- Comes with complete DSR SOURCE CODE. Explains how to write A/L CALL routines to enhance TI BASIC.

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Subroutines provide support for 3D graphics, CAD

By DARREN LEONARD

Have you ever seen the television commercial for high performance cars, in which there is a man in a lab jacket standing next to a computer terminal?

On the monitor is a 3-D representation of the car and when a few keys are pushed the car rotates on the screen so that it may be viewed from several different perspectives.

Have you ever wondered how this was done? If so, read on.

The concept of using computers as design tools is often called CAD, for Computer Aided Design, and in many places the draftsman is replacing the drawing board and T-square with a keyboard and monitor. As new monitors are giving better resolution than ever before, CAD is only going to become more important in the future.

What are the benefits of CAD that make it so advantageous? First of all, once the critical data are entered for a design, it can be viewed and edited on the screen very easily. The drawing can be enlarged, rotated or printed on paper at the touch of a key. Finally, if the computer is properly programmed, the design can be analyzed for stresses and other engineering-related design problems.

It should be obvious that these benefits outweigh the high cost of CAD systems and should be taken seriously.

Now to the TI. The TI has limited resolution and cannot compare to high priced sophisticated equipment. However, we can do some basic things on the 99/4A that will give you a feel of what CAD is about.

In this series of articles, I will go over, step by step, how to plot circles, lines, squares and cubes on your screen. You will then be able to adjust the size (scale), move to a different screen location or rotate the image in either two or three dimensions.

Subroutines will be provided to make things as understandable as possible.

First, let's make sure we are familiar with cartesian coordinates. In figure A, a cartesian axis is drawn, and the vertical axis is labeled Y and it is positive above the horizontial axis and negative below the horizontal axis. The horizontal axis is labeled X and is positive to the right of the vertical axis and negative to the left of the vertical axis.

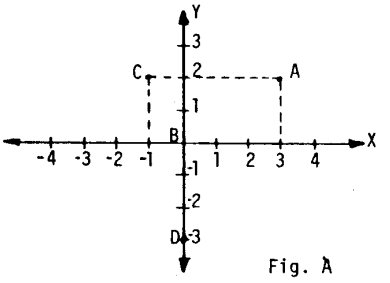

Fig. A

Points within the axis can be identified by their location with respect to the place where X and Y are zero. It is conventional to give the location of a point by specifying its X location first, followed by its Y-value; this can be abbreviated at (X-Value,Y-Value). Therefore, (3,4) means to go three places to the right of zero (center) and four places up. To check that you understand this the position of the points in figure A are A=(3,2) B=(0,0) C=(-1,2) D=(0,-3).

Unfortunately, computer manufacturers decided to invert the vertical axis so that it has the largest positive value at the bottom of the screen. Figure B represents your TV screen. The zero point is in the top left corner.

Since it is easiest to work with cartesian coordinates, we must develop a relationship that will convert cartesian coordinates to screen coordinates. This will be inserted into the PUTDOT subroutine.

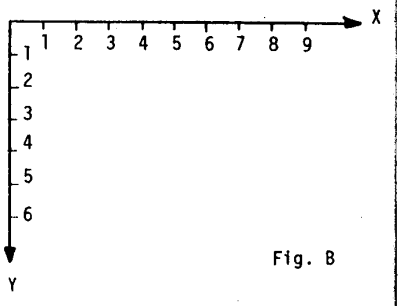

Fig. B

The expressions
X + 125 = screen position in X direction
95-Y = screen position in Y direction
To verify that this is so, use the cartesian location of (0,0) and change it to its screen position. 0+125=125 and 95-0=95, thus the screen coordinates are (125,95), which is the center of the TV screen. Try a few other conversions to prove to yourself that this is correct.

To keep things simple, the PUTDOT subroutine will do the conversions for you and all you have to provide to it is the cartesian coordinates of the point you want to plot.

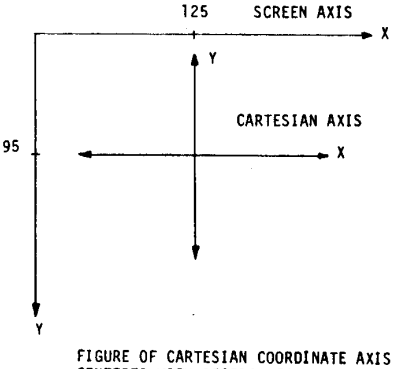

FIGURE OF CARTESIAN COORDINATE AXIS CENTERED WITH RESPECT TO THE SCREEN COORDINATE AXIS.

It is now important that we define a point. In this article, a point will refer to a single pixel on the screen. The TI

(Please turn to Page 16)

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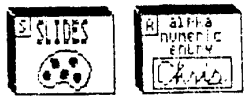

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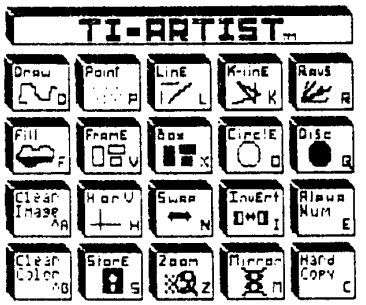

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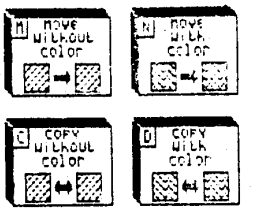

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CAD—

(Continued from Page 14)

has about 50,000 points on its screen. Single pixels can be accessed easily only in the bitmap mode of the 9918A VDP.

Since Extended BASIC includes no intrinsic provisions for plotting in the bitmap mode, we must improvise.

The subroutine PUTDOT does just that. It redefines the character definitions so that it appears to be plotting in BIT-MAP. However, there are limitations. First of all, it is somewhat slower than we would like, and secondly, since there are only about 130 different redefinable characters, it can plot only 120 to 400 points, approximately, depending on the specific geometry. This will, however, be more than adequate for the rest of this article. Subroutine PUTDOT is listed in PROGLST A.

The PUTDOT subprogram is called from your program with the command
CALL PUTDOT(X,Y)
where X = the x-value in cartesian coordinates and Y = the y value in cartesian coordinates. Since the subprogram will convert them to the corresponding screen coordinates, the range of plottable values are
-125 = X = $14
-95 = Y = 95
if you call the subprogram and send it values outside this range, the subprogram will ignore the call and return to the main program without crashing.

By using the PUTDOT command you can now plot corrdinate axes on your screen with this small calling program. (Remember to merge PUTDOT at the end.)

```
100 FOR X = -125 TO 125
110 CALL PUTDOT(X,0)
120 NEXT X                    PROGLST2
130 FOR Y = -95 TO 95
140 CALL PUTDOT(0,Y)
150 NEXT Y
```

If you change the zeros in lines 110 and 130 to other integer values, you can move the point of intersection anywhere on the screen. Try different values and observe the change in the location of the zero.

Now, suppose you would like to plot a diagonal line on the screen. Vertical and horizontal lines can be drawn rather easily with the above PROGLST2. Diagonals are slightly more involved. Let's take a look at a diagonal line and then I will explain the solution.

Figure C is a diagonal line plotted on cartesian coordinates.

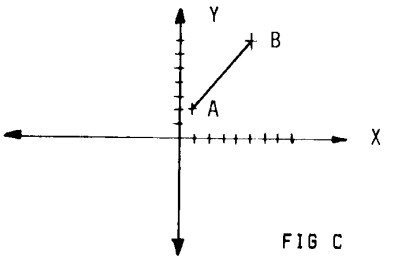

FIG C

Point A is at (1,2) and point B is at (5,7). In order to connect the two points we need to determine the slope of the line. All that the slope means is the

$$\frac{\text{change in Y}}{\text{change in X}} = \frac{Y2-Y1}{X2-X1} = \frac{7-2}{5-1} = \frac{5}{4} = 1.25$$

thus the slope in FIG C is 1.25. All this means is that for every time you increase X by one, you must increase Y by 1.25.

If you are having trouble understanding this, just use the line subroutine; you needn't fully understand it to use it.

If you have any two points on the screen and want to connect a line between them, use PROGLST3. The form of the call is
CALL LINE(X1,Y1,X2,Y2)
where the first point has the position (X1,Y1) and the second point has the position (X2,Y2). The subroutine then determines the slope and fits the straightest possible line that can be made on the TI between the two points.

If you think about it for a minute, all you need to define a square or rectangle is two of the diagonal points. This is fairly simple and you should be able to pick out what to do from the subroutine SQUARE. To call this subprogram, use the form
CALL SQUARE(X1,Y1,X2,Y2)
where (X1,Y1) and (X2,Y2) are diagonal corners of the square or rectangle to be drawn. Remember to merge PUTDOT at the end of SQUARE.

Now it is time to enter the realm of the circle. First a brief review of simple geometry and basic trig definitions. Figure D is a drawing of a circle plotted on the cartesian coordinate axis and centered about the point (0,0).

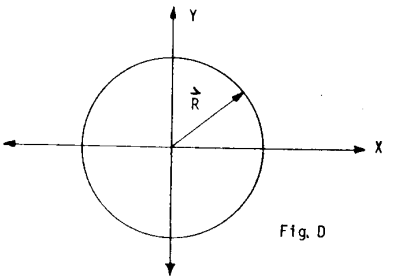

Fig. D

From the definition of a circle, we know that all points on the circle are the same distance from the center point of the circle. This distance is known as the radius and is drawn in figure D as a line connecting the center to a point on the circle.

This being established, we know the size and the location of a circle that we want to plot. Now we need an equation to do this. Many of you may remember that the equation of a circle can be given as:
$X^2 + Y^2 = R^2$
where:
X = x-coordinate
Y = Y-coordinate
R = radius of circle

You would normally solve the equation to make x the independent variable and y the dependent variable. But this leads to some rather cumbersome values and requires a great deal of effort.

If you suspect that there is a much simpler method, you are right. This is where the trig comes in. By using the basic definitions of the sine and cosine functions, we plot the point for each incremental angle.

(Please turn to Page 18)

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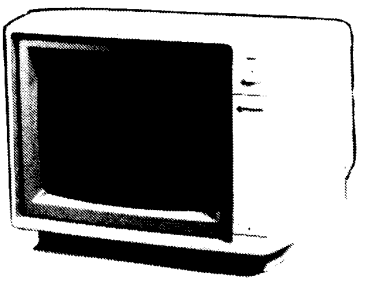

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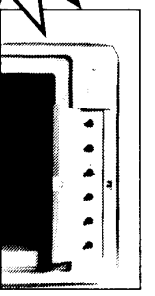

Rear Panel

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CAD—

(Continued from Page 16)

Remembering that this computer, like most computers, works in radians instead of degrees, we will plot the corresponding point given the radius and the angle.

A full circle has 360 degrees which is the same as 2pi or 6.28 radians. Extended BASIC intrinsically defines pi = 3.141592653. So we should use increments in our loop that correspond to logical values such as pi/36. A moment's thought immediately reveals that the smaller the increments, the smoother the circle will be. However, since the TI has limited resolution, it is worthless to use very small incremental values, since they would exceed the resolution of the computer.

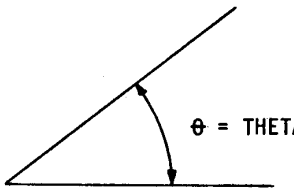
As a rule of thumb, the larger the circle, the smaller the incremental value should be. Thus a very large circle might best be drawn with a pi/72 incremental angle, whereas a small circle might be best "fitted" with a pi/12 incremental angle. For reasons beyond the scope of this article, you should try to select the denominator of the incremental angle so that it is evenly divisible by 6.

If you need to review the sine and cosine functions, I refer you to any high school trigonometry book.

The algorithm for plotting a circle of radius R and angle THETA is:

```
100 FOR THETA=0 TO 2*PI STEP PI/INC
110 X=R*COS(THETA)
120 Y=R*SIN(THETA)
130 CALL PUTDOT(X,Y)
140 NEXT THETA
```

THETA is just a Greek letter commonly used to represent an angle.



DEFINITION OF THETA (θ)

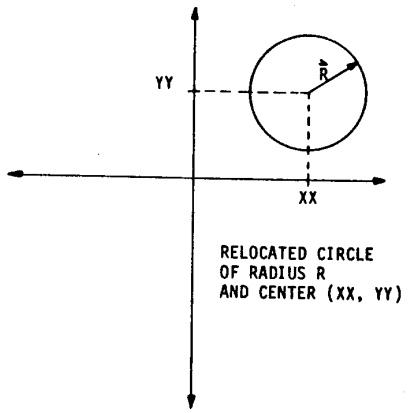
The above routine plots a circle at the center of the screen, which is at location (0,0) om cartesian coordinates. If you would like to plot a circle that is centered around any given point (XX,YY) just include the following to the above routine:

```
121 X=X+XX :: Y=Y+YY
```

Now, let's take a quick look at what we have to define a circle.

R = Radius
INC = Incremental value of THETA
XX = X-offset
YY = Y-offset

By changing R we change the size of the circle. We must then adjust INC to produce the smoothest fit for the given radius. The best way to do this is simply trial and error. If we want the circle plotted in the center of the screen, we set XX and YY both to zero. When it is desired to plot the circle with a center other than (0,0), we set XX and YY to the values of the new center so that the circle will be plotted around point (XX,YY).



Now, we have covered points, lines and circles. I threw the squares in to illustrate how many common shapes can be made from these basic elements. For example, if any three points are given, a triangle can be drawn merely by three successive calls to the LINE routine to connect all three points.

I would also like to point out that there are some new Extended BASIC modules out that can produce lines by themselves. In general, they just have the same algorithm included on the cartridge. I have also read about single pixel graphics as well, but I have not had a chance to check into this, so I cannot give any opinion of it.

It is worth noting that the simple Extended BASIC PUTDOT routine is limited and can be replaced by a good program such as DRAW-N-PLOT by Quality 99 Software. It allows you to use the bitmap mode by clever manipulation of memory.

In part 2 of this article, I will go into rotating lines and squares along with some other shapes and interesting graphics. In part 3 I hope to dive into 3D to a limited degree, so I hope that everyone will be looking forward to this.

I would like to close on a recommendation.

Before you try to do anything in this article, read the entire article *twice!* I think that re-reading will greatly clarify any ambiguous concepts that may befuddle you the first time around.

PUTDOT

```
90 REM SUBPROGRAM PUTDOT MUS
T BE MERGED ON THE END
100 SUB LINE(X1,Y1,X2,Y2)
110 SLOPE=(Y2-Y1)/(X2-X1)
120 FOR PARA=X1 TO X2
130 Y=SLOPE*PARA
140 X=PARA
150 CALL PUTDOT(X,Y)
160 NEXT PARA
170 SUBEND

100 SUB SQUARE(X1,Y1,X2,Y2)
110 FOR BN=X1 TO X2 :: X=BN
:: Y=Y1
120 CALL PUTDOT(X,Y)
130 NEXT BN
140 FOR BN=X1 TO X2 :: X=BN
:: Y=Y2
150 CALL PUTDOT(X,Y)
160 NEXT BN
170 FOR BN=Y1 TO Y2 :: Y=BN
:: X=X1
180 CALL PUTDOT(X,Y)
190 NEXT BN
200 FOR BN=Y1 TO Y2 :: Y=BN
```

(Please turn to Page 20)

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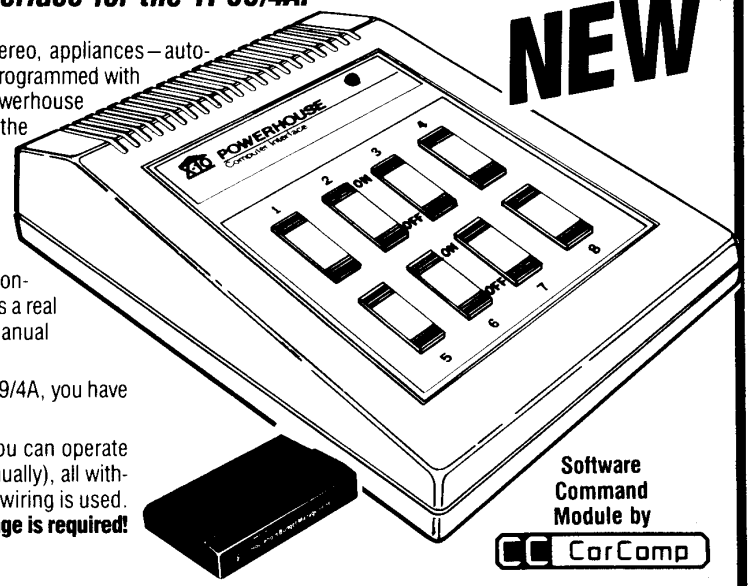

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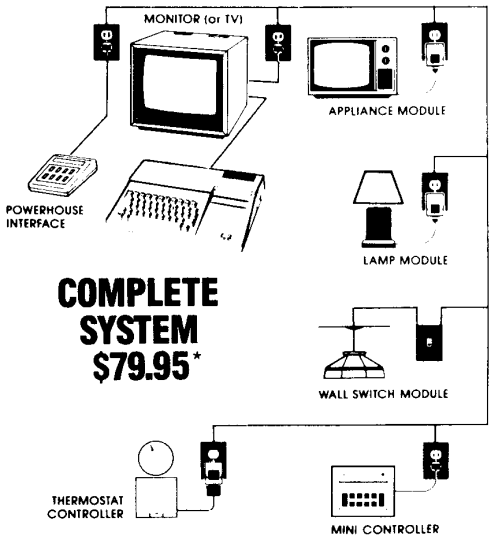

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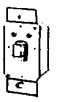

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CAD—

(Continued from Page 18)

```
:: X=X2
210 CALL PUTDOT(X,Y)
220 NEXT BN
230 SUBEND
```

```
100 SUB CIRCLE(R,X1,Y1)!R=RA
DIUS IN # OF PIXELS AND PINT
 (X1,Y1)=CENTER
110 FOR THETA=0 TO 2*PI STEP
 PI/36
120 X=R*COS(THETA)
130 Y=R*SIN(THETA)
140 X=X+X1
150 Y=Y+Y1
160 NEXT THETA
170 SUBEND
180 REM MAIN CALLING SUBPROG
RAMS (SUB LINE, SUB SQUARE A
ND SUB CIRCLE) MUST BE MERGE
D WITH SUB PUTDOT)
```

```
500 SUB PUTDOT(V,Q)
501 X=Q :: Y=V :: IF X<-125
OR X>125 THEN 532
502 IF Y<-95 OR Y>95 THEN 53
2
503 X=(95-X):: Y=INT(Y+125)
504 IF C=0 THEN C=143
505 W=INT((X-1)/8)+1 :: Z=IN
T((Y-1)/8)+1 :: X1=X-((W-1)*
8):: Y1=Y-((Z-1)*8):: CALL G
CHAR(W,Z,A):: A1=A :: IF A<3
2 THEN A=32 :: A1=32
506 CALL CHARPAT(A,A$):: P=X
1*8-8+Y1 :: Q=INT(P/4.06)+1
:: IF Y1>4 THEN Y1=Y1-4
507 IF A<>32 THEN C=C+1 ELSE
 A=C :: IF C<34 THEN 32767
508 B$=SEG$(A$,Q,1):: B=ASC(
B$):: IF B<65 THEN B=B-47 EL
SE B=B-54
509 ON B GOSUB 515,516,517,5
18,519,520,521,522,523,524,5
25,526,527,528,529,530
510 D$=SEG$(C$,Y1,1):: IF D$
="1" THEN IF A1=32 THEN 532
ELSE 531
511 B=B+2^(ABS(Y1-4))
512 ON B GOSUB 515,516,517,5
18,519,520,521,522,523,524,5
25,526,527,528,529,530
513 A$=SEG$(A$,1,Q-1)&B$&SEG
$(A$,Q+1,16-Q)
514 CALL CHAR(A,A$):: CALL H
CHAR(W,Z,A):: GOTO 531
515 C$="0000" :: B$="0" :: R
ETURN
516 C$="0001" :: B$="1" :: R
ETURN
517 C$="0010" :: B$="2" :: R
ETURN
518 C$="0011" :: B$="3" :: R
ETURN
519 C$="0100" :: B$="4" :: R
ETURN
520 C$="0101" :: B$="5" :: R
ETURN
521 C$="0110" :: B$="6" :: R
ETURN
522 C$="0111" :: B$="7" :: R
ETURN
523 C$="1000" :: B$="8" :: R
ETURN
524 C$="1001" :: B$="9" :: R
ETURN
525 C$="1010" :: B$="A" :: R
ETURN
526 C$="1011" :: B$="B" :: R
ETURN
527 C$="1100" :: B$="C" :: R
ETURN
528 C$="1101" :: B$="D" :: R
ETURN
529 C$="1110" :: B$="E" :: R
ETURN
530 C$="1111" :: B$="F" :: R
ETURN
531 C=C-1 :: IF C=0 THEN C=1
532 SUBEND
```


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QUALITY 99 SOFTWARE

Software protected, Canada court rules

The Federal Court of Canada has ruled that Canada's copyright laws protect computer software, according to a Canadian Press dispatch from Waterloo, Ontario, quoted in the newsletter of the Regina, Saskachewan, Users Group.

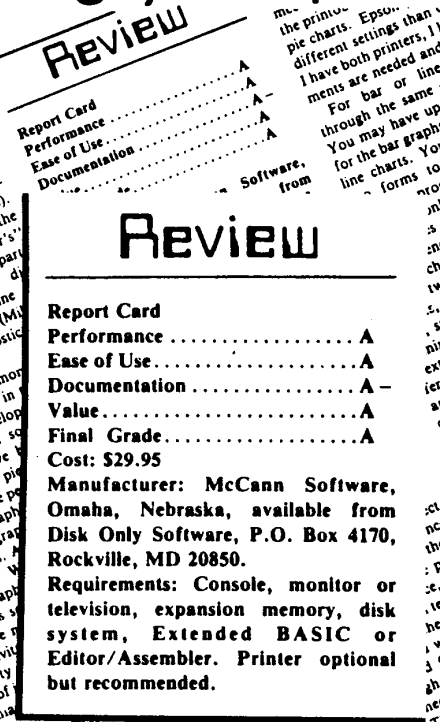
According to the CP dispatch, the decision is believed to set an international precedent because it is thought to be the first case anywhere in which a legal dispute over rights to software has gone to court. The report says similar cases in Britain, Australia and the United States have concluded with pretrial injunctions against software pirates.

The decision can still be appealed, the report noted.

Business Graphs 99

Enhancing your productivity

By RON ALBRIGHT



Review

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Manufacturer: McCann Software, Omaha, Nebraska, available from Disk Only Software, P.O. Box 4170, Rockville, MD 20850.
Requirements: Console, monitor or television, expansion memory, disk system, Extended BASIC or Editor/Assembler. Printer optional but recommended.

I have viewed software development for the TI 99/4A in three distinct phases. First, when TI was producing software, we were in the "cutesy" phase with games and educational software predominating (certainly, TI-Writer and Multiplan were exceptions). Second, immediately after TI left the market, we entered the "hacker's" phase, with software from third-party developers opening up the operating system and machine architecture for exploration (Multi-Graphic's Advanced Diagnostics, Explorer as examples). Over the past several months we have entered and are still in the "productivity" phase of development. Sophisticated communication software, graphics software have been increasingly dominant. One piece of productivity software I have personally lacking was graphics software to generate useful graphs from numbers and reports. Until now. With "Business Graphics 99" from Disk Only Software, this software void has now been filled and we now have a powerful piece of productivity software in the facility to generate displays of any nature

Performance: Both Forth and auto-boots from Editor/Assembler BASIC or through Editor/Assembler BASIC. It is not copy protected and allows easy back-up of the program disk for consumer protection. Even the warranty statement is first-class, as it is the "Fair Use Agreement" pioneered by Jerry Pournelle (a noted computer author who writes regularly for *Byte* magazine), and is clear and precise.

Once the program is booted, you are presented with a menu to choose which type of graph you wish to make, pie chart, bar graph or line chart. The pie chart is automatically booted and choosing bar or line graph will boot the other slices). For each slice. You may print out the graph. The printouts are full size and take up, roughly, two-fifths of a page. The graphs are shown on the monitor while being printed. Textures are printed as chosen, but colors are printed without a pattern (I did not use with a color printer and I do not know if the software will support one). You are not allowed to save the pie charts to disk, but, since you are the printout. Epson... pie charts. Epson... different settings than C... I have both printers, I know the... ments are needed and work perfectly. For bar or line charts, you go through the same data entry process. You may have up to 20 data elements for the bar graphs and up to 100 for the line charts. You may also save these forms to disk for recall later. ...rogram is loaded from disk, ...only reenter the graphs titles ...s and the old data will be used ...nerate the graphs. You also choice for data presentation for two forms of graphs. For bar ..., there are three choices: single , stacked bar (maximum data over ...nimum), or double bar (maximum ...ext to minimum). You may use a different texture or color for minimum and maximum for contrast. For line charts, you also have three choices: a hi-lo plot, a line plot, or a area plot. For both bar and line charts, you may have a grid off or on for the graph. You may also use the same data to display the different forms before printing to see which type of graph is the most visually effective. At any time, you may also edit the data to change any part of the graph. You may also use data saved as a bar chart to be used to generate a line graph if saved to disk and reloaded and vice versa (if the line chart has no more than the 20 data elements a bar graph can use). A nice feature is also the ability to catalog the disk when you chose to retrieve old graph data.

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Make no mistake:

Extended BASIC knows how to handle errors

By R.M. CARMANY

Have you ever "booted" a program in Extended BASIC and had it encounter an error and halt execution?

Maybe it was trying to access a text file from disk and you inadvertantly made a typo or had the disk in the wrong drive. It's really frustrating to have something like that happen. It is especially frustrating if the prompt that you got the error on was not the first one that you had to enter in a series. Well, join the club!

One of the little-known functions in Extended BASIC is the ability to let the user decide what action is to be taken when an error is encountered. The XB manual gives a somewhat enigmatic description of the procedure in the documentation in the discussion of ON ERROR. The second half of the discussion is continued in the test of RETURN (with ON ERROR). It was very thoughful of them to separate it like that!

Actually, you are given two choices (and variations) of what to do when the computer encounters an error when executing a program. The first of these is the default—STOP. In this case, when you do not use the ON ERROR statement, the computer defaults to displaying an error message and halting the execution of the program. That is what usually happens because very few programmers take advantage of the superior error handling routines in Extended BASIC.

The next option (and variations) make use of the ON ERROR statement. The first of these is very simple to use. It follows the form: ON ERROR xxx. In this case, xxx is the line number for the program to branch to when the program encounters an error. The line ON ERROR xxx must be entered at the beginning of the program (or at least at a point before the error is encountered). Let's see how this would work in a program.

```
100 .....
110 .....
320 DISPLAY AT(5,3):"Enter Text Filename" :: ACCEPT AT(7,7)SIZE(10):D$
330 ON ERROR 560
340 OPEN #1:"DSK1."&D$,INPUT ,DISPLAY ,VARIABLE 80
560 CALL SCREEN(7) :: DISPLAY AT(23,1)BEEP ERASE ALL:"DRIVE/FILENAME ERROR" :: FOR DELAY=1 TO 500 :: NEXT DELAY :: CALL SCREEN (8) :: RETURN 320
```

This example actually uses the second half of the ON ERROR process—RETURN (with ON ERROR). First of all, we have inserted an ON ERROR 560 line in the program so that if an error is encountered, the program will branch to the error message and error handling routine in line 560. In our program let's assume that we are asked to input a filename of a text file in line 320. If there is NO error handling routine in place, if you make a typo entering the filename, the program "burps" up an error message and stops. You then have to restart the program. Some fun!

Let's see what happens with the error handling routine in place. If you were to make the same typo in line 320, when the computer tried to access the non-existent file, the program would branch to line 560. Instead of stopping, the screen would change color to red and the message "DRIVE/FILENAME ERROR" would be displayed at the bottom of the screen. After a short delay, the screen would change back to Cyan and the program would RETURN back to line 320 to let you re-enter your filename. That is much more convenient than having to start the program again.

This is by far the easiest and most useful application of the ON ERROR routine. It allows you to control what happens when you inadvertantly enter incorrect information in response to an input prompt. There are also two other variations of ON ERROR that also use RETURN and we will just briefly touch on what they do.

The last two variations of ON ERROR also use RETURN. If you don't specify a line number with the RETURN statement, the program will return to the line that generated the error. For example, if we had a program that was prompting you to enter a number within a specified range, you could use RETURN after transferring control with an ON ERROR statement, and have the program RETURN to the input line for a second chance.

Another variation is to use NEXT with RETURN. That returns control to the line after the one that caused the error.

So, let's look at what we have so far by referring back to our original program example. Without an error handling routine in place, our typo would generate an error message and the program would stop. With ON ERROR in place, the first example would change screen colors, display the message "DRIVE-FILENAME ERROR", change the screen back to normal Cyan color and return to let you try to input the filename again.

If we changed the "RETURN 320" at the end of line 560 to just "RETURN", the program would return to the line that generated the error—in this case, line 340. In this instance, it would not help us because we would

(Please turn to Page 26)

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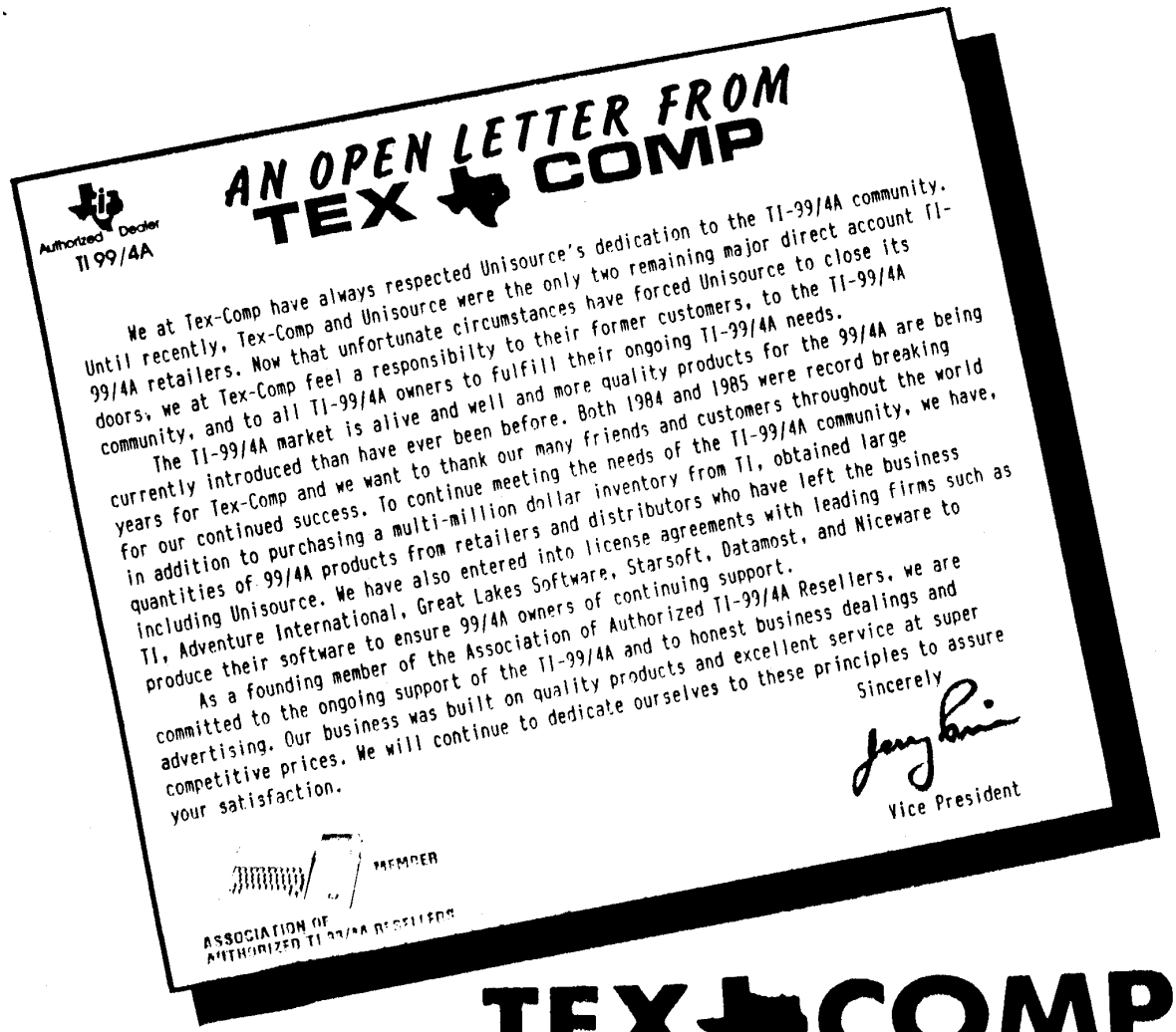

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BASIC/XBASIC

Self-modifying programs

By LEE WILKERSON

Whether running on a microcomputer or a mainframe, whether in BASIC, machine code or PASCAL, most software is a fixed set of instructions which only changes internal data and output. But it is possible to write programs which are self-modifying: while running they can alter certain instructions in memory, and then execute the new code. Some programmers consider the idea of changing code "on the fly" as irregular and undesirable. Nevertheless, there are cases when self-modification is a valid, and perhaps the best, solution to a programming problem.

This class of software is probably not new to many readers, especially those familiar with the common auto-load programs used with Extended BASIC disk systems. These come in many versions, but they almost always end with a statement like "RUN DSK1.ABCDEFGHIJ". Not everyone who uses one of these load programs understands fully how it works, or how they could apply the same technique to other software. Writing this type of program is tricky, but it opens up new possibilities for the creative programmer. This is the first of two articles on the subject, in which I will cover some preliminary information essential to the process.

In order to run self-modifying programs, it is necessary to have a system configuration which allows values to be inserted directly into the relevant areas of RAM. This can be ac-

(Please turn to Page 28)

XB ERROR HANDLING—

(Continued from Page 22)

not have the chance to re-enter the filename. However, if we needed to return to the line that generated the error—as in the case of a number prompt within a specified range, we could simply use RETURN.

If we were to change the last portion of line 560 to read RETURN NEXT, the program would return to line 350 in the original program for whatever action you wanted to take in that line.

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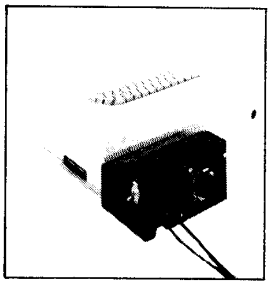

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SELF-MODIFYING PROGRAMS—

(Continued from Page 26)

complished with the LOAD command of Extended BASIC if a memory expansion is in use, or with the POKEV subprogram from console BASIC with the Mini Memory or Editor/Assembler modules. Extended BASIC cannot be used on unexpanded systems, because it cannot modify the VDP RAM.

To create self-modifying routines, it is necessary to understand how BASIC programs are stored in memory. Program statements are not stored in RAM the way they are typed into the console. To save memory and speed execution, instruction keywords and symbols are condensed to one-byte TOKENs with values from 128 to 255. At the end of this article is a table of all TI Extended BASIC instructions, functions, mathematical and logical operators and special symbols, along with their internal token values. Notice that some tokens, such as 199, 200 and 201, are used as instructions to the BASIC interpreter. A few values do not appear to be used at all.

When a BASIC program line is typed and entered, the text is scanned by the console ROM. All keywords and symbols are converted to the appropriate tokens. Numbers and text are stored as ASCII strings which are preceded by two bytes. The first byte identifies the string as being quoted (text) or unquoted (a number, subprogram name or IMAGE string). The second byte holds the string length. Variable names are stored as ASCII strings, the same way they are typed. Line numbers are stored using three bytes. The first byte indicates that a line number follows. The number itself is stored in binary form and split into two bytes. To convert a line number to this form, divide it by 256, put the quotient into the first byte and the remainder into the second. Spaces and non-embedded quote marks are removed from the line. A single byte of value 0 is appended to mark the end of the line, and the tokenized version is inserted into memory. The line number and the beginning address where it is stored are placed into the line number table. The location of the table entry for the highest numbered program line is also updated if this line number is higher than all others.

```
ITEM:       STORED AS:
-----       ----------
440         Stored in line number table.
SUM         SUM     (ASCII string)
=           [190]
X           X       (ASCII string)
+           [193]
87.1        [200]   (Unquoted string follows)
            [004]   (String length of 4)
            87.1    (ASCII string)
::          [130]   (Statement separator)
PRINT       [156]
"SUM ="     [199]   (Quoted string follows)
            [005]   (String length of 5)
            SUM =   (ASCII string)
;           [180]
SUM         SUM     (ASCII string)
::          [130]   (Statement separator)
GOTO        [134]
300         [201]   (Line number follows)
            [001]   (Two line number bytes:
            [044]   (001 x 256 + 044 = 300)
            [000]   (Marks end of line)
```

Fig. 1

An example can make all this clearer. Assume this program line is entered:

440 SUM=X+87.1 :: PRINT "SUM=";SUM :: GOTO 300

The line is stored in memory like this, with token byte values in brackets (See Fig. 1):

The result is a condensed line which takes only 31 bytes of RAM, whereas the text version contains 47 characters. By the way, when Extended BASIC programs are saved in MERGE format, the lines in the file are written in virtually the identical format used for internal RAM storage. The difference is that the line number is added to the beginning of each line, in the usual two byte format. Studying MERGE format program files is a good way to understand how programs are tokenized and stored. Another way is to use a RAM dump program to view the areas of memory where programs are stored.

The next step in writing a self-modifying program is to create a routine which will duplicate the process described above, or at least the portions of it which will be needed. It is safest not to tamper with the line number table. Instead, include dummy lines in the program listing, and insert the data for the new lines in their place, retaining their line numbers. Be sure each dummy line takes up at least as much room as any line which might be inserted in its place. Otherwise the new line will overwrite something in memory and the program will almost certainly crash. One safeguard is to make the dummy as long as possible, such as:

1000 !DUMMY1!!!!!!!!!!!!!!!!!!

Keep editing the line and adding exclamation marks until no more are accepted.

In next month's article I will explain how to find the correct address for inserting new lines, give a few cautions about using this type of program, present a generalized routine for converting BASIC to internal format, and show some ways to use this type of program.

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BITMAC has provisions for trackballs, joysticks and even a second computer input! If you have a second computer such as an IBM PC, an Apple Macintosh even an IBM 370 main frame there are provisions for your second computer to create graphics with BITMAC!

BITMAC can make "slide presentations" for group meetings (and print the graphics!), give hours of "just doodling" pleasure, create charts for a stock holder report, print camera ready art for business ads, make still cartoon sequences (and print them in one of two sizes), create mechanical drawings, draft floorplans and many other uses!

BITMAC, with a second computer, can plot satellite data, statistical data, computer generated art plots, analog sampled data and just about anything your second computer can throw at BITMAC.

BITMAC offers BOOLEAN disk input (just like NASA enhances photos!) and a wealth of computer enhancement techniques that lend raw power to your ability to manipulate bitmapped graphics.

BITMAC offers icon input that allows you to point at the functions you want. Nothing was spared in making BITMAC easy and simple to use. Even a child can use it!

BITMAC requires either the Extended Basic, Mini Memory or Editor/Assembler Module, as well as a disk drive system, memory expansion and joysticks or trackball (for precision work).

NOTE: Compatible only with Epson, Star 10X or SG10, or other fully Epson compatible dot matrix printers (the TI-99/4A Impact Printer made by Epson [MX80] requires the upgrade of a GraphTrax or GraphTrax Plus chip set, available from Epson).

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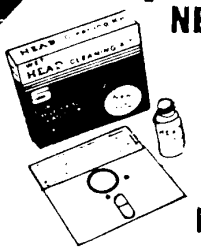

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TABLE #1:
EXTENDED BASIC KEYWORDS, SYMBOLS AND TOKEN VALUES

ASCII VALUE	TOKEN MEANING	ASCII VALUE	TOKEN MEANING
0	end of line	192	)
128	----	193	+
129	ELSE	194	-
130	::	195	*
131	! (remark)	196	/
132	IF	197	^
133	GO	198	----
134	GOTO	199	Quoted string follows
135	GOSUB	200	Unquoted string follows
136	RETURN	201	Line number follows
137	DEF	202	EOF
138	DIM	203	ABS
139	END	204	ATN
140	FOR	205	COS
141	LET	206	EXP
142	BREAK	207	INT
143	UNBREAK	208	LOG
144	TRACE	209	SGN
145	UNTRACE	210	SIN
146	INPUT	211	SQR
147	DATA	212	TAN
148	RESTORE	213	LEN
149	RANDOMIZE	214	CHR$
150	NEXT	215	RND
151	READ	216	SEG$
152	STOP	217	POS
153	DELETE	218	VAL
154	REM	219	STR$
155	ON	220	ASC
156	PRINT	221	PI
157	CALL	222	REC
158	OPTION	223	MAX
159	OPEN	224	MIN
160	CLOSE	225	RPT$
161	SUB	226	----
162	DISPLAY	227	----
163	IMAGE	228	----
164	ACCEPT	229	----
165	ERROR	230	----
166	WARNING	231	----
167	SUBEXIT	232	NUMERIC
168	SUBEND	233	DIGIT
169	RUN	234	UALPHA
170	LINPUT	235	SIZE
171	----	236	ALL
172	----	237	USING
173	----	238	BEEP
174	----	239	ERASE
175	----	240	AT
176	THEN	241	BASE
177	TO	242	??
178	STEP	243	VARIABLE
179	,	244	RELATIVE
180	;	245	INTERNAL
181	:	246	SEQUENTIAL
182	)	247	OUTPUT
183	(	248	UPDATE
184	&	249	APPEND
185	----	250	FIXED
186	OR	251	PERMANENT
187	AND	252	TAB
188	XOR	253	# (file or sprite)
189	NOT	254	VALIDATE
190	=	255	end of program
191	<		

GEnie more accessible

General Electric Information Services Co. says that GEnie (General Electric Network for Information Exchange), its network service for personal computer users, has reached 12,000 paid subscribers since service began Oct. 1.

According to general manager William Louden, GEnie has added 46 local telephone nodes for access to the service. The additions make GEnie accessible by local telephone from more than 500 cities, he said.

The new cities are:

Alabama—Sheffield.

California—Colton, Culver City, Madera and Victorville.

Colorado—Fort Collins, Grand Junction and Pueblo.

Connecticut—Middletown.

Florida—Boca Raton, Ocala and Stuart.

Georgia—Albany and Augusta.

Idaho—Idaho Falls and Pocatello.

Illinois—Champaign, Freeport and Waukegan.

Kansas—Topeka.

Massachusetts—Lawrence.

Maine—Kittery.

Michigan—Traverse City.

Missouri—Columbia.

Mississippi—Meridian.

Montana—Bozeman, Great Falls, Helena and Missoula.

New Jersey—Bound Brook, Hillsdale and Red Bank.

New Mexico—Roswell.

New York—Mt. Kisco and Nyack.

North Dakota—Fargo.

Ohio—Mansfield and Tiffin.

Pennsylvania—Hazelton and State College.

Tennessee—Murfreesboro.

Texas—Laredo, McAllen, Prairie View and Temple.

Wyoming—Casper.

Genie charges $5 per hour for non-prime time access at either 300 or 1200 baud, Louden noted, but some of the cities carry a $2 per hour surcharge. The non-prime time rates apply to use from 6 p.m. to 8 a.m. weekdays local time, weekends and national holidays.

Louden said that free uploading of public domain software to RoundTables (including the TI RoundTable) has been made a permanent feature of GEnie.

Personal computer callers may sign up for GEnie from their own keyboard by calling 1-800-638-8369. Callers should be prepared to give a VISA, MasterCard or personal checking account number. Upon connection, enter HHH and press Return. At the user number prompt, enter XJM11999,GEnie and press Return to be led through a sign-up procedure. For more information call 800-638-9636, Ext. 21.

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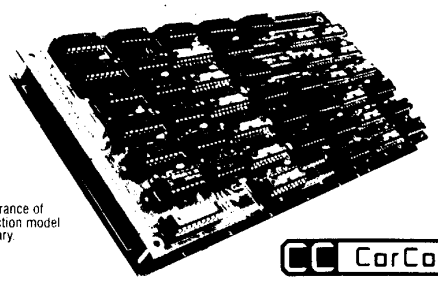
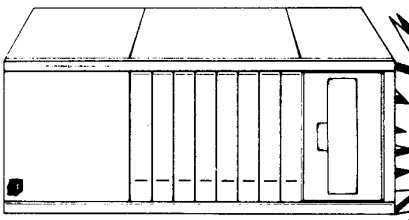


Appearance of production model may vary.



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Some of the features include:

1. Multi-disk selectability RAM disk capability.
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Structured BASIC programming

Adding and debugging

By EMILE VERKERK

Last month we wrote a skeleton checkbook reconciliation program. Even though it works well, it can be improved. Using structured programming techniques, we shall improve our checkbook program to add file handling capabilities to allow us to SAVE files, READ files and PRINT to a printer.

First of all we are going to SAVE our file. All that data entry to keep track of our checks should not be swept into an electronic vacuum at the end of a session.

In order to SAVE our file there are certain steps that we have to take. First, determine what the file name is to be, then determine what it is we want to save, then write the pseudocode for the module and finally code the module. Since each module strives for independence we should be able to write the module separately, test it to make sure that it works, RES it from line 3560, and then MERGE it (if you have Extended Basic) into the checkbook program.

Pseudocode for SAVE module.

```
  Ask for filename.
  Open file.
  Save balance and account number.
If there are records to be saved
    Save amount, date, comment,
       and sign
  Else
    Close file.
  Return to calling module
```

Once your have written the pseudocode the next step is to code the module, which would look like this:

```
3510 REM ******************
3520 REM * THIS MODULE^^^ *
3530 REM * WRITES A FILE ^*
3540 REM * TO CASSETTE OR *
3550 REM * DISK^^^^^^^^^^^*
3560 REM ******************
3570 CALL CLEAR
3580 LINE$="FILENAME^^^^^^^^
^^^^^^^^^^"
3590 ROW=8
3600 COL=5
3610 GOSUB 3330
3620 LINE$="DSK1."
3630 ROW=10
3640 GOSUB 3330
3650 FOR Y=0 TO 9
3660 CALL HCHAR(10,10+Y,95)
3670 GOSUB 3430
3680 IF KEY=13 THEN 3730
3690 CALL HCHAR(10,10+Y,KEY)
3700 CALL GCHAR(10,10+Y,FILE
(Y))
3710 FILE$=FILE$&CHR$(FILE(Y
))
3720 NEXT Y
3730 OPEN #1:"DSK1."&FILE$
3740 PRINT #1:BALANCE
3750 FOR Y=1 TO TRANS
3760 PRINT #1:DATE$(Y);AMOUN
T(Y);SIGN$(Y);COMMENT$(Y)
3770 NEXT Y
3780 CLOSE #1
3790 RETURN
```

See how easy it is!

Since you are all becoming experts in structured programming, I'll leave the rest of the enhancements up to you.

DEBUGGING

You've finally typed in the last comma, breathe a sigh of relief, stretch, type RUN and ... the program fails to respond. Now it's time to debug. Debugging occurs when you've made a mistake and you wish to correct it.

In other styles of programming, looking for an error becomes a nearly insurmountable chore. How can you debug your initialization routines if they are spread all over a 1000 line program? How can you make changes and/or enhancements to your program if you don't understand what it does?

Using structured techniques, it becomes easy to localize errors. If the error is in the input module, then that is as far as you have to look. Instead of having to search your whole program for lines of code that may have something to do with input, you have narrowed your potential for error to a few, well-documented lines of code.

Tomorrow, six months or a year from now, you can look at your HIPO charts, pseudocode, and program, with a realization that confusing programs can be a thing of the past.

Even though this structured programming exercise was in TI BASIC, a language that doesn't lend itself to structure, I hope that these techniques will find their way into your programs.

FREEWARE—

(Continued from Page 12)

government series EE bonds (identified by serial number and purchase date), sort by purchase date, and calculate current and future values, including annualized return, for each bond held. As new variable interest rates are announced by the government in November and May, the user enters the new rates which are automatically stored by the program and used to figure returns for those bonds five years or older.

The program requires Extended BASIC. The documentation may be printed from the main menu. Send disk, self-addressed and stamped return mailer to R. Kent Thompson, 409 Elberon Ave. No. 2, San Pedro, California 90731.

DRAGON STORM REMOVED FROM LISTING

Howard Uman has removed Dragon Storm from the Freeware market. Readers are advised to refrain from ordering the program.

MISCELLANY

Howard Uman of 3913 Sybil Rd., Randallstown, Maryland 21133, has issued a volume of programs called

(Please turn to Page 34)

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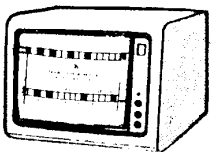

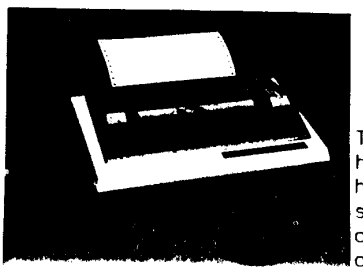

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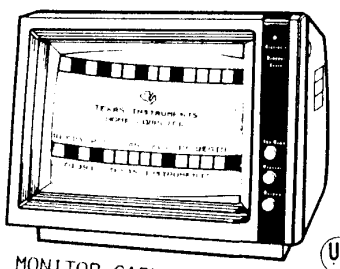

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FORTHMAIL:

Using your FORTHFONT characters for a disk mailer

By HOWARD H. ARNOLD

In the March issue we presented FORTHFONT for designing fancy characters to be printed on your Epson MX-80 Graphtrax type printer; we've also reviewed a printing program for using these characters on address type labels for labeling disks, packages or what-have-you.

This month we'll examine a Forth program for marking the cut and fold lines for a disk-mailing wrapper, and printing the DONT XRAY warning label needed to encourage kindness by the postal authorities. The graphics characters again are those designed (either by you or me) with FORTHFONT.

If you've followed the previous articles, this one should be easy. If not, you might like to dig out your previous issues. In our time-honored tradition, we'll first look at the new variables added for the application. They appear on screen 67, the first of three

(Please turn to Page 35)

```
SCR #67
  0 ( DISK MAILER PRINT PROGRAM)
  1 0 VARIABLE NBF 20 ALLOT 0 VARIABLE ABF 20 ALLOT
  2 0 VARIABLE CBF 20 ALLOT 0 VARIABLE TBF 20 ALLOT
  3 0 VARIABLE TABF 9 ALLOT
  4 : BLKRET NBF 20 BLANKS ABF 20 BLANKS CBF 20 BLANKS ;
  5 : RETURN CR 1023 MESSAGE CR BLKRET NBF 20 EXPECT CR
  6          ABF 20 EXPECT CR CBF 20 EXPECT ;
  7 : SETTAB 56 27 0 79 69 14 9 68 27 9 0 DO TABF I + C! LOOP
  8        TABF BF 9 CMOVE 9 WRT ;
  9 : PRTFLD 13 10 124 9 124 9 9 124 9 124 10 0 DO BF I + C! LOOP
 10          10 WRT ;
 11 : PRTRET 13 10 124 9 124 9 30 24 DO BF I + C! LOOP
 12          TBF BF 4 + 20 CMOVE 9 124 9 124 4 0 DO BF I + C! LOOP
 13          30 WRT ;
 14 -->
 15  ENTER NAME, ADDRESS AND CITY ST ZIP -- THREE LINES
```

FREEWARE UPDATE—

(Continued from Page 32)

"Best of Howard Uman." Included are games, educational programs, demos and music programs. The entire collection requires two diskettes. To order, send two single-sided, single-density diskettes with prepaid return mailer and $4-6, or send $9 and Uman will supply the diskettes and return mailer and postage.

MUSIC PREPROCESSOR

Music Preprocessor requires two single-sided diskettes. The program is a very sophisticated music generating utility. A subroutine called EMUSIC is used to provide XBASIC programmers with assembler capabilities. Users code their compositions from sheet music. The program allows users to integrate graphics and sprites with music. EMUSIC allows users to enter music in one- to four-part harmony and takes advantage of all three sound generators to provide full, resonant sounds. Included is very extensive documentation which may be dumped to printer or screen. Users have control of all music variables, ranging from beat length to "chops per beat" to fades. Included are a number of sample music programs. Requires disk system, expansion memory and XBASIC. Send two SS/SD diskettes, return mailer and postage to Norm Sellers, 15 Dorset Dr., Broomall, PA 19008. Sellers would like a donation to compensate for the many hours devoted to the development of this program but hopes mostly that others will compose and exchange compositions with him and other users.

KUCKABURRO SPELLING

Kuckaburro Spelling is designed to help children in studying spelling lists from school. The list is entered and may be saved to cassette. Uses graphics and sound effects to reward correct spelling. Requires XBASIC. A printer is optional. Send blank cassette and self-addressed, stamped return mailer to Larry P. Morgan, 9 Fountain Lake Dr., Greenfield, IN 46140. Or, send $7 and Morgan will pay all costs and provide the cassette. Do not send diskettes. A small contribution is asked from users who find the program to be worthwhile.

ENHANCED MPG

FineLine Software has released an enhanced version of its MPG program, called Enhanced MPG. Added are the ability to keep gas cost in the MPG database and the ability to output to a printer. The program is used to keep track of mileage and now gasoline cost for one or more vehicles. Includes 24-page on-screen manual. Requires XBASIC, disk system and memory expansion. Printer is optional. Send diskette, return postage and mailer to FineLine, 3 Wendy Lane, Marlboro, NJ 07746. Or, send $4 and FineLine will provide the diskette, etc. A donation of $5 or less is encouraged by FineLine.

ENHANCED SIDE*PRINT

Jim Swedlow has released version 1.3 of his Side*Print program. Side*Print prints Multiplan spreadsheets sideways. The new version supports Epson Mx 80, TI PHP 2500, Epson FX 80, Gemini 10X and Panasonic KX-P1090 printers. In addition, the program now has error trapping and expanded documentation. Owners of other printers may write for informa-

(Please turn to Page 43)

FORTHMAIL—

(Continued from Page 34)

screens used for the mailer printing program. NBF, ABF and CBF are, respectively, buffers for the name, address and city lines of the return address to be printed on the label. TBF is a temporary text buffer used for moving the individual lines of the return address to the printer. TABF is a buffer for storing the settings for the printer TABS.

Still on screen 67, BLKRET blanks the return address buffers. SETTAB does just that, setting the tab positions at column 9, 14, 69 and 79. For good measure, this also sends ESC 56 to the printer, telling it to ignore the "paper out" sensor. A word here about the tab settings. The codes shown here work on most Epson and compatible printers. The RX-80 sets tabs differently, requiring modification to this code. Screens 67A and 68A show the modifications to 67 and 68 needed to work on the RX-80.

PRTFLD loads the print buffer BF with ASCII 124 characters and appropriate ASCII 9s (tabs) to print the fold lines. PRTRET loads a line of the return address together with appropriate fold and tab characters and transfers them to the printer.

Going to screen 68, PRTADD moves the successive lines of the return address to TBF, the text buffer and calls PRTRET to print each line in turn.

PTTL may require a bit of mental gymnastics. First, remember that the FONT characters that we wish to use in the title are identified, for convenience of storage on the disk, not as ASCII numbers but by their ASCII number minus 64. Thus uppercase A is #1, uppercase D #4, etc. The characters immediately following: PTTL first loads these numbers into PAD, an internal storage buffer provided by the Forth seers just for such an occasion; then stores two more sets of identical numbers into pad; and then reads them all back onto the stack. The reason is that GETFNT (discussed in a previous lesson) wants three sets of letter identifiers on the stack in order to get the

(Please turn to Page 36)

```
SCR #68
  0 ( DISK MAILER CONT)
  1 : PRTRADD NBF TBF 20 CMOVE PRTRET ABF TBF 20 CMOVE PRTRET
  2           CBF TBF 20 CMOVE PRTRET ;
  3 : PTTTL 4 15 14 20 0 24 18 1 25 9 0 DO PAD I + C! LOOP PAD
  4   DUP 9 + 9 CMOVE PAD DUP 18 + 9 CMOVE 27 0 DO
  5   PAD I + C@ LOOP ;
  6 : XRAY PTTTL 3 0 DO I GETFNT LOOP ;
  7 : TAB 9 BF C! 1 WRT 1 WRT ;
  8 : MARKIT FD TAB GRP TOP 3 0 DO TAB GRP TTL LOOP 0 XL ! TAB
  9   GRP BLNK CRO TAB PTSR FD TAB GRP BLNK CRO TAB LTXT FD
 10   TAB GRP BOT FD 1 SER# +! ;
 11
 12 : NOTICE INIT BGN XRAY MARKIT 27 BF C! 65 BF 1+ C! 12 BF 2+ C!
 13   3 WRT ;
 14 : PRTCUT 13 10 124 9 9 124 9 7 0 DO BF I + C! LOOP 7 WRT ;
 15 -->

SCR #69
  0 ( PRINT MAILE CONT)
  1 : PTTXT 33 32 68 78 69 66 32 84 78 79 68 32 107 115 105
  2   68 32 114 101 116 117 112 109 111 67 32 32  32   28 0 DO
  3   TXB I + C! LOOP ; ( Put text for label in buffer)
  4 : PRTLN  13 79 BF + C! 10 78 BF + C!
  5   78 0 DO 45 BF I + C! LOOP 80 WRT ;
  6 : MAIL PRTLN 16 0 DO PRTCUT LOOP PRTLN 2 0 DO PRTFLD LOOP
  7   PRTRADD 3 0 DO PRTFLD LOOP PTTTL NOTICE 17 0 DO PRTFLD LOOP
  8   PRTLN 16 0 DO PRTCUT LOOP PRTLN ;
  9 : PRNTML 5 66 LOAD  RETURN PTTXT GETSER 0 DO CR 1054 MESSAGE
 10   CR 1055 MESSAGE PAD 1 EXPECT CR ." TURN PRINTER ON"
 11   SETTAB MAIL LOOP 2 66 LOAD ;
 12
 13 ;S
 14     Load paper for disk wrapper.
 15      Press any key when ready


 SCR #67A
 0 ( MODIFICATIONS FOR RX80 DISK MAILER PROGRAM)
 1
 2
 3
 4
 5
 6
 7 : SETTAB 56 27 0 0 0 0 0 7 27 9 0 DO ..............
 8
 9 : PRTFLD 13 10 124 9 9 9 9 9 9 9 9 124 9 124 14 0 DO BF
10 I + C! LOOP 14 WRT ;
11 : PRTRET 13 10 30 28 DO BF I + C! LOOP
12
13
14 -->
15



 SCR #68A
 0 ( MODIFICATIONS FOR RX80 DISK MAILER PROGRAM)
 1
 2
 3
 4
 5
 6
 7
 8
 9
10
11
12
13
14 : PRTCUT 13 10 124 9 9 9 9 9 9 9 9 124 9 13 0 DO BF I + C!
15 LOOP 13 WRT ; -->
```

Seattle TI99/4A Convention slated

A TI99/4A Convention for the state of Washington is scheduled for Sept. 26-28 at the Sea-Tac Holiday Inn in Seattle.

The show is sponsored by user groups in the state of Washington and planned features include consignment tables, door prizes and opportunities to buy, sell and trade TI-compatible hardware, software, supplies and books, according to Barbara Wiederhold, contact person for the convention.

Admission is $3, $1 to card-carrying users group members.

Business spaces are available for $40 apiece, including electrical wall outlet, along the wall or $35, including electrical wall outlet, in the middle of the room. Businesses who register by July 15 will be eligible for a door prize drawing. Late registration deadline is Aug. 15.

A Special Users Group room with 24 spaces will be available for users group exhibits on a first-come, first-served basis on registration. Wiederhold says out-of-state users groups are encouraged to register at a $10 user group fee and sell the convention package to members. Users groups which register by July 15 will be entered for door prizes, she says. Also, in-state and out-of-state prizes will be awarded to the groups with the most in attendance.

Users groups should bring expanded systems and software to trade or sell, Wiederhold says. She says no freeware software prices can be charged except by the owner of the program and that software being marketed and licensed cannot be traded by users groups.

A President's Dinner will be held Sept. 26, honoring all presidents registered at the convention. Wiederhold notes that only 250 seats can be reserved, so users group presidents need to make reservations. Speakers scheduled for the dinner include Cheryl Whitelaw (C. Regena), Lou Phillips of Myarc, Bill Moseid of DataBioTics, Chris Bobbitt of Asgard Software, Jim Horn of the CompuServe TI Forum and Craig Miller of Millers Graphics. Cost of the dinner is $25. Deadline for dinner reservations is Aug. 15.

Wiederhold says 100 rooms at the Holiday Inn have been set aside for advanced reservations at $70 per night. Rooms can be occupied by up to four persons. A hospitality room at the hotel will be available to all convention-goers.

Persons attending have an opportunity each day to attend Expo 86 in Vancouver, Canada, on the Holiday Inn bus, whether or not they are staying at that hotel. Cost is approximately $68 round-trip, including entrance fee.

For further information, or to register, contact Wiederhold at the Queen Anne Computer Shoppe, 6½ Boston St. #4, Seattle, WA 98109 or (206) 283-0953 (voice 11 a.m.-5 p.m. Pacific Time, BBS after hours).

FORTHMAIL—

(Continued from Page 35)

FONT design information from our disk storage. And the very next word, XRAY, calls GETFNT three times, using the stack of numbers we put there for its convenience. Maybe not the most elegant move in the world, but by darn it works!

TAB simply delivers two ASCII 9s to the printer—meaning TAB twice.

MARKIT now calls the stuff from these screens and from the label printing screen previously reviewed to print the graphics label. See, you do need those back issues!

NOTICE initializes the printer, calls XRAY to get the appropriate fonts into the print buffer and calls MARKIT to do the printing and finally sends the sequence ESC 65 12 to the printer, to reset the line spacing to the default 12 dot value.

PRTCUT loads tabs (9s) and ASCII 124s into BF and sends them to the printer for the cut lines on the mailer.

PTTXT (moving on to screen 69) puts the ASCII values for "Computer Disk DONT BEND !" into buffer TXB.

PRTLN simply prints a horizontal line (78 ASCII 45s followed by a carriage return and a line feed.

MAIL now calls all the above printing words in the proper order and, finally, PRNTML, the user word we all must use, opens the printer file by loading the appropriate lines of screen 66; calls the necessary prompting messages; and, finally, closes the printer file by loading line 2 of screen 66.

NOTE: Those who do not want to type and debug the FORTHFONT programs themselves may send $5 for disk, shipping and handling to Howard H. Arnold, 210 Beech Valley Rd., Lewisville, NC 27023. Arnold requests that readers specify FORTHFONT as he has a couple of other freeware offerings active.

Business reporter changes tune on TI

"It's a model of loyalty," read the headline in the Seattle Times business section May 6.

Reporter Richard Buck recapped an article he wrote last fall, lamenting his ownership of a "dead home computer," the TI99/4A.

Buck said the article "turned into a premature obituary, to my initial embarrassment and my later delight."

He notes that there is a "passionate loyalty" among owners of the 99/4A, much of which is centered in Seattle. After the first article was published, he says, he received numerous phone calls and letters from TI owners.

He notes that the Queen Anne Computer Shoppe in Seattle is devoted to selling the TI only, and even has a limited quantity of new consoles in

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Korean orphans get TIs, software

Sung Ne Won Orphanage is South Korea recently received several TI99/4A systems and educational software packages.

Members of the California Air National Guard's 162nd Combat Information Systems Group brought the donations during the recent large-scale joint U.S.-Korean military exercise Team Spirit '86.

The computer equipment was part of gifts and supplies for more than 140 homeless children brought by the guardsmen.

The 261stCISS headquartered in Van Nuys decided to raise funds for the 99/4As and software. Members of the group who own TIs "felt this would be an ideal gift," according to Lt. Col Regina M. McGuinness, 162ndCISG public affairs officer.

Members of the group contacted Jerry Price of Tex-Comp, who offered to match each dollar spent by the group with $2 from Tex-Comp, resulting in the group obtaining three times as much computer equipment as originally planned. Price also donated a large amount of TI99/4A training and instructional materials. Material was adaptively selected based on a previous donation by Tex-Comp and a local Optimist club to public and private school classes for the hearing-impaired.

Before being packed for shipment to Korea, each computer system was completely set up and operated at Group Headquarters to ensure trouble-free operation in Korea and to familiarize members making the trip with operation of the TI and software. Each system included the computer with a disk drive, disk drive controller, 32K additional memory, color monitor, speech synthesizer and joysticks. Educational software to train the Korean children in math and English skills was sent, along with games to be used as rewards for completing educational assignments.

According to McGuinness, a number of members of the squadron were so impressed with the demonstration that they purchased TI99/4As.

TSgt Chong S. Kim of the 261stCISS made the trip to Korea and arranged the installation of the computer systems at the orphanage and trained its staff in the use and care of the computer systems. The squadron has made a commitment to continue assisting the orphanage in its computer program and has been assured of continuing support from Tex-Comp, McGuinness said.

The squadron was planning to honor Tex-Comp at a formal ceremony to which representatives from the Air Force, Texas Instruments and the State of California have been invited.

Reviewed in MICROpendium

1984

February: B-1 Nuclear Bomber, Tandon TM-100 Disk Drive, Void, Beanstalk Adventure, Microsurgeon, On Gaming, Database 500
March: Star Trek, Escape From Balthazar, Garkon's Getaway, Sky Diver, Mail-Call, Prowriter 8510 Printer
April: Monthly Budget$ Master, Budget Master, Home Budget, Thief, Donkey Kong, Khe Sanh
May: Companion Word Processor, Q*Bert, Mad-Dog I & II, Programs for the TI Home Computer
June: Creative Expressions Accounts Receivable/Accounts Payable, CDC 9409 Disk Drive, Starship Concord, Lost Treasure of the Aztec, ASW Tactics II
July: Theon Raiders, Introduction to Assembly Language for the TI Home Computer, Game of Wit, Pole Position
August: TE-1200, Tower, Galactic Battle, Galaxy
September: Wycove Forth, 99/4 Auto Spell-Check, QUICK-COPYer, Wizard's Dominion, Anchor Automation Mk XII Modem
October: Killer Caterpillar, ZORK I, Defender
November: 9900 Disk Controller Card/Manager, Super Bugger, Transtar 120S printer, Floppy-Copy, Data Base-X
December: Gravity Master, Data Base Manager System, Learning 99/4A Assembly Language Programming

1985

January: Super Sketch, Foundation Computing 128K Card, PTERM-99, TI-Runner
February: Super Extended BASIC, Beginning Assembly Language for the TI, ZORK II
March: Morning Star Software CP/M Card, WDS/100 Winchester Disk Drive, Sketch Mate, BMC Color Monitor
April: 9900 Micro Expansion System, Disk + Aid, Gemini 10X-15X
May: Character Sets and Graphics Design, Draw 'N Plot
June: GRAPHX, DATA BASE I
July: Acorn 99, Advanced Diagnostics
August: Model Dow-4 Gazelle, TI-Artist, PC-KEYS, Not-Polyoptics' Bankroll
September: Midnite Mason, Myarc 32K/128K Card, GRAPHX Companion
October: 4A/TALK, Extended BASIC II Plus, XB Detective, Console Writer 2.1
November: Foundation Z80A/80-column cards, 9900BASIC, Adventure Editor
December: Display Enhancement Package, Triple Tech

1986

January: BITMAC, Starcross
February: Night Mission, Peripheral Diagnostic Module, BA-Writer
March: Super Duper, Tunnels of Doom Editor, Business Graphs 99
April: U.S. Open Tennis, PRBASE
May: 4A Flyer, GRAM Kracker, Artist's Companion

REPORTER—

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stock. He cited Barbara Wiederhold, the owner, as saying she has about 3,000 customers. Buck notes that five TI users groups operate in the state.

Buck reports that Wiederhold helped him and his son "revive" their TI and that it is out of the closet now.

Puget Sound 99ers offer Fest-West tape

The Puget Sound 99ers offer a videotape of the Lost Angeles TI Fest-West for $15 plus $5 shipping.

Chuck Wynne, president of the Puget Sound 99ers, says he and his son produced the tape, which includes presentations by Barry Traver, William Warren, Lou Phillips and Craig Miller.

Orders may be sent to the group at P.O. Box 6073, Lynnwood, WA 98036.

Wynne notes that the group operates a BBS at (206) 784-4142.

Myarc's disk controller card

Command capabilities

By JEFF SHAW

One of the biggest hardware advances for the 99/4A has been the introduction of disk controllers able to handle double-sided drives. Myarc Inc. produces such a card.

The Myarc disk memory system actually consists of two parts: the disk controller itself and the "Disk Manager Level III Supreme." Both are important to a total evaluation of this package. First, let's look at the card.

The disk controller comes in a sturdy case though it is quite a bit lighter than the TI disk controller card. It fits easily into the peripheral expansion box. The disk controller provides four new commands that may be executed from command level. The "CALL ILR" command emulates the CALL INIT command from BASIC. This command must be executed to start using machine language programs.

The next command is "CALL LR." This command is the same as CALL LOAD except for the obvious benefit of being able to execute it from command level as well as in a program.

The third new command is "CALL LLR." This is the same as CALL LINK.

Finally, we come to perhaps the most exciting new command of all—"CALL DIR." This command catalogues a specified disk drive. This command may be executed at any time. It will not affect the program in memory. Before obtaining this card, I had dreamed of this capability countless times.

It should also be noted that the controller is capable of handling up to four disk drives, an improvement over the TI controller's three. However, this will be of little advantage to the average user.

Now, let's move on to the disk manager. The disk manager comes on disk and is loaded from BASIC using the CALL ILR and CALL LR commands mentioned above.

Review

Report Card

Performance ..... A
Ease of use ..... A
Documentation ..... B+
Value ..... A

Requirements: Expansion box, disk drive.
Manufacturer: Myarc Inc. P.O. Box 140 Basking Ridge, N.J. 07920 Cost: $169.95

The main menu lists six options. These options are chosen by a single keystroke.

The SETUP option allows one to alter the disk manager's default values. Foreground and background colors may be changed to any combination desired. The main drive and copy drive numbers may also be changed as well as the formatting defaults (ie. single/double-sided single/double-density). Finally, the print device name may be altered.

The CATALOG option catalogs the selected disk drive. After choosing the drive number, the listing is displayed to the screen. It may then be dumped to a printer by pressing FCTN P. It is also possible to scroll through the files using the up and down arrow keys. This is very convenient, especially if one has a large number of files all of which will not fit on the screen. It is also possible to home the cursor back to the top of the screen.

Now we come to what are perhaps this product's most powerful and easy to use features: the EDIT commands. After cataloging a disk, selecting EDIT will cause a new menu to appear at the bottom of the screen. These options are again initiated by a single keystroke. The disk catalog remains at the top of the screen with the first entry highlighted When an EDIT function is selected, the first letter of that function is displayed to the left of the filename and the next file is highlighted.

The first command is COPY. This command copies the designated file from one disk to another. The disk drives to be used are chosen when all the EDIT commands are executed. Because the Myarc disk manager makes use of expansion memory, files may be copied much more quickly than with TI Disk Manager II. I will have more to say on this when discussing the BACKUP command.

The next command is PROTECT. This command is used to protect a file from being deleted accidentally. The file may be unprotected using the UNPROTECT command.

The next command is DELETE. It does the obvious.

A very interesting command is the MOVE command. This command is the same as COPY except that the file being copied is deleted from the source diskette. This command can be quite useful when cleaning up your disks.

The next command is BACKUP. This command copies all files on the designated diskette. As noted before, this program makes use of expansion memory which translates into fewer passes and thus shorter copying times, than the TI Disk Manager. In fact, the Myarc disk manager required only four passes to copy a single-sided, single-density disk and thirteen passes for a double-sided, double-density disk.

One of the most exciting commands is the SEE command. This command reads a Display/Variable or Fixed 80 file and scrolls it across the screen. If one has a disk full of TI-Writer files and wishes to copy some and discard others, this command is a great help. It also may be of use to assembly language programmers.

Filenames may be changed using the RENAME command. Disk names may

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MAXIMEM

Saving your modules to disk

By JOHN CLULOW

MAXIMEM is an exciting new product for the TI99/4A from Guy Gournay of Longueuil, Quebec.

MAXIMEM allows the user to save virtually ANY TI module software on disk. The software can then be loaded into the MAXIMEM device and executed by single-key menu selection; the command module from which the program was extracted is no longer needed.

In addition to its ability to imitate the ROM and GROM memory in a command module, MAXIMEM also contains an improved, resident version of the Editor/Assembler module and the Disk Manager II module. The user can select MAXIMEM, Editor/Assembler or Disk Manager II simply by setting a three-position slide switch. Having access to the E/A and Disk Manager modules without having to load them into MAXIMEM is a big time saver and adds greatly to the convenience of using this peripheral.

About the size of a cartridge expander, MAXIMEM plugs into the command module slot. It does not require an external power source. The device adds 16K of RAM and either 32K or 40K of GRAM to the system depending on the option you choose. A battery-backed version is also available as an option, and GPL compiler and decompiler programs written in Forth are provided on request.

MAXIMEM comes with all utilities required to save modules on disk, and complete source code is provided. A menu file, MODU1, is first placed on a blank disk. Then as modules are saved to that disk, the MODU1 file is automatically updated. Whenever the MAXIMEM option is selected, the MODU1 file is accessed to present a menu of all modules which have been stored on the disk. The module to be loaded into the MAXIMEM cartridge may be selected with a single key press. This is one of the best features of MAXIMEM, making it possible for children to use the device. Modules can be loaded and run without having to remember and type in file names.

Review

Report Card

Performance ..... **A**
Ease of Use..... **A+**
Documentation ..... **A**
Value..... **A**
Final Grade..... **A**

Cost: $142 ($200 Canadian). Options extra
Manufacturer: Guy Gournay, 146 178 Can Inc., 933 Delorimier, Longueuil, Quebec, Canada J4K 8M8
Requirements: Console, monitor or TV, disk system, 32K memory expansion. Can also be used with cassette recorder without disk and 32K.

Perhaps the easiest way to save a module is by making use of a cartridge expander and the Editor/Assembler module. The process is explained step by step in the easy-to-read manual. First, the dump program is loaded, using E/A Option 5. Then the cartridge expander is switched to the module to be saved. Following entry of a four-character file descriptor, the module is automatically dumped to disk and the MODU1 file updated. From the information displayed, the user can determine which ROMs and GROMs the module uses. The user enters a 12-character module name to be used in the MAXIMEM module menu and then has the option of saving more modules.

For those who, like me, do not have a cartridge expander, another method is provided: After loading the dump (using either an E/A module or MAXIMEM's resident E/A), a "reset" button is pressed. This button must be installed in the console by the user, and is "not recommended for beginners." As long as the button remains pressed, the computer ignores the reset that normally occurs when modules are inserted or removed. So with the button pressed, the user removes MAXIMEM and inserts the module to be downloaded. After the reset button is released, a LOAD interrupt button (AKA GROM-buster) is pressed, causing the dump software to pick up where it left off. This technique also allows the dumping of one module after another without reloading the dump program.

This method of dumping modules has worked flawlessly for me. (I found that I could not get a reset switch to work in a "1983" beige console, but had no trouble installing one in a black and silver console. MAXIMEM users with the latest model consoles may have to use a cartridge expander to save modules to disk.)

Once a module has been downloaded to disk it can subsequently be transferred to cassette tape. The module can then be loaded into MAXIMEM from tape without the need for 32K memory or an expansion system.

SOME MAXIMEM APPLICATIONS

Most people tend to use the computer routinely for certain tasks such as word processing or spreadsheets and so find themselves using four or five modules frequently. With MAXIMEM, these can be kept on disk and easily loaded as required with no wear and tear on the module port (or your nerves when you can't locate the module you need).

The modules I use most often are TI-Writer and Editor/Assembler. I also occasionally use Disk Manager II, Terminal Emulator II and TI Extended BASIC. Since Editor/Assembler and Disk Manager are resident in MAXIMEM's 16K "GROM," I can put Extended BASIC in MAXIMEM, use TK Writer and load TE II on those few occasions I need it. I almost never have to change modules.

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MYARC DISK CONTROLLER CARD—

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be changed using the VOLUME command.

After all commands have been entered, the EXIT command returns the user to the main menu.

Now all one has to do is choose the XECUTE command. All EDIT commands are then executed. This means that copying, deleting, renaming, etc. is done at the same time. This is much faster than having to go to a separate screen for each of these functions.

Another group of main menu commands is the UTILITY commands. These commands include TESTS, CLONE, FORMAT, LOAD/RUN, and RAMDISK.

The TESTS command allows the user to test disk functioning. There are three tests available. The first is the non-destructive quick test. This test does not destroy the data on the disk being tested. Also, there is the destructive disk test; somewhat more in-depth than the first but the data on the disk is destroyed. The last test is the comprehensive disk test. This is an exhaustive test which takes about twenty minutes to execute.

CLONE is a very useful and welcome function. This performs a sector copy of a disk. Any information on the copy disk is destroyed. This command is useful for backing up a disk as it is FAST.

The FORMAT command is used to format disks. Any format from single-sided, single-density to double-sided, double-density may be chosen. The user is prompted for the disk name, the number of tracks, the format, the number of sectors per track and the interlace step. These last two options may be new to TI users.

The user can choose between 16 or 18 sectors per track. However, the 16 sector format is recommended by Western Digital, TI, and the manufacturer.

The interlace step option is perhaps a bit more useful. A default value for this option is always given which is appropriate for the chosen format. However, it is possible to speed up disk access by experimenting with the interlace. FORMAT executes relatively quickly. It takes just 52 seconds to format a SSSD disk, 60 seconds for SSDD, 100 seconds for DSSD and 116 seconds for DSDD. The LOAD/RUN option allows one to execute assembly language programs. The user is prompted for the file name and the program name. The program is then executed. The disk manager is removed from memory.

The RAMDISK command may be used with the Myarc 128K or 512K ramdisk cards. The user may format the ramdisk as well as emulate one of five drives. As I do not own either of these cards, I was not able to test this option.

Performance: So far, the card has performed almost flawlessly. The only exception is that the indicator light on my card does not work. This is of minor concern. (Incidentally, the light is red, not amber.)

Ease of Use: The Disk Manager Level III Supreme sets a new standard for ease of use. The ability to enter commands for certain files (copy, delete, etc.) and then to execute them all at the same time is a great time saver. Most commands are issued using a single key stroke. If I gave out grades of A+, I would give it here.

Documentation: The documentation consists of two manuals. The first is almost an exact reprint of the manual which comes with the TI disk controller card. It is thus well written but contains little new information for former users of the TI disk system.

The second manual describes the disk manager. It is a short, 5 12 by 8 12-inch booklet. This manual tends toward terseness. Nevertheless, all functions are described adequately if not in detail. There is also a two-page addendum which describes such things as operation with TI-Forth and the Myarc WDS100 hard disk system.

Value: I cannot rate this product highly enough. The ability to use double-sided disk has essentially doubled my disk storage capability.

The Myarc disk manager is light-years ahead of the Disk Manager II in speed and ease of use. There are also some features not available with the TI disk system, most notably the CALL DIR command. Other than the documentation, this product would be very hard to improve.

MAXIMEM—

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Parents whose children use the TI educational modules will be able to put several on disk. Children can select modules from the MAXIMEM menu with a single key press. Of course, disks of TI's great game modules can also be prepared for easy use by children.

MAXIMEM will run all SUPERCART software without modification. With MAXIMEM, however, assembly language programmers now have 16K of RAM available instead of 8K; the additional 8K is bank selectable. As all assembly programmers know, a lot can be done with 16K or machine language.

For TI hackers who are familiar with Forth and want a real challenge, the GPL compiler and decompiler will provide hours of fun, and with some understanding of Graphics Programming Language, DEBUG can be used to modify and customize existing modules.

MAXIMEM WITH A RAMDISK

Users with a RAMdisk will be happy to learn that MAXIMEM is fully compatible. Loading a large module like Extended BASIC takes about 30 seconds using a floppy drive but only takes eight seconds using a RAMdisk. Shorter educational and game modules take only one or two seconds to load.

Using one of the RAMdisks now available for the TI, I saved modules and reloaded them with no problem whatever. It is an additional advantage if the RAMdisk retains data when the system is powered down so the module files do not have to be reloaded from

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Newsbytes

Labels, history, disk jackets from Nameloc

Nameloc Software offers three programs, Labelmaker, Timetravel and Catalope.

Labelmaker offers five lines of text for the standard 3½-inch-by-$^{5}/_{16}$-inch label, according to the manufacturer. The program offers four different pitches or print styles: enlarged, with 17-character maximum length; enlarged/condensed, with 28-character maximum length; pica, with 34-character maximum length; and condensed, with 56-character maximum length. In the enlarged and pica styles the user also has the option of regular, emphasized, italic or emphasized italic, according to the manufacturer, and each label line may be designated in any of these print options.

The program contains a mailing list option which allows the user, to add, delete, change, sort and scan entries and to save them to disk.

Labelmaker is $5 postpaid and requires Extended BASIC, 32K, disk drive and Epson-compatible printer.

Timetravel allows the user to display any month from 1601 to 2100 on the monitor or an entire year at once. These may also be sent to the printer; one year fills an 8½x11 sheet while a single month fills about ⅓ of a page. A special "Year Search" option will find all identical years to the one chosen within any two years specified, according to the manufacturer.

The second half of the program consists of a 115-question multiple-choice history trivia quiz, which resides on the disk as QUIZFILE. The user specifies the number of questions desired (up to 30). Questions utilize speech and sound, according to the manufacturer. The user has the option of seeing the actual calendar month for the event, after each question, before moving to the next question.

An included QUIZMAKER program allows the user to build his own quiz questions and store them on disk. A five-column reference copy of the quizzes may be printed out in 132-column condensed print format.

Timetravel is $5 postpaid and requires Extended BASIC, 32K and disk drive. An Epson-compatible printer is optional.

Catalope is designed to allow the user to create disk jackets with the catalog printed on the front. According to the manufacturer, it will handle the maximum number of 127 files and prints in one- to four-column format with full directory information. The manufacturer says the user can print just the directory or the directory plus a disk jacket "outline" of the envelope pattern. The user cuts the outline on the dotted lines, folds it and puts two pieces of scotch tape on the back to attach it to the envelope. Catalope requires Extended BASIC, disk drive and an Epson-compatible printer and is $5 postpaid.

Nameloc offers any one of the programs for $5, any two for $8 and all three for $10. For information, or to order, contact Nameloc, 3971 S.E. Lincoln, Portland, OR 97214.

MAXIMEM—

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floppy disk every time the system is used.

MAXIMEM OPTIONS AND PRICE

Because MAXIMEM is priced in Canadian dollars, the U.S. dollar prices for various MAXIMEM options reported here are approximate and based on an exchange rate of 71 percent.

The basic MAXIMEM device contains 16K RAM and 32K GRAM and is priced at $142. ($200 Canadian). This model is sufficient to save and load any existing TI module. An option I would strongly recommend is battery-backup. This costs an extra $14 ($20 Canadian).

Because future applications may make use of the additional GRAM, I would also recommend the extra 8K GRAM option. (This will provide continuous GRAM from 6000 to FFFF.) The cost is only an additional $7 ($10 Canadian).

This brings the cost of a battery-backed unit with a full 56K of memory to $163 ($230 Canadian) plus $7 for postage, insurance and handling.

I spoke with Mr. Gournay about the availability of his unit in kit form, and he said he would be willing to discuss sales of kits with interested persons. The PC board, EPROM, PROM and utility software would be included together with instructions. The customer would then purchase the parts separately. Do-it-yourselfers and user groups interested in building their own MAXIMEMs at a savings over the purchase of built units are encouraged to contact Mr. Gournay for details at (514) 651-7280.

RATING MAXIMEM

I have not had a single problem with the MAXIMEM unit MICROpendium sent me for review. I feel its most outstanding characteristic is its ease of use; I gave it an A+ in that area.

The tutorial guide suppled with the unit covers every step in using the device. It is clearly written and also available on the utility disk for access from the resident E/A module editor.

After using MAXIMEM for a month now, I do not want to be without it. I think it's a valuable addition to my system, and my "final grade" is best expressed in the order I just mailed for a MAXIMEM with all the options.

Texaments to sell CSGD software series

Texaments has signed an agreement with Dave Rose for manufacturing and distribution rights to his Character Sets and Graphic Design series of software.

The series includes CSGD I, CSGD II, User Disk #1, User Disk #2 and the newly released User Disk #3.

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Newsbytes

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CSGD User Disk #3 is described as "another complete two-disk set of character sets and graphics for the CGSD series of software." The manufacturer says the two disks include 12 individual character sets, 27 pictures and 127 CS graphics, all new and original designs.

User Disk #3 is available for $10.95 plus $1.50 postage and handling. The manufacturer invites dealer inquiries.

For further information, or to order, contact Texaments, 53 Center St., Patchogue, NY 11772 or (516) 475-3480.

Great Northwest BBS

The Great Northwest BBS, a Caltex Ver.4 CBBS system, operates at 300 baud at (206) 598-3228.

The BBS is in Suquamish, Washington, in the Seattle area.

Hours are 7-10 p.m. Monday through Thursday and from 7 p.m. Friday to 10 p.m. Sunday.

Cliff James, sysop, says plans are for 1200 baud soon and that the board will go to 24 hours if there is enough response.

Thomson Software has new address

New address for Thomson Software is 436 Le Tour, Rochester, MI 48063.

Donald M. Thomson of Thomson Software also says his computer has been in storage, so there have been some delays in filling orders, but he is in the process of filling the backlogged orders now.

BRAIN released

Datax announces the release of a new program, the BRAIN.

The BRAIN contains routines for converting numbers in four number base systems, decimal, hexadecimal, octal and binary. It contains tables for ASCII codes in both hex and decimal and has tables of TMS 9900 instruction set.

The BRAIN also has routines for computing financial and real estate investments and for measurements used in physics and advanced mathematics.

According to the manufacturer, the program is controlled by a set of 24 menus arranged in a treelike pattern. Eighteen help screens are available. The program uses 40-column bitmap display and contains a fast five-operation calculator window, the manufacturer says. The user can change the program defaults and these new defaults are saved to disk by the program. The new defaults are automatically read in by the program at loading time. The program can handle numbers with up to 100 digits and up to 12 decimal places, according to the manufacturer.

According to Julian Achim of Datax, the BRAIN comes with a lifetime warranty and customer support. Price is $49.95. The program is available on disk and requires 32K or more memory and Extended BASIC.

For further information or to order, contact Datax, 1923 Linden St., Ridgewood, NY 11385 or (718) 417-0165.

U.K. 'magazine' comes in tape, disk version

A new "magazine" on tape or disk, 4FRONT, is being published in the United Kingdom.

According to Harry Pridmore, the publisher, the main structure of the tape version runs in TI BASIC or Extended BASIC and also contains programs to run in both those formats as well as in other environments. It has items in TI BASIC that do not appear on disk.

Pridmore says the disk version assumes XBASIC as standard and includes items that do not run from tape, such as Editor/Assembler material.

The first issue of the quarterly publication was recently released. Pridmore says the U.S. price is to be announced.

For further information, contact Pridmore at New Day Computing, Jerrard Close, Honiton, Devon, UK EX14 8EF or telephone (0404) 41856.

Intelpro to move

New address for Intelpro, effective June 30, will be 13 Saratoga Dr., Kirkland, Quebec, Canada H9H 3J9.

Allan Swett, president of Intelpro, says the new telephone number will be established only after the move, but should be available through Greater Montreal directory assistance at (514) 555-1212, probably after July 10.

TI-Forth utilities are released

TI-Forth Utilities I is a series of powerful tools designed to aid the beginner and advanced Forth programmer, according to the program's author, Mike De Frank. Included are a machine code disassembler, Forth definition decompiler, screen dump utility, sound utility, enhanced versions of both the 64- and 40-column screen editors, speech routine, two graphics demos, a music demo, forth loader for the 8K SuperCart and an assortment of routines.

The software includes source code and documentation. The cost is $19.95. Editor/Assembler, expansion memory and a disk system are required. For more information, contact De Frank at 4374 NW 9th Ave., Pompano Beach, FL 33064.

Newsbytes is a column of general information for TI99/4A users. It includes product announcements and other items of interest. The publisher does not necessarily endorse products listed in this column. Vendors and others are encouraged to submit items for consideration. Items submitted will be verified by the staff before inclusion and edited to fit the Newsbytes format. Mail items to: MICROpendium, P.O. Box 1343, Round Rock, TX 78680.

User Notes

Side*Print error is corrected

Side*Print, a freeware utility that prints Multiplan spreadsheets sideways, has a minor bug in it, according to its author Jim Swedlow. Line 140 should be changed to read: 140 CALL INIT.

Using CTRL in XB programs

David Gore, of Albuquerque, New Mexico, writes:

Everyone keeps saying how neat it would be if they could use control keys instead of writing our reserved words; well you can! There are eight control keys that can be used in programs (without using a REM statement). However, you can use only one per line number and cannot use it in conjunction with other statements in any program line.

The keys are:

CTRL Q = UNTRACE
CTRL T = RESTORE
CTRL U = RANDOMIZE
CTRL O = UNBREAK
CTRL P = TRACE
CTRL H = RETURN
CTRL K = END
CTRL X = STOP

Listed below is a program example using four CTRL commands.

```
100 (ENTER CTRL P)
110 CALL SOUND(100,110,0)
120 GOSUB 140
130 GOTO 110
140 (ENTER CTRL U)
150 A=INT(RND*200)+110
160 CALL SOUND(100,A,0)
170 (ENTER CTRL H)
180 (ENTER CTRL K)
```

After entering the program, type LIST. Then RUN it.

User Notes is a column of tips and ideas designed to help readers put their home computers to better use. The information provided here comes from many sources, including TI home computer user group newsletters. MICROpendium will pay $10 for any item sent in by readers that appears in this column. Mail tips to: MICROpendium, P.O. Box 1343, Round Rock, TX 78680.

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tion. Send $5 in U.S. funds or an initialized disk and stamped return mailer to Jim Swedlow, 7301 Kirby Way, Stanton, California 90680.

Anyone wishing to have a Freeware announcement included in MICROpendium's Freeware listing may do so by submitting a copy and brief description of the program, and a note indicating that it is in the public domain, to MICROpendium. Complete Freeware listings, updated quarterly, are available from MICROpendium for $1 (or 50 cents and a self-addressed stamped envelope). Freeware announcements will continue to be published in the listing until withdrawn by the persons submitting them or the publisher.

A thousand pardons, please

We goofed on the line numbers in last month's improvements to Word Count. All line numbers listed in the May User Notes Word Count program should be advanced by 10, starting with line number 320. The first line should read as follows:

```
330 DISPLAY AT(5,2)ERASE ALL:"
Enter Text File Name" :: DISPLAY A
T(10,7):"DSK" ::ACCEPT AT(10,10
)SIZE(12):D$
```

By changing the line numbers the ON ERROR routine in line 330 will work properly. In the May issue, the routine to the last line of the program rather than to the next to the last line, which should be 560.

Triple-Tech and TI-Writer

Dave Erickson of San Jose, California, says CorComp's Triple-Tech card isn't just for Extended BASIC. He writes:

While experimenting with TI-Writer and the CorComp Triple-Tech card, I found that the LF (Load File) command can be used to retrieve the date and time information to the screen. The procedure in the command mode is:

```
LF
CLOCK
```

This fills the buffer with the date and time (978 lines) in the format:

```
2,05/21/86,22:35:24
```

To load one line (or a limited number of lines), use: 1 1 CLOCK (for one line) or 1 5 CLOCK (for five lines), etc.

To load these into the buffer after a specific line (26, for example), use: 26 1 1 CLOCK

TI-Writer may also be used to set the date and time on the Triple-Tech card using the PF (Print File) command. First enter into line 0001 of a cleared buffer (edit mode)— the day, date and time information to be set. Be certain to use the correct format, including leading zeros on the month, date, hour and minute if applicable; and the commas between the day, date asnd time. Any character may be used for the slash or colon separators, but only the slash and the colon will be returned by the Triple-Tech card when recalled. With on line of text in the buffer, enter the command mode:

```
FCTN 9
PF
1 1 CLOCK
```

The clock ignores the seconds from the text buffer and begins with :00 upon pressing ENTER. (The Formatter cannot use CLOCK as a file (input, output or from .IF).

Pastel colors?

The following program by John Johnson appeared in the Cedar Valley 99ers User Group newsletter. It produces pastel-like colors by making

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User Notes

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every other dot in a CHAR statement a one or a zero. The background color is white (16). As written here, the program will change cyan to a pastel shade.

```
90 CALL SCREEN(16)
100 CALL COLOR(1,8,16)
110 CALL CHAR(32,"55AA55AA55AA55AA")
120 CALL CLEAR
130 GOTO 130
```

Changing the second number in line 100 will change the shade. Try 14, 12, 10 and 2.

Orderly programs run faster

This is a tip that has appeared in several user group newsletters in one form or another. We think it started with the Southwest Ninety-Niners of Tucson, Arizona. At any rate, when programming in BASIC or Extended BASIC, new lines are added to the top of the stack in the order they are entered. Thus, if you go back to correct a line, the line number is automatically placed at the top of the stack rather than in sequential order. This can result in errors when running the program, and the errors can be difficult to correct because they are not obvious. However, programs saved to disk using the MERGE convention are written to disk in line number order. Therefore, to insure that programs are stored in line number order rather than memory image format, one may save them using the MERGE convention, enter NEW to clear memory and then MERGE the program into memory. Then delete the MERGE program on disk and resave the program in the normal way.

Another advantage of MERGEing in this way is that programs that are stored in line number order may run faster. This is because when running programs that are saved in line number order the computer doesn't have to "look" for lines that are out of place.

Non-random patterns in Extended BASIC

The following program appeared in the Boston Computer Society newsletter. It provides a long-running series of colorful graphic patterns. A color-monitor or television is definitely a plus.

```
10 REM
20 CALL CLEAR :: CALL INIT :: CALL LOAD(-31788,232) ::
30 PRINT "PRESS ENTER"
40 CALL KEY(0,K,S) :: IF S=0 THEN 40 ELSE CALL SCREEN(2)
50 CALL CLEAR :: FOR T=1 TO 7 :: FOR I=34 TO 126
60 PRINT CHR$(I);:: NEXT I :: NEXT T
70 FOR I=34 TO 126 :: CALL VCHAR(1,1,I,768) :: NEXT I :: GOTO 50
```

Gemini 10 fix

We haven't encountered this problem with our Gemini-15X, but it's been reported that there are Gemini-10X printers that don't print the first couple characters when starting to print a document. Apparently, the problem occurs after the printer has been turned off for awhile. The problem appears to be in the print head and can be corrected by replacing it. It is suggested that users with this problem contact Star Micronics Inc. in California at 714-768-4340 to obtain a new print head. The company has other regional offices, with telephone numbers listed in the printer manual. (Apparently, the company doesn't charge for the new print head but does require the defective print head to be returned.) We're just passing this along, for what it's worth.

A test for expansion memories

David White of the Ozark 99er Users Group in Springfield, Missouri, published two BASIC programs in his group's newsletter that test the integrity of expansion memories. He wrote:

Recently I was challenged by the failure of the club's and member's 32K memory boards. The boards were different in that one was manufactured by TI and the other by CorComp. Additionally, their failure symptoms were different. The only thing common was that neither worked. The result of this challenge is two programs for testing expansion memory and two good (repaired) 32K memory boards.

The first program, MEMTEST1, tests for a bit failure. It first writes all "1" bits—1111 1111, FF or 255 (binary, hexidecimal or decimal). After writing this pattern throughout memory it reads it out and checks to see if it has changed. For example, if it reads out 1111 0111 then the "8" bit is being dropped. After checking for drop-outs it tests for bit pick-up by writing all "0" bits—0000 0000 (00 or 000). If it then reads 0000 1000 it is picking up the "8" bit.

The program worked great for diagnosing the TI board. The chip responsible for the "8" bit was removed and replaced with a new 89-cent memory chip and returned to its owner. However, the non- working CorComp 32K memory board passed MEMTEST1 with flying colors.

If the problem is in addressing then it seemed logical that it could conceivably pass MEMTEST1. That led to the writing of MEMTEST2.

MEMTEST2 writes random values all through memory and then checks to see if it can find what it wrote (stored). If an entirely different value is found, then we probably have an addressing problem. This is what was wrong with the club's CorComp card. In this case it was a bad memory controller chip (TMS4500-15NL). This chip was not as cheap as the TMS4116 memory chip but was socketed so it was easy to swap it with a known good one to prove that we did indeed have a bad one.

Both programs are written in BASIC. They will run even if expansion memory is not present. However, they require that the Mini-Memory or

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Editor/Assembler cartridge be plugged in.

The programs allow users to determine the output device for error messages and provide "short" and "long" tests, depending on the thoroughness of testing desired—Ed.

```
100 REM MEMTEST1
110 CALL CLEAR
115 PRINT "THIS MEMORY TEST
WAS WRITTEN FOR THE TI 32K M
EMORY       EXPANSION.  IT CA
N BE USED  FOR OTHER 32K MEM
ORY"
116 PRINT "EXPANSIONS BUT TH
E CHIP"
117 PRINT "LOCATOR INFORMATI
ON MUST BE IGNORED. THE TEST
 LOOKS FOR"
120 PRINT "BIT PICKUP AND BI
T DROPOUT  BY WRITING ALL ""
0"" BITS AND THEN ALL ""1""
BITS."
130 PRINT "YOU CAN SELECT EI
THER AN     ABBREVIATED OR A
FULL TEST. THE ABBREVIATED T
EST WILL    RUN IN 1 1/4 MINU
TES BUT WILL "
140 PRINT "ONLY TEST 1/50 OF
 THE UPPER EXPANSION MEMORY.
 THE FULL  TEST TAKES ONE HO
UR AND WILL"
150 PRINT "TEST ALL UPPER EX
PANSION     MEMORY."
160 PRINT "DO YOU DESIRE A:
               (1) SHORT
               (2) FULL":"ENT
ER 1 OR 2:"
170 CALL KEY(0,K,S)
180 IF S=0 THEN 170
190 IF (K<49)+(K>50)THEN 170
200 SF=1
210 IF K=50 THEN 230
220 SF=51
230 INPUT "OUTPUT DEVICE OR
""NONE""      ":OD$
240 IF OD$="NONE" THEN 260
250 OPEN #1:OD$
260 B=255
270 FOR A=-24576 TO -1 STEP
SF
280 CALL LOAD(A,B)
290 CALL PEEK(A,C)
300 IF B<>C THEN 330
310 NEXT A
320 GOTO 550
330 REM BIT TEST FOR FAILED
ADDRESS
340 REM
350 REM
360 IF A>-16385 THEN 390
370 N=27
380 GOTO 400
390 N=35
400 FOR I=0 TO 7
410 IN=2^I
420 CALL LOAD(A,IN)
430 CALL PEEK(A,D)
440 IF IN<>D THEN 460
450 GOTO 510
460 PRINT "CHIP U";N;" IS BA
D"
470 PRINT "DROPPED THE ";N;"
 BIT AT ADDRESS ";A
480 IF OD$="NONE" THEN 500
490 PRINT #1:"CHIP U";STR$(N
);" IS BAD. DROPPED THE ";2^
I;" BIT AT ADDRESS ";A
500 PRINT
510 N=N-1
520 NEXT I
530 EFLAG=1
540 GOTO 310
550 B=000
560 FOR A=-24576 TO -1 STEP
SF
570 CALL LOAD(A,B)
580 CALL PEEK(A,C)
590 IF B<>C THEN 620
600 NEXT A
610 GOTO 850
615 STOP
620 REM BIT TEST FOR FAILED
ADDRESS
630 REM
640 REM
650 IF A>-16385 THEN 680
660 N=27
670 GOTO 690
680 N=35
690 FOR I=0 TO 7
700 IN=255-2^I
710 CALL LOAD(A,IN)
720 CALL PEEK(A,D)
730 IF IN<>D THEN 750
740 GOTO 800
750 PRINT "CHIP U";STR$(N);"
 IS BAD "
760 PRINT " PICKED UP THE ";
2^I;" BIT AT ADDRESS ";A
770 PRINT
780 IF OD$="NONE" THEN 500
790 PRINT #1:"CHIP U";STR$(N
);" IS BAD.  PICKED UP THE "
;2^I;" BIT AT ADDRESS ";A
800 N=N-1
810 EFLAG=1
820 NEXT I
830 GOTO 600
850 IF EFLAG=1 THEN 890
860 PRINT : : :"NO ERRORS DE
TECTED"
870 IF OD$="NONE" THEN 890
880 PRINT #1:"NO ERRORS DETE
CTED"
885 CLOSE #1
890 STOP
```

```
90 REM MEMTEST2
95 CALL CLEAR
100 PRINT "MEMORY TEST PROGR
AM- TESTS  FOR ADDRESSING AN
D MEMORY   CHIP PROBLEMS BY
WRITING    RANDOM PATTERNS"
110 PRINT "SEQUENTIALLY THRO
UGH MEMORY. IT THEN READS SE
QUENTIALLY THROUGH MEMORY AN
D COMPARES TO THE PATTERN"
130 PRINT "THAT WAS WRITTEN.
 YOU CAN   SELECT EITHER AN
ABBREVIATED OR A FULL TEST.
THE        ABBREVIATED TEST
WILL RUN"
140 PRINT "IN ONE MINUTE BUT
 WILL ONLY TEST 1/50 OF THE
TOTAL      EXPANSION MEMORY.
 THE FULL"
150 PRINT "TEST TAKES 1 HOUR
 AND WILL  TEST ALL OF EXPAN
SION MEMORY"
160 PRINT :"DO YOU DESIRE A:
               (1) SHORT
               (2) FULL": :
"ENTER 1 OR 2:"
170 CALL KEY(0,K,S)
180 IF S=0 THEN 170
190 IF (K<49)+(K>50)THEN 170
200 SF=1
210 IF K=50 THEN 250
220 SF=51
230 INPUT "OUTPUT DEVICE OR
```

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```
""NONE"" >>":OD$
240 IF OD$="NONE" THEN 270
250 OPEN #1:OD$
260 PRINT #1:"ADDRESS EXP  S
AW"
270 RANDOMIZE 1
280 HL$="HIGH"
290 MA1=-24567
300 MA2=-1
310 PRINT "WRITING ";HL$;" M
EMORY"
320 FOR T=MA1 TO MA2 STEP SF
330 CALL LOAD(T,INT(RND*255)
+1)
340 NEXT T
350 RANDOMIZE 1
360 PRINT "CHECKING ";HL$;"
MEMORY"
370 PRINT "ADDRESS EXP  SAW"
380 FOR X=MA1 TO MA2 STEP SF
390 C=INT(RND*255)+1
400 CALL PEEK(X,B)
410 IF (B<>C)THEN 440
420 NEXT X
430 GOTO 490
440 IF OD$="NONE" THEN 460
450 PRINT #1:X;TAB(8);C;TAB(
13);B
460 PRINT X;TAB(8);C;TAB(13)
:B
470 EFLAG=1
480 GOTO 420
490 IF FLAG=1 THEN 560
500 FLAG=1
510 MA1=8192
520 MA2=16383
530 HL$="LOW"
540 RANDOMIZE 1
550 GOTO 310
560 IF EFLAG=1 THEN 580
570 PRINT : : :"NO ERRORS DE
TECTED"
580 IF OD$="NONE" THEN 610
590 PRINT #1:"NO ERRORS DETE
CTED"
600 CLOSE #1
610 STOP
```

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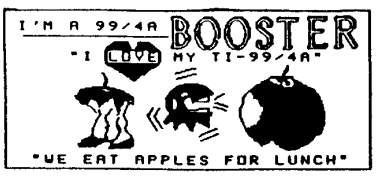

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v3n5

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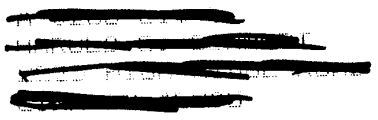
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