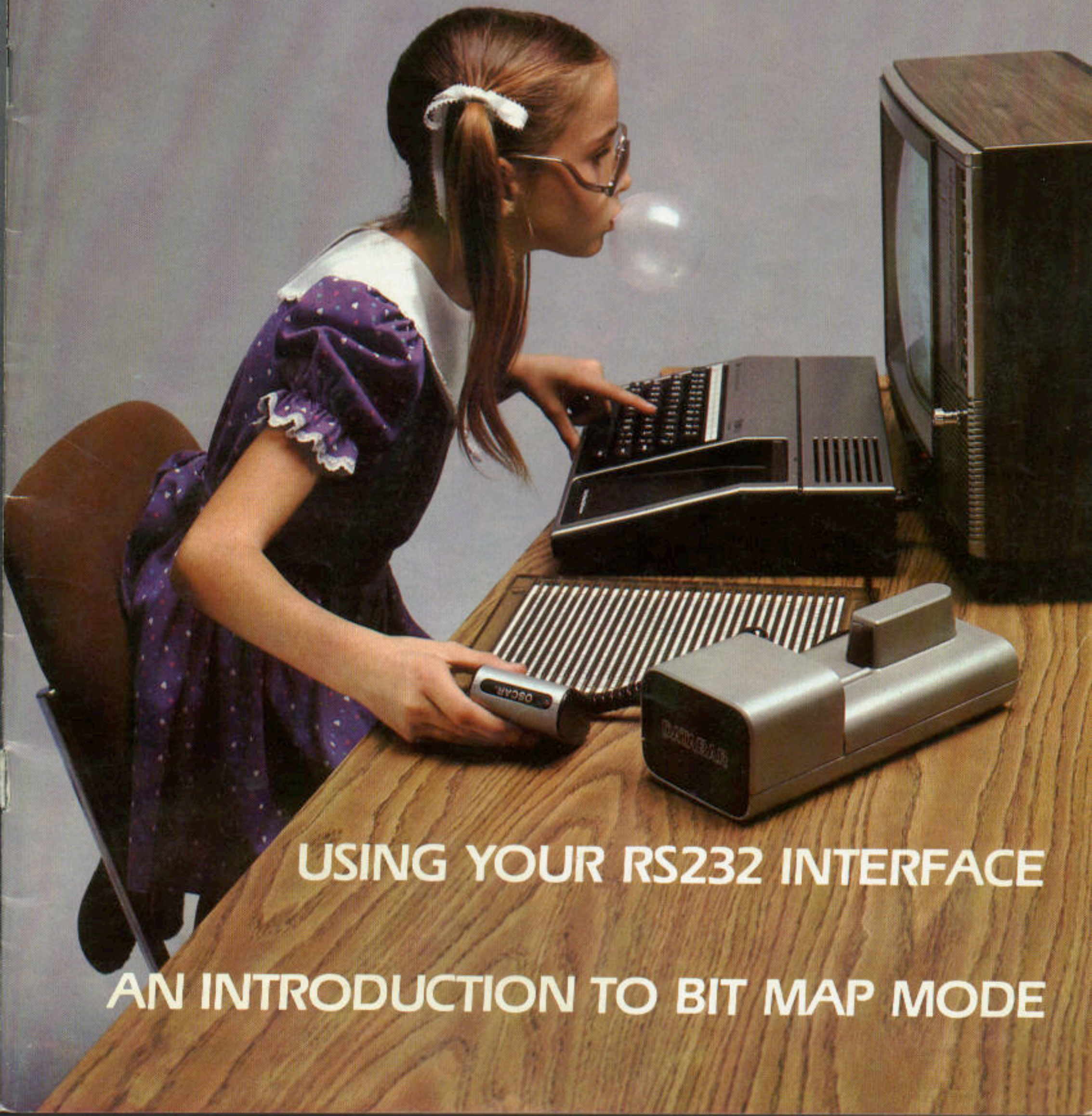
Enthusiast'99®

OFFICIAL PUBLICATION OF THE INTERNATIONAL 99/4 USERS GROUP

International 99/4 Users-Group

MARCH 1984
Vol. 2, Number 2



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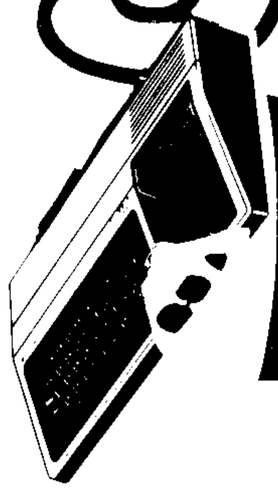

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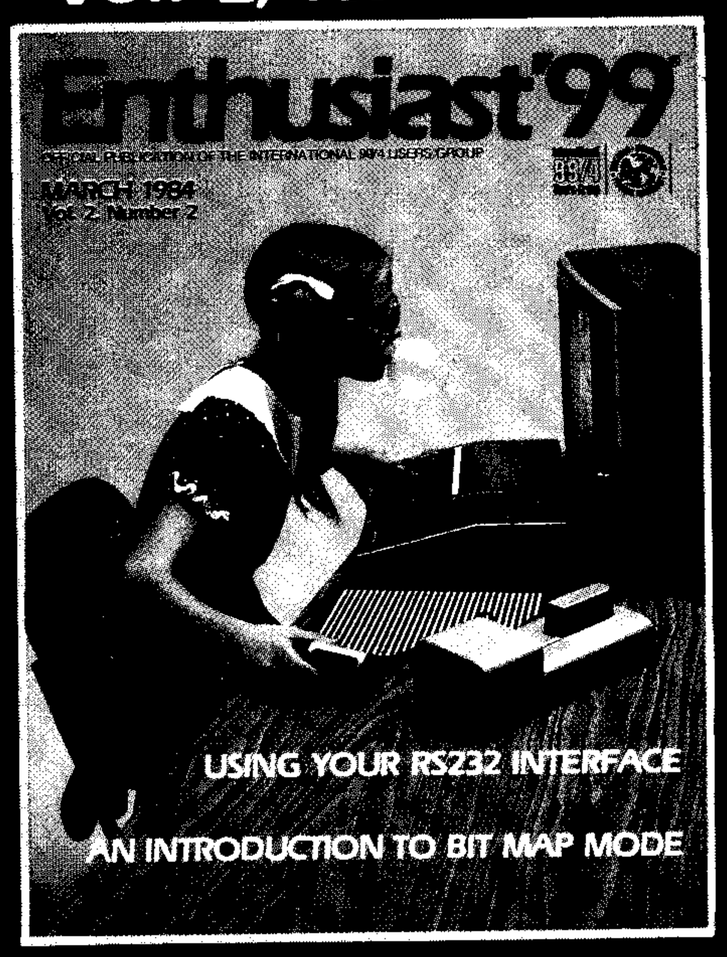

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PROGRAMS REVISED MASTER 99 SERIES

Four programs in the International 99/4 Users-Group's Master 99 series have been improved.

Database 500, Database 300, M9-120, Accounts Receivable (500 records) and M9-130, Accounts Receivable (2000 records) have been revised. Error-handling in all programs runs more smoothly, and the programs are more user-friendly.

Both Database 300 and 500 input routines operate more smoothly, and the data entry screens are more accurate. Additionally, each time an individual portion is completed, the program returns to the main menu.

The Accounts Receivable programs were greatly improved both in program operation and documentation. Both programs can now be operated with or without the password requirement. In addition, two features were added to the program; a printer option, and an end-of-year zeroing capability. The program also notifies you if an error has been made, and instructs you to consult the documentation.

Members owning any or all of the above programs may have them exchanged if they choose. Simply return your master disk addressed to MASTER 99 SERIES REPLACEMENT, International 99/4 Users-Group, P.O. Box 67, Bethany, OK 73008 and a new disk will be mailed to you free of charge.

Enthusiast '99™
OFFICIAL PUBLICATION OF THE INTERNATIONAL 99/4 USERS GROUP

Well, we've weathered the storm. The International 99/4 Users-Group has remained stable and intact at a time when many others have packed up and left. We've organized and reorganized to more efficiently meet the needs of our members, and have withstood more than our share of knocks in order to reach this higher level of productivity. Our committment is standing, and the IUG is at a point where, given most circumstances, it can continue to provide its members with the best possible service in existence.

International 99/4 Users-Group memberships are increasing at a steady rate; in fact, I'd like to apologize to all new members who didn't receive the most recent issue of Enthusiast '99--the sudden and dramatic increase in membership caught us unprepared.

Third parties have begun to fill the void left by Texas Instruments upon their exit from the Home Computer market, but we still have a long road to travel. These products must be proven and tested, and a new line of products must establish itself in the market.

In addition to providing a channel to other sources of product, the IUG has updated and added many titles to its Software Exchange Library Catalog, and have received much positive response to its Master 99 Series. Current plans are to periodically add to the Software Catalog, and expand the selection of titles in the Master 99 Series.

As others continue to abandon a market of loyal 99/4A owners, the International 99/4 Users-Group will remain as a steady source of information and service to its members as long as possible.

Dana

NEWS BYTES

IUG UNDERGOES REORGANIZATION

With Texas Instruments' decision to withdraw from the Home Computer market, the International 99/4 Users-Group has been forced to make several changes in its operation and services provided to its over 100,000 members. Service changes include the discontinuance of the President's Club and The President's Letter.

Charles La Fara, president, International 99/4 Users-Group, stated that with the current state of instability surrounding the 99/4 Home Computer and the inavailability of products previously supplied only by Texas Instruments, a separate President's Club level no longer seemed feasible.

Other changes include moving IUG Library Services, originally based in San Francisco. "We felt it was best to bring this operation back into our main office at this time," La Fara said.

Members wishing information on products in the Software Library should contact us during normal business hours, 8:30-5:00, at (405) 948-1023. The IUG is committed to continued service for its members and our reorganization places more emphasis on customer support.

Current plans call for the continuation of Enthusiast '99 magazine as long as advertising revenues permit.

SOFTWARE CATALOG NEARING COMPLETION

The International 99/4 Users-Group will be issuing a new Owner Written and Translated Software Catalog to its members in mid-April. This new, easier-to-read catalog will contain nearly 2,000 owner written and translated programs submitted by our members to the IUG's Software Library.

Programs consist of Games, Music, Graphics and Demos, Educational, Business, Engineering, and Utilities, and are available exclusively for IUG members.

SOFTWARE PRICES DECLINE

Left with an estimated $30 million in software inventory after their withdrawal from the Home Computer business, Texas Instruments is frantically looking for a home for it.

Many of the large retail chains who in the past have handled TI Home Computer software are refusing to reorder, afraid they could get caught in the middle of going-out-of-business price declines. Sears, America's largest retailer, has posted signs in their software department advising consumers they will no longer stock TI Home Computer software products once current inventory levels are sold out.

"It looks as if we have only two choices at this time," said a TI employee. "We can drastically reduce the prices on our remaining inventory or dig a big hole in west Texas and bury it. We as a company are afraid of alienating retailers who still have our inventory left if we make a price move too soon, but on the other hand, we have told the world we are getting out of the Home Computer Business, and need to do just that."

Apparently Texas Instruments has chosen to at least make an effort to reduce prices on some of its Solid State Command modules with the lowering of prices on 20 items. These price reductions are reflected on our April temporary price list, which is on the mailing cover of this issue's Enthusaist '99. Many retailers feel that additional price reductions may be forthcoming.

"If retail sales do not pick up soon, you may see TI modules selling as low as $4.95 this summer," said a major chain store buyer. "We saw it happen with Atari VCS products last year and now it may well be Texas Instruments' turn."

Best estimates are that most retail outlets will be completely out of TI software product inventories by mid-May. The International 99/4 Users-Group will discontinue selling all Texas Instruments products effective May 1, 1984, but will continue to provide a variety of items from third party sources.

TRACY CAINE JOINS IUG STAFF

Mr. Tracy Caine, a graduate of Kansas State University, Manhattan, KS, has joined the staff of the International 99/4 Users-Group. Tracy has been working with microcomputers for the past five years and will assume the position of technical assistant and IUG Librarian.

Caine is married and has one child. He will be available to assist our members on a variety of subjects and can be contacted at the IUG office Monday through Friday, 8:30 a.m.-5:00 p.m.

IUG FILES SUIT

The International 99/4 Users-Group has filed a lawsuit in the United States District Court of Los Angeles against the 99/4A Program Exchange, Inc., Torrance, CA. The suit seeks injunctive relief and damages for infringements of copyright, trademark and unfair competition under the Lanham Act, the federal copyright act and for unfair competition at common law.

Charles La Fara, IUG president, said "after consultation with our attorneys, we feel very strongly that our rights have been violated. Unauthorized use of programs and descriptions in our Software Exchange Library as well as infringement on our corporate logo must be dealt with."

John Roper, IUG attorney bringing forth this action, stated that "federal copyright laws regarding computer programs are being tested now more than ever before in the history of our courts. We feel we have a solid case in this action, and have proceeded to bring it to trial."

A WOMAN'S VIEW

By Regena
P.O. Box 1502
Cedar City, Utah 84720

I had the chance to go to the Consumer Electronic Show in Las Vegas this January as a guest of COMPUTE! Publications. It was interesting to see the acres of electronic equipment and to meet many people. I've known our president for about three years by telephone and mail. I knew he would be there and wondered how I could possibly find him among the crowds, but there he was at the Texas Instruments display. It was great to talk to him and hear his enthusiasm about **our** computer.

Since Texas Instruments is no longer in the home computer business, I believe Users Groups will be even more important. The IUG will be the hub, but local groups can really be a great way to continue to share information about the TI. We recently (January) organized a Users Group in my town, and about 50 people showed up for the first meeting. We'll probably triple that number by the time you read this — and I live in a small town. It's exciting to get together with other TI owners and share information and ideas with each other. When I first called Charlie about three years ago for names of other TI owners, he gave me about five names in the whole state of Utah. You can see how the number of owners is growing!

We are also excited because we have at least one TI in each of our four elementary schools in this area. One of the schools has at least one TI in each classroom, and some of the classes have three computers. It's interesting to watch how the "computer wave" is hitting and to see how we need to learn to utilize these machines effectively.

Thanks to all of you who have written to me (or called). I thought I would try to answer some of the general or most commonly asked questions n this column this month. The first answer is YES, I will continue to write for the TI as long as my publishers feel there is a reader base for the TI. Just because Texas Instruments dropped the computer doesn't mean it isn't a good computer. The color graphics and sound capabilities of the TI-99/4A make it a fun computer to learn on. The microprocessor used makes it a very powerful and accurate computer. Those of you who got the computer for under $50 should realize that there's a lot packed into this machine, and that fifty dollars may change your life more than any other money spent. I think most of us who spent $600 (or $1100 including the monitor in 1980) even believe the TI is worth that price. As many of you know, I write for several computers, but the TI is like my first love.

More responses to mail. In my first book, **Programmer's Reference Guide to the TI-99/4A** (COMPUTE! Publications), only one small section requires the Speech Synthesizer and Terminal Emulator 2 command module. All other programs require **no** extra peripherals (except a cassette recorder to save the programs).

The biggest warning is do NOT use Extended BASIC to run the programs! There are three major problems you can have running a console BASIC program in Extended BASIC. First, I use colons in PRINT statements to go to the next line or to print blank lines. XBASIC interprets a double colon as a command separator. If there are several colons together, such as

```
PRINT :::::::
```

the computer is supposed to print blank lines. In XBASIC the computer may "hang up". The way you print several blank lines in XBASIC is to put spaces between the colons.

XBASIC does not allow graphics characters in color sets 15 and 16. In regular BASIC I use these color sets quite freely. Your program will stop with a BAD VALUE message in XBASIC. It is easier to run the program in console BASIC than it is to convert to different characters and color sets.

The third major problem of trying to run a console BASIC program in XBASIC is that you may get a MEMORY FULL error. XBASIC has less memory available, although you can conserve quite a bit by combining lines.

In answer to another question, if you do get a MEMORY FULL message in console BASIC, my first guess is that you have a disk drive connected. You do not need the memory expansion for **any** programs I have published. All the programs in my books will run with the disk drive on if you first type CALL FILES(1) and press ENTER. Type NEW and press ENTER, then continue normally. This procedure frees up about a thousand bytes of memory. The default value is CALL FILE(3), so to get more memory CALL FILES(1).

The most common typing errors in a program are in DATA statements, especially if there are a lot of numbers and commas. These may occur in a procedure such as

```
200  FOR I=1 TO N
210  READ C,C$
220  CALL CHAR(C,C$)
230  NEXT I
```

Your error message is usually BAD VALUE IN 220. Your typing in Line 220 is probably fine. The BAD VALUE means something is wrong with either C or C$ that is not acceptable and a character cannot be defined. Notice that those values come

from Line 210, which is reading C and C$ from DATA statements. Since this is a FOR-NEXT loop, the process is repeated and the DATA statement contains quite a few numbers and character definitions. Check those DATA statements to make sure commas are in the right places.

If you don't want to get bug-eyed reading a bunch of numbers, RUN the program. When it stops with the error message, type PRINT C,C$ and press ENTER. The last values read for C and C$ will be printed on the screen, and you should be able to see the problem and find those numbers in the DATA statement.

Do not call TI-CARES about questions on my programs (write directly to me). They have told a couple of people that Line 220 was incorrect, which certainly is not true. They don't know about my programming techniques. Likewise, I don't know about other people's programs, so please don't write to me asking questions about someone else's programs, or to debug your own programs. I am happy to help you with one of my programs — just be sure to tell me the title, which computer, and the exact error message. A listing and a SASE helps.

I've been very happy with the printing in my books. All of those with "hairy" DATA statements have been printed correctly. The only major error so far was mine, not the publisher's — in Electrical Engineering Circuit Design, Part 1, I have interchanged two of the solutions. The IUG will have a corrected copy, and several of the local users groups have copies. You can get a copy from me by sending a blank cassette and a stamped, self-addressed mailer.

One other question I get asked quite often is if I have programs for all the United States. Southern States, Western States, and New England States have been published. The rest is left up to you. Sorry, I haven't done them. (Get out your graph paper and a map . . .)

I'm happy with your response to **COMPUTE!'s First Book of TI Games.** It has been especially popular with your young programmers. The main idea of the book was to give you gaming ideas so you can then program your own games (although there are actual listings for 29 games). For example, use one of the ideas for generating a maze, then use your own graphics theme to design your own game — and have fun!

Things To Do in 4K or Less should be out by the time you read this article. This book idea was originally for the VIC-20 and 4K Radio Shack computers, but YES I did include TI versions for the programs. The TI versions may not necessarily be 4K programs but programs that require no extra peripherals or memory. The main object of this book was to show a variety of things you can do without spending more money on hardware.

A final public answer. It surprises me how many letters I get asking about my personal life rather than programming questions (especially from **Enthusiast '99** readers and former **99'er** readers). To sum it up, my first name is Cheryl, and my middle name is Regena. I am married and have five children ranging in age from 3 to 14. I get a lot of programming done by neglecting housework. We bought extra dishes and silverware so we can go another day before digging through the kitchen. Another hint I learned is to leave the vacuum cleaner out in the middle of the room — if someone visits they will figure the mess is because they caught you in the middle of cleaning.

Once my husband came home from a three-day trip and commented that I must have gotten a lot of computer work done while he was gone because his Wheaties bowl was right where he had left it on the table before his trip. (Lesson: at least scoot the dishes around a little before he's expected home again.) Fortunately, my husband works with computers too, so he's very understanding about my work. We both know that "Just one more thing here" means a half hour, and "Just a couple of quick changes" means go ahead without me.

(printout on page 36)

SPECIAL FEATURE

COMPUTER LITERACY

STEPPING UP TO THE PROFESSIONAL

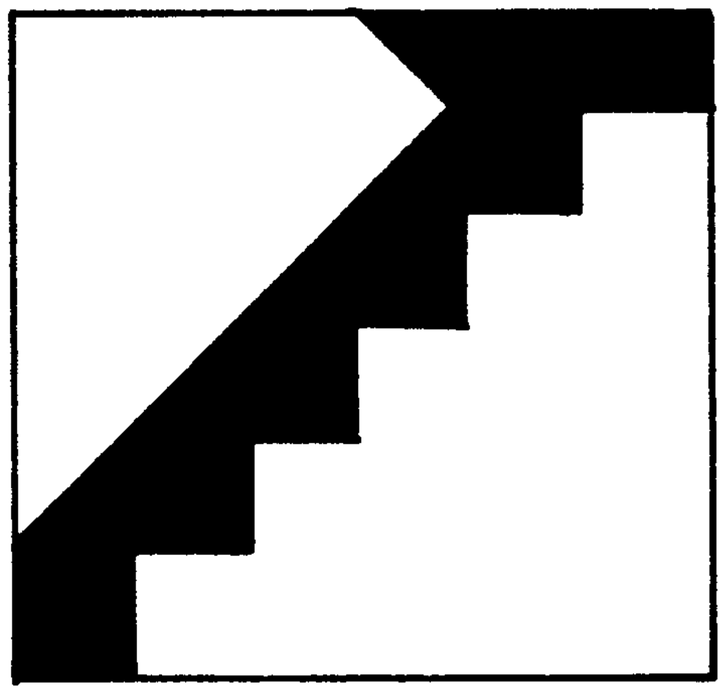
INTRODUCTION

The following represents excerpts from a conversation with five people involved in sales and/or education for TI 99/4As and TI Professional Computers. Charles LaFara, publisher of Enthusiast '99, began by asking the questions, "When does someone learn enough on a 99/4A to really be ready to move on to a bigger computer? What motivates someone to set aside the system he or she purchased for around $400 and make the jump to an $1800 to $3500 system? And what's a bigger system going to do that the home computer will not do?"

Computer literacy really begins when someone sits down to use a computer for the first time. Until a person takes this action toward actually using a computer, computers remain some kind of foreign, slightly frightening phenomena. No matter what kind of computer is used to begin this process, there are miles to go in the arena of computer literacy — always another option, something else to learn and use. So for many, the world of computers begins to hold a fascination. They continue to read and try things out. They want to learn more, and often the system they began with becomes inadequate for their quest. Just how is it that computer literacy actually develops, and when is it that someone moves from a "home" computer to a "professonal" computer? Our panel of experts have some thoughts on this timely subject.

Charles: I think there is a fear of computers from a first time standpoint, but the fear is readily overcome, no matter what system is used. The TI 99/4A is especially useful for beginners because it's so easy to plug in a learning cartridge that tells someone exactly what to do. Often people begin by learning a subject, like maybe with the music maker on cartridge, but they are also learning how to use a computer by actually using one.

Diane: In our classes, most people have never used a computer before. The main thing we do is help people get over their fear, so they can see that these machines are no more complicated than a sophisticated typewriter. Once they've taken even a basic class, they get over that hump of not being comfortable with the machine. There are some basic constructs of how to use a computer that carry over from machine to machine. My children, for example, are comfortable sitting down at anything. They just ask a few questions and begin using the system. So it is true that the knowledge transfers rather easily.



Dolly: Surprisingly enoúgh, the hurdles are identical with the TI Professional Computer. The first hurdle is always fear — people are afraid they won't be able to do something or that they will do something wrong. I have taught many high-level managers who are just as afraid. They are afraid of hitting the wrong buttons, so they can see that nothing terrible is going to happen. The first step in computer literacy is just to feel some confidence at being able to accomplish something, to have some success.

Steve: Most of the people who we deal with just want to learn what a computer is. They tend to be intimidated by the professional type computers, so they shy away from ComputerLands. They tend to relate the home computers to the video game machines, and feel a little more comfortable with that type of thing. It's a low initial investment, so they think, "Why not give it a try?" With the 99/4A, you just plug it in and you're on your way. You don't have to contend with the operating system and copying diskettes like you do with the TI Professional. With the 99/4 learning cartridges, it is easy to have instant success so they feel they can use a computer after all. This is a real valuable function that the 99/4A plays in helping people become familiar with computers.

Mac: At ComputerLand, our customers are primarily businessmen; they are looking for a professional-type computer because they have surmised that they probably need it. Interestingly enough, I'd say 85-90 percent of them have never sat down at a computer before either, and they are just as scared that they won't be able to use it. The application programs these days are getting real sophisticated and it's getting easier and easier for someone to be guided through an application. Entry-level knowledge is almost non-existent. It's just gaining that comfort zone, the feel of how to work with this new machine.

Steve: I think a lot of parents buy the 99/4 for their children, for the educational aspect, but secretly so that they can educate themselves as well.

Charles: I think what happens is a real natural learning process. The guy who gets the 99/4A discovers Basic, then he's going to buy Extended Basic. First he gets a cassette recorder to store programs; then he wants the machine to run a little faster, so he decides to get a disk system. To some extent, the future purchases of a 99/4A owner are fairly predictable; a mass storage device, an RS232 expansion slot, a printer for hard copy. Then he wants a little higher resolution graphics, he gets into P Code. By the time he is finished, he has as much invested in the 99/4A as he would have needed to buy a TI Professional, which will run five times as fast and have three times the capabiities.

Steve: We were asking when a person goes from the home computer to a professional computer? I think it's when that person realizes what a computer can do. Then he or she can begin to discover what a particular computer does better than another. In the case of the 99/4A system which is pieced together, of course it's not going to run as well as the TI Professional, which is designed as a whole unit for more advanced applications.

This issue of which machine to buy, or whether to move up to a bigger machine really depends on the application. The 99/4A was designed primarily for single-user education and small applications. If you get into extensive word processing or extended business applications, then the 99/4A is not the machine to use. It's just a fact that word processing is slower and harder to do with a 40 column screen that requires word-wrap. We tell people this when they buy a 99/4A right up front. Or take MultiPlan, for example. You can use MultiPlan with the 99/4A, but it is slow. With a complicated balance sheet, you can sit there for 30 to

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60 seconds sometimes, waiting for it to perform an operation.

Charles: And for a computer user, that is a long time. Most people would think something was wrong and not wait. And this points out a two-fold problem. One is the unreasonable expectations of the naive person who is buying a computer for the first time. He or she thinks, "I can get a computer for only $150." He goes to the local discount store and says, "I want a computer and I want it to do this, and I want it to do this, and etc." Then comes the second part of the problem. The guy at this kind of store just says, "No problem, it can do it." He is not educated enough to know the limitations of the system. He really cannot give the kind of informed advice you get at a place like ComputerLand or Computer Shows.

To use an analogy, a Ford Pinto is not going to give the same kind of performance that a LeMans will. People have this belief that anything called a computer can do anything — it's the magic black box. But it really is much more scientific than that. You have to decide what your application is and then buy the machine and software to suit the application. You don't have to buy a race car to drive around town, but you don't want to put a town car on a race track.

Dolly: I talked to someone the other day who had become very adept with word processing on the 99/4A. Then he started using EasyWriter on the Professional and he realized he could be a lot more productive on it than on the 99; it's faster with full sreen text editing, the keyboard has cursor keys and function keys . . . and these things add up.

Mac: It's like a guy plowing the field with a mule. Unless somebody brings a tractor by and shows him how to use it, he thinks he's doing as good a job as he can do.

Steve: My office manager is a good example. When we first hired her, she had experience on the really good typewriters. She even insisted on bringing her own typewriter with her. But since she started using word processing, she can't stand to use the typewriter anymore. Word processing is so much more efficient. It's just a process of evolution. If it's better than what you're using, it's great. But there's always something that is better.

Mac: There's always a step above. And if you can afford it and you know that your productivity is going to increase, then it is going to be worth it. People always wonder if they should wait for the newer model, but when a newer model comes out, there will always be a newer model coming out. As soon as you buy it, it is obsolete. And if you keep waiting, you'll never get the expertise to use the new technology anyway.

Diane: At some point, people just have to jump in and begin the learning process. If they don't, the whole area will just remain some mystical, promising mecca that is too far away. Most of the computers now have the expandability to upgrade with new features anyway, so you are not boxed in once you buy a system.

Mac: One thing we come up against, even with an adequate machine, is frustration in learning how to use a software package. Most people don't care how it works, they just want to sit down and use it. The majority of our sales is to businesses and the average sale is around $4000. Business people buy these applications, and if they just read the manual and hit the keys, they can accomplish their goals. But they get frustrated reading the manual so they give up. They don't have the time or patience to undertake the initial learning process.

This isn't always the case. There are others who buy a computer for their business, learn the applications, and once they realize what it can do, they buy another one to use at home.

Dolly: I think this is the group of people that become the hard-core computer literates — the ones that start reading the magazines and try to keep up with what is happening. People may start out with everyday applications, but at some point, the technology itself begins to open up new possibilities — things that hadn't been considered because they couldn't be done manually. These are things like generating graphics, telephone management, and electronic mail. People won't ask about these applications until they are educated enough in the area to know that they are possible.

Steve: The new computer owner starts out doing a few things and ends up doing 100 times more, even with the 99/4A. It ties right back in to the person going from home computers to personal computers. He sees more and more things he can do, and these things increase his productivity at home and at the work place. A business might come up against the same thing, and decide to expand into a minicomputer, since it would continue to increase productivity to have an even bigger system. It's impressive to see two people do the job of 15 in half the time.

Mac: When someone already understands computers and knows how they work, then he or she can certainly appreciate the advantages of getting a better one.

Charles: If someone cuts his teeth on the 99/4A, rather than put it up in the closet after buying a TI Professional, it can still serve some useful applications. I see a shift in our membership to more and more interest in the educational software, mostly for children. They still might want to use it for games, or maybe even household security. It's still a valuable resource, not something to discard.

CONCLUSION

When all is said and done, the 99/4A as a learning tool shines in a class of its own. With Basic built in to the main unit, it is extremely easy to set up and get started. An abundance of tutoring programs make it fun for a beginner to learn about computers and other topics. But once someone has learned the ropes and begins to see all that a computer can do, there may be a real need to use it for some sophisticated information processing applications. Word processing, data storage and retrieval, spreadsheets, graphics, bookkeeping — these are applications that will run better on a bigger microcomputer such as the TI Professional Computer. The TI 99/4A can get someone started in computers easily and at low cost, while meeting many home and personal computing needs. But the need for more sophisticated applications, coupled with increasing skill on the part of the user, may lead the user to seriously considering expanding into the TI Professional Computer.

CAST OF CHARACTERS

STEVE FICKLIN, Vice President and General Manager of Computer Shows in Austin, Texas. Computer Shows is a retail outlet with the main focus on education. Computer Shows primarily uses the 99/4A to teach computer basics to school teachers and administrators.

CHARLES LA FARA, President of International 99/4 Users Group and publisher of Enthusiast '99 magazine. The users group and the magazine serve as a source of information to members, providing technical support for the 99/4 hardware, peripherals, and software, whether developed by TI or by a third party.

DIANE LEONARD, Area Manager for the Texas Instruments Computer Advantage Club. As area manager, Diane organizes classes for the TI 99/4A in Austin, Texas and several other cities, and has just completed training about 1250 school teachers on the 99/4A.

MAC MCKINLEY, salesman with ComputerLand in Austin, Texas for over two years. Mac also has a background in electronics and management. At ComputerLand, Mac sells a variety of brands of small business computers, and is familiar with most of the leading software for business applications.

DOLLY UNDERWOOD, Instructor with the TI Employee Education Center. Dolly's main focus is training TI employees to use the TI Professional Computer at their workstation. Prior to this position, she worked in training and course development for TI's Data Systems Group. In that position, Dolly trained TI sales representatives, TI analysts, and customers of Texas Instruments to use the TI Professional Computer.

SOFTWARE

SOFTWARE REVIEWS

GUARDIAN TO THE RESCUE!

By Dana Nichols
Managing Editor

Saving the world was never so challenging or fun! Guardian, by Kevin Crowder, is the latest and by far one of the best game programs written for use with the Editor/Assembler in the present market.

Guardian is a one- or two-player game, and each category consists of four levels of difficulty. The object of the game is to preserve the eight energy pods that provide food, comfort and entertainment to your city. Intent on stealing these pods, evil robots (in full force) fill the screen. Once the robots steal all the pods, the city and everyone in it comes under their control and the game is over.

The action is super-fast, the graphics and color are good and the game itself can continue indefinitely. Although playing solo is exciting enough, the two-player option must be experienced to be believed.

You and your opponent are allies in combat, but are still vying for individual points. You strive for a common goal, to save the pods and the city from the evil robots, but you still can beat your opponent in total points. Strategies are involved in allowing your ally to help you rid outer space of many of the aliens, then exterminate the opponent when you feel you can blast the remaining robots single-handedly to tally your score even higher.

You have an advantage in knowing when an enemy has pilfered a pod; he turns white, the color of the pods themselves. However, when you dissolve him into oblivion to regain possession, the pod remains where the enemy was downed. This is when your peripheral version must be at its peak. The remaining enemy robots come at the pods from any and all sides, and can pick up the stray pods at will.

Bonus pods are awarded for high scores, and you keep playing until the robots make away with all the ill-gotten booty.

Guardian is a must for the serious space game player and can be played by all ages for hours on end. The game requires the 99/4A, 32K memory expansion, disk memory system, and Editor/Assembler cartridge. Guardian is available for $29.95 from Softmail, Incorporated, P.O. Box 745, Rockwall, TX 75087.

We've reviewed four other programs we think you'll find enjoyable. Two are space action games, one takes us bowling, and one is educational for your children ages two to five.

The first, Letter Fun, is available from American Software Design & Distribution Co. It requires the Speech Synthesizer and Extended BASIC, and is available on cassette for $19.95, and disk, $21.95. It is geared toward the preschoolers, and helps familiarize them with the alphabet.

Your child has three choices in which to play: your child picks the letter, the computer picks the letter, and the third, your child watches, A to Z.

You pick the letter. The computer will say "press any letter." When your child presses a letter, the computer displays the large letter on the screen and provides a word beginning with the letter and a colorful scene displaying the object. For example, pressing the "A" key will prompt the computer to display the letter "A" at the top of the screen, the word "airplane" will appear at the bottom of the screen, and an airplane, complete with sound effects, will buzz across the screen. Quite a variety of objects accompanies this drill, and your child will easily recognize most of the objects, such as bird, fish, and pencil.

The computer picks the letter. The computer will display a large letter at the top of the screen. The child must press the correct key in order to see the word and display. If he should press an incorrect key, the computer will say "try again please." Upon completion of the display, the computer will pick another letter and continue the game.

You watch A to Z. With this colorful and educational option, your child merely sits back and watches the 99/4A run through the alphabet. The computer says each letter, displays the word at the bottom of the screen, and displays the object in the center. This option will help your child to memorize the order of the alphabet, and provide a colorful and absorbing lesson for him.

Your child will be captivated by this program, and versed in the alphabet as well. Additional information concerning Letter Fun and American Software Design & Distribution Co. can be found in this issue of Enthusiast '99.

The second program reviewed is Space Tunnel 2525, by Micromagic Software. The space action game is available on cassette for $14.95, and on disk, $17.95; it requires Extended BASIC and joysticks.

You are captain of a fleet of five space probes which have strayed off course into a lost universe. There is a way back to civilization, but numerous obstacles block your path. The first screen displays a force of hostile flying saucers which, one by one, your ship must destroy with its laser cannon. You command one ship at a time, and must not only shoot each saucer but move forward in space simultaneously. Fifty points are awarded each time you obliterate a saucer, and your successful trek to the opposite side of the screen brings on the next obstacle. But beware, for not only do you face peril against the flying saucers; contact with either the floor or ceiling of the corridor you are in will result in the loss of a ship.

An onslaught of asteroids attempts to see you to an early doom. The reaction time of ship movement is a little slow, so your timing must be precise in this sea of

rubble. You gain no points through use of your phaser cannons, but each second you stay alive in the asteroid belt tallies an equal point to your total score. You must ultimately guide your ship, again avoiding the floor and ceiling, to the opening at the top of the screen and through to the next. Completion of this screen nets you 100 points for each remaining ship you have in your fleet.

The ice tunnel offers a narrow passageway in your trek to safety. You control the upward and downward movement of your ship, and receive 10 points for each second you avoid contact with the tunnel walls. Again, you receive 100 points for each ship remaining. Your next obstacle awaits in yet another narrow passageway lined with ice, of which large blocks may fall from the walls or ceiling at any time. Again, 10 points are awarded every second you stay alive, and the bonus points are added as before.

Ominous ice caverns await you in he fifth screen, where both stalactites and stalagmites impede your progress. In addition, more asteroids stream in through your only exit, making your trek that much more difficult. This one's much harder; you receive, in addition to 10 points each second, 150 points per ship upon completion through the ice caverns.

The final leg of your journey sees a barrage of asteroids intent on seeing that you fail your mission, and home lies just within your sight. If you succeed, you are awarded command of a new ship to rescue the others. Bonus is 100 points per ship remaining, and an extra ship so you can continue to help the others home.

A wide variety of action makes this space action program worth your investment. You can get Space Tunnel 2525 from Micromagic Software, 4129 Abercorn Road, Knoxville, TN 37921.

The third program we think you'll enjoy is 3D Bowling, written in Assembly language by Natural Software. Documentation, critical in this very detailed program, is well written. 3D Bowling can be played by one or two players, and requires Extended BASIC, and optional Speech. It is available for $19.95 on either disk or cassette.

The game has many features, including variable lane conditions, ball hardness, spin and speed adjustments, and oil evaporation. The player has the realistic choice of moving "boards" to pinpoint his approach, and over 1200 pin motions create realistic pinfall outcomes.

A table of contents gives you a quick preview of what the game has to offer and acts as a reference guide to help you along. A graph of the lane is displayed on the Quick Reference page, featuring spots at the point of release, arrows, and the ten pins. Explained on this page are bowler location, target location, and hook, in addition to the keys needed to move your position and target.

A Definitions/Speech Vocabulary listing is also included, such as: "Angle — a combination of bowler positioning and lane TARGET forming a LINE or trajectory to the HEAD PIN or POCKET."

You can adjust your lanes to allow for oil evaporation automatically throughout the game, and you must adjust your spin and speed each time you step up to bowl. The program requires pinpoint accuracy and concentration, but southpaws (as I am) BEWARE!! The game offers only right-handed bowling, although an experienced leftie should have no real problems.

3D Bowling will keep you at the console for hours. And the best part is, you'll never get tired of the game. With over 1200 pin motions to contend with, the odds of getting a 300 are as great as in reality! 3D Bowling is available from Natural Software, 63 Fiske Mill Rd., Upton, MA 01568.

Our final review selection for this issue is a space action game from D.S.

Muenchau, "Star Fort." Written in Assembly language, it's fast, high-quality action from beginning to end.

Star Fort requires the Editor/Assembler, Extended BASIC or Mini-Memory module, and joysticks.

You are the commander of Star Fort, and you find yourself under attack by a race of crystalline beings intent upon taking over your fort. They are armed with fusion bombs, blink bombs, and crystalline webs. These baddies can attack you as much as five times in one day, and the game can conceivably last as long as 99 days.

Positioned in the center of the screen, you are armed with a photon cannon. Right and left joystick movement causes the cannon to rotate clockwise and counterclockwise. Moving the joystick toward you during an attack will result in a pause in the action, and resume when the fire button is pressed.

You have two Star Forts in reserve, and all three are protected by a force field against only the fusion bombs released from the enemy. Your timing, however, must be accurate, because your field is inactive at the time you fire a shot.

The enemy has quite an array of weapons. The ship itself can be destroyed by a direct hit from your cannon. If it is not, it can release fusion bombs which fall diagonally and are immune to your cannon's shots. The bombs, as mentioned above, are destroyed upon contact with your force field.

Blink bombs, however, fall vertically from the ship to a point and then horizontally toward the Star Fort. They MUST be destroyed by direct hit, and are oblivious to your force shield.

The crystal webs are activated by the release of a crystal "seed" from the enemy ship. The seed moves toward the Star Fort, leaving a crystalline web in its wake. Both the seeds and the web can be destroyed by your cannon, but are also heedless of your shield.

An added disadvantage: you are not limitless in your ammunition. Each time you fire a shot or obliterate a fusion bomb, your energy level drops. The energy bar indicates your reserve, and it is replenished only after the completion of an attack. You do have the advantage of seeing the progression of your energy reserves by a change in color from green to yellow and to the final deadly red. When reserves are gone, your fort is destroyed.

Star Fort is available on disk only for $19.95 from D.S. Muenchau, P.O. Box 572, Allen, TX 75002. It definitely gets a Star in my book!

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ETCETERA

USING YOUR RS232 INTERFACE

By Jack Carrel
Staff Technical Editor

In my last article, we discussed the theory behind interfacing your computer to a printer, with heavy emphasis on the information needed to select a printer that will meet your needs. In this article, I plan to discuss the uses and operation for the RS232 interface card.

The RS232 interface gives your computer a whole new dimension of the world in which you can communicate and control. Until you get an RS 232 interface, your computer is limited in scope and capability to its immediate hardware environment. This environment includes the console, memory expansion, disk drive, and video display device.

One major concern with this type of system is that all of the data used by the computer is in a format that is not convenient for you to use. The only data you can view is on the video screen, and this is only when the computer system is turned on and the appropriate data has been loaded into the computer.

Should you need to take the data to a location outside the locale of your computer, you will need to handcopy the data so it can be transported to another location. Sure, if you wish to take the data to another TI 99/4A computer you can transport the data by storing it on cassette or diskette. But there are many uses for your computer that generate data which is most useful when it is in a form other than that the computer uses, i.e., letters, bookkeeping, etc.

This leads us back to the subject of this discussion. Besides being a means of communicating with your printer to develop the desired hardcopy of data generated by your computer, the RS232 interface has a few other uses that can really expand the scope for your computer. Instead of you and your computer being locked out of the world, the world becomes accessable.

The first and most obvious use for the RS232 interface is telecommunications. This usage requires the addition to your system of a MODEM. A modem acts as a translator between your computer and the phone system. As you know, the phone system is designed to transfer information in the form of audio frequencies, whereas your computer and RS232 interface transfer data in the form of electrical signals that are not audio signals. So, the modem changes the data it receives from your RS232 interface into audio tones that can be transported by the telephone system. Also, the modem can translate data received from another computer and modem system into a format the RS232 interface can recognize.

There are several options available if you have a modem and an RS232 interface. First of all, you can get a subscription to one of the major database services like THE SOURCE, which is available through the International 99/4 Users-Group. With these services at your disposal, you can do many things, such as checking national news releases, using the power of large system programming languages, acquiring new software, checking the stock

market, or doing some shopping for household items, etc.

As you can see, the large database services give your computer a tremendous increase in its power and scope. But there are several other uses for a system that has the capability to perform telecommunications. Among these is the access of local and national electronic bulletin boards. Most communities have at least one of these bulletin boards available. Usually, the bulletin board is operated by an individual or a group who wish to use the telecommunications capabilities of their computers to send and receive messages. Many times access to these services is free, and other times a small user fee is required, usually to help cover the cost of maintenance and operation.

These bulletin boards offer you the opportunity to get in touch with other computer users with whom you can share ideas and software. Also, it is a good way to leave a message with someone whom you may not be able to contact otherwise. Often, these bulletin boards have two means by which you can leave messages. One is leaving a public message that anyone can read when they access the bulletin board. The public messages range from announcements of meetings to inquiries for assistance on a computer problem. The second, leaving a personal message that is directly addressed to another user on the bulletin board.

A third usage for your modem and RS232 interface system related to the aforementioned usage is direct telecommunications with another user. This way you can swap data, software, and play games with another person, all within the comforts of your own home. I have utilized this capability a great deal, since it is a lot easier to send someone a routine I have written over the phone lines than to copy the software onto a disk and travel to their location, especially if it is a small piece of software.

There are countless more uses for the modem and RS232 system, and you can probably think of some right now. But the point I wish to make is this: this type of system REALLY expands the scope and usage of your computer system.

Even without a modem, an RS232 interface gives you and your computer many options. One of these is the communications between two computers. By directly connecting two computers to each other via their RS232 interfaces, the two computers can communicate directly without the need for a modem. Of course, this does not offer the convenience of telecommunications, but does offer you the same capabilities to swap data and play games.

All of the uses discussed so far for your RS232 interface involve two-way communications between your computer and another computer. But there are many other uses for an RS232 interface. There are several types of electronic equipment requiring the RS232 interface which are designed to enhance the capabilities of your computer system. Among these products, you can get a real time clock that connects to your computer via the RS232 interface and gives your computer the capability to perform functions according to the day and time. Also, you can now obtain a controller system for the electrical appliances in your home, and this controller has the capability to operate with your computer through the RS232 interface. Just think of the possibilities if you had both of these items at your disposal. The home of the future would be available to you, NOW!!

I hope this discussion so far has helped to expand your understanding of what the RS232 interface can do for you and your computer system.

MORE ON PRINTER INTERFACING

Now, I would like to digress a little with you and try to tie up some loose ends concerning the operation of your printer,

your RS232 interface and your computer. First of all, let's cover the particulars of getting the system working. Problems can develop in one or both of two major areas, hardware and software.

For the most part, the problems with the hardware aspect of interfacing a computer with a printer begin at the connector of the RS232 interface on the computer and head in the direction of your printer. Don't get me wrong; I'm not suggesting that your printer has any problems with reliability. It's just that when it comes to interfacing a printer to your computer, there are many variables you will have to pay particular attention to, such as the connections and conditions required by your printer.

First of all, you will need a cable to connect your computer and printer. Usually, you can purchase the proper cable from the dealer where you purchased your printer. But you must make sure that the cable you get is designed to work with the 99/4A and your printer. Because of the number of variables involved with getting a printer working properly with your computer, it is best to try to not generate any new questions before you get everything working.

The cable is not very difficult to make if you already know what signals you need. But even though the interface between your computer and your printer are supposed to be compatible, (isn't that the purpose of the RS232 specification?) the people who are involved in making the RS232 interfaces for computers seem to have different interpretations of the specification. The problem, I believe, is primarily with the definition of the printer's system function.

In the RS232 interface specification, each piece of equipment that is to be communicating in the system has a definition according to its function. These definitions include names like DATA TERMINAL EQUIPMENT (DTE) and DATA COMMUNIATIONS EQUIPMENT (DCE). As you can see, neither of these names leads you to an immediate conclusion as to the functional description of a printer. In fact, the RS232 was not really written with the printer in mind. For the most part, the specification was written for the interfacing of terminals to computers and to other terminals. But the RS232 specification has become the standard interface for printers, anyway.

This is not as bad as it may sound, because once the manufacturer has decided upon the functional definition he will use, the location of signals on the connector of the printer is established. So, what happens is that the manufacturer's interpretation of the specification (right or wrong) decides what the pinouts are going to be for the printer.

This variation affects only the location of the signals on the connector. The electrical characteristics of the interface are not affected. There is no question

concerning that (and we should be thankful for that big favor). This means the only problem for us is with getting the signals properly connected between your computer and your printer.

Now, these connections are usually not that complicated. But I have found several times that the information given to me by the printer manufacturer is either incomplete or incomprehensible.

Since there are so many printers available and I do not want to suggest that you purchase any particular one, I'm just going to explain the signals that are most often used on the computer; hopefully, this will help you to figure out the rest.

Since the computer will be sending data to the printer, you will need to connect pin 3 on the RS232/1 or pin 16 for the RS232/2 (pin numbers are marked on the connector) to the receive pin on the printer (the pin on the printer will be either pin 2 or 3).

Next, you will need to provide an electrical common between your computer and printer. This is pin 7 on each device (there is no variation on this pinout).

Now we need to discuss the connection which seems to cause the most confusion. Because your computer can undoubtedly send data to the printer faster than the printer can print it, the printer must have some way in which it can inform the printer that it cannot receive data. This means that this signal will need to be an input to the computer, specifically the RS232 card. There are only two inputs on the RS232 card for each RS232 port. These signals are the receive data, RD, and the data terminal ready, DTR, signals. The receive data signal is used only if you are going to be receiving data from another source. The signal we are concerned with here is the printer unless the printer places the proper signal on this line. This signal is located on pin 20 for RS232/1 and pin 19 for RS232/2.

I hope this information has helped you to understand what you need to connect to the computer to most printers. You can experiment a little to look for the right combination; just make sure you do not tie any outputs to each other. Also, the IUG is available to offer you assistance.

Once you have made a cable to connect the printer to the RS232 interface card, you are probably going to have to spend a little time with your head stuck in your printer instruction manual. Most printers have at least one set of switches that can only be accessed by removing the printer cover. These switches are very important. Usually, if anyone of them is in the wrong position the printer will not operate properly with the computer. Each printer manufacturer has a different idea about what variations are necessary to make the printer as versatile as possible. All I can say is, you're going to have to make sure you understand the description of each switch. Some of the switches require special attention to any printer. These switches include settings for baud rate, parity, number of data bits and automatic line feed/carriage return.

NOW LET'S SEE SOME ACTION

Let's look at the operation of the printer from the computer. There are a lot of good examples for you in the RS232 interface card instruction manual. These examples are written in BASIC, so there is no reason for me to go into any great detail on accessing your computer in BASIC.

I would like to show you how to get more control of your printer at your computer keyboard. You see, most printers have several options you can select to enhance your printings. These include the selection of different character sets, page length, graphics, line spacing, and carriage control (line feed, carriage return and vertical tabs, etc.) The printer recognizes a sequence of non-printable characters as a command to change one of these options.

If you have TI-WRITER, you can use the special character function, or the transliterate command, to imbed custom

formatting instructions that you need to send to your printer, such as expanded printing, subscripts, italics, etc.

Also, I have a simple BASIC routine that I keep on many of my disks so that I can set my printer to whatever conditions I choose before I begin printing a document.

By using the CHR$ basic command, I can send the special codes to the printer. My printer requires each printer command to be preceded by an ESC character. The decimal value for this code is 27. So, by using the CHR$ command to change the 27 into its ASCII equivalent, I can send this character to my printer via the RS232 interface.

Below is the program that I use:

```
100  OPEN #1:"RS232.BA
     =1200"
110  INPUT "ENTER THE DE
     CIMAL CODE":A$
120  PRINT #1:CHR$(27)&
     CHR$(A)
130  GOTO 110
```

As you can see, this program is very simple. But it makes the control of my printer very convenient.

NOW LET'S TRY IT IN ASSEMBLY

Let's look at another method of accessing your printer and other devices via the RS232 interface, i.e., with Assembly language. The method for accessing the RS232 interface in Assembly language is not very difficult once you have gleaned all of the pertinent information out of the EDITOR/ASSEMBLER manual. The information is in the manual but it is not all in one place. And unlike what we encountered in BASIC with various configurations and examples with explanation of each, in Assembly, we have no examples, just the information with nothing to really tie it all together for us.

Let's go through this information in the EDITOR/ASSEMBLER manual and begin building a general purpose routine that we can use for many applications.

First of all, if we try to look in the index of the manual for pages where the RS232 interface is referenced, we will come up empty-handed. Instead, we are going to have to use a little logic and intuition to locate the pertinent information.

First of all, if you will remember how operation of the RS232 interface is handled, this gives us a big key on where to look. That's right — the RS232 interface is handled just like a file, i.e., open, close, file #, etc. So, if we look under file in the index we find several places we can look. To save time, and as you probably know, I have already looked at all of these references. So, let's look at the section on file management.

It is in this section we begin to see some things that really help us to better understand the operation of our computer and its peripherals. We learn that all devices, with the exception of the keyboard and its screen, are handled with DEVICE SERVICE that DSRs are accessed via a utility program called DSRLNK. By setting up a series of parameters in certain locations of memory, we can use this routine to gain control of the RS232 interface.

Then we are informed that we must have something called PERIPHERAL ACCESS BLOCK (PAB) set up VDP RAM before we call this routine. Well, this little bit of info sends us back to section 18 on file management.

In subsection 18.2, we find the definition of the PAB and how to set it up. We find the PAB is a series of bytes by which we can pass data to the device we are trying to control or access.

The first byte of the PAB must contain the op-code. These codes are explained in subsection 18.2.1. Here we see that the operation of the RS232 is going to be similar in function to the way it is operated in BASIC. That is, we are going to have to first perform an opening operation for the RS232 interface and then change the op-code so we can use the RS232 for output. And when we are finished we are going to have to close the RS232 operation.

The next byte of our RS232 PAB will contain the information on the file characteristics. Here we will use the default characteristics that are used for the RS232 operations in BASIC. So, we will set up our RS232 PAB for variable record length, display type data, update operation, and sequential file.

Next we need to decide where we are going to put the data we are going to send to the RS232 interface. This data must be in VDP RAM. So, not only do we need to decide where in VDP RAM we are going to put this data, we must now make a note that any data we will be sending to the RS232 interface will need to be placed in the VDP RAM before we can send it. For the purpose of this routine we will use VDP RAM address >0002 for the location of our data. This is also the third location of the screen image table. So we will be able to see the data that we are sending to the RS232 interface.

The fourth byte will contain the value 80. This is the default value of the record length for the RS232 interface when we are using BASIC. The next byte contains the information on the number of bytes to be transferred. Therefore, this byte will contain the length of our character string we will be sending to the RS232 interface card.

We will put zeros in the next three bytes, since we don't need to specify the record number when the file is sequential and we're not using the cassette interface.

The next byte contains the length of the file descriptor. The file descriptor itself is identical to the information we enter in BASIC to access our printer and RS232 interface. In our example, the file descriptor is RS232.BA =1200. So, the value in this byte will be 13. And since I have already given our file descriptor, it will start in the byte following the name length byte; in other words, byte number 10 of the PAB.

Now that we have built our PAB, let's go back to the section on the DSRLNK, ad continue developing our RS232 accessing routine.

The next piece of information we get from the section of the DSR link utility is the CPU address " >8356 and >8357 must contain" the VDP address of the name

length byte in the PAB. Since we will be putting the PAB in VDP RAM at address >1000, the name length byte will reside at VDP address >1009. As a note of interest, I have found that you need to replace this pointer each time you call the DSRLNK because you can never be sure of its value after you have returned from DSRLNK.

Now, we see that the manual informs us of an area of memory called UTLTAB, but this information does not pertain to us in this application.

Lastly, we see that upon returning from the DSRLNK, if an error occurred the equal bit of the CPU STATUS REGISTER will be set. So, if we test the equal bit after executing DSRLNK, we can jump to an error routine which will display the error. If an error occurs, the error code is placed in workspace register 0 of our workspace registers.

We now have all the information we need to write our routine. I have written a sample routine for this article which is included for you. This routine was written for the EDITOR/ASSEMBLER system.

Those of you that own MINIMEMORY systems will need to make a few changes in order for this program to work with the LINE-BY-LINE Assembler. The three labels at lines 8, 9, 11 and 18 will need to be changed to two character symbols, such as M, M0, M1, etc. Also, the symbols VMBW, VSBW, and DSRLNK will need to be substituted with their equivalent addresses, >6028, >6024, and >6038, respectively. And of course, you will not need the REF and DEF statements on lines 6 and 7.

Lines 8 through 18 form the calling part of the program. Once the program is executed, each time you press the ENTER key, the string will be sent to the RS232 interface. When you press FCTN, the program will terminate by returning to the calling program.

Lines 19 through 35 write the string to the VDP RAM, write the PAB to VDP RAM, open the RS232 interface as a file, write the string to the RS232 interface, close the RS232 file, and return to the calling program.

Lines 36 through 41 store the value of the VDP RAM address of the name length byte in the PAB to CPU address >8356, and then calls the DSRLNK routine after which the equal status bit is checked to see if an error occurred during the DSRLNK. If not, the routine returns to the calling program.

Lines 42 through 53 are called if an error is detected after returning from the DSRLNK. This routine displays the error on the video screen and waits for you to terminate the program by pressing "FCTN=".

The remainder of the program contains the text for the error routine, the PAB data, and the string that is transmitted to the RS232 interface.

RS232 PROGRAM

```
0001  ****************************************
0002  * RS232 PRINTER SUBROUTINE              *
0003  * THIS ROUTINE WAS WRITTEN FOR THE      *
0004  * EDITOR/ASSEMBLER SYSTEM.              *
0005  ****************************************
0006          REF   VMBW,VSBW,DSRLNK
0007          DEF   RUN
0008  RUN     MOV   R11,R10    ;SAVE RETURN POINTER
0009  RUN0    CLR   R12
0010          LIMI  2
0011  RUN1    TB    7          ;WHEN "FCTN" PRESSED
0012          JNE   RUN2       ;EXIT ROUTINE.
0013          TB    5          ;WHEN "ENTER" PRESSED
0014          JEQ   RUN1       ;PRINT ANOTHER LINE.
0015          LIMI  0
0016          BL    @P0
0017          JMP   RUN0
0018  RUN2    B     *10
0019  P0      MOV   R11,R9     ;SAVE RETURN
0020          LI    R0,>0002   ;WRITE TEXT TO VDP
0021          LI    R1,T1
0022          LI    R2,62
0023          BLWP  @VMBW
0024          LI    R0,>1100   ;WRITE PAB TO VDP
0025          LI    R1,PB
0026          LI    R2,29
0027          BLWP  @VMBW
0028          BL    @P3        ;OPEN FILE "RS232.BA=1200"
0029  P1      LI    R1,>0300   ;SET WRITE OP-CODE
0030          BLWP  @VSBW      ;TO PAB.
0031          BL    @P3
0032          LI    R1,>0100
0033          BLWP  @VSBW
0034          BL    @P3
```

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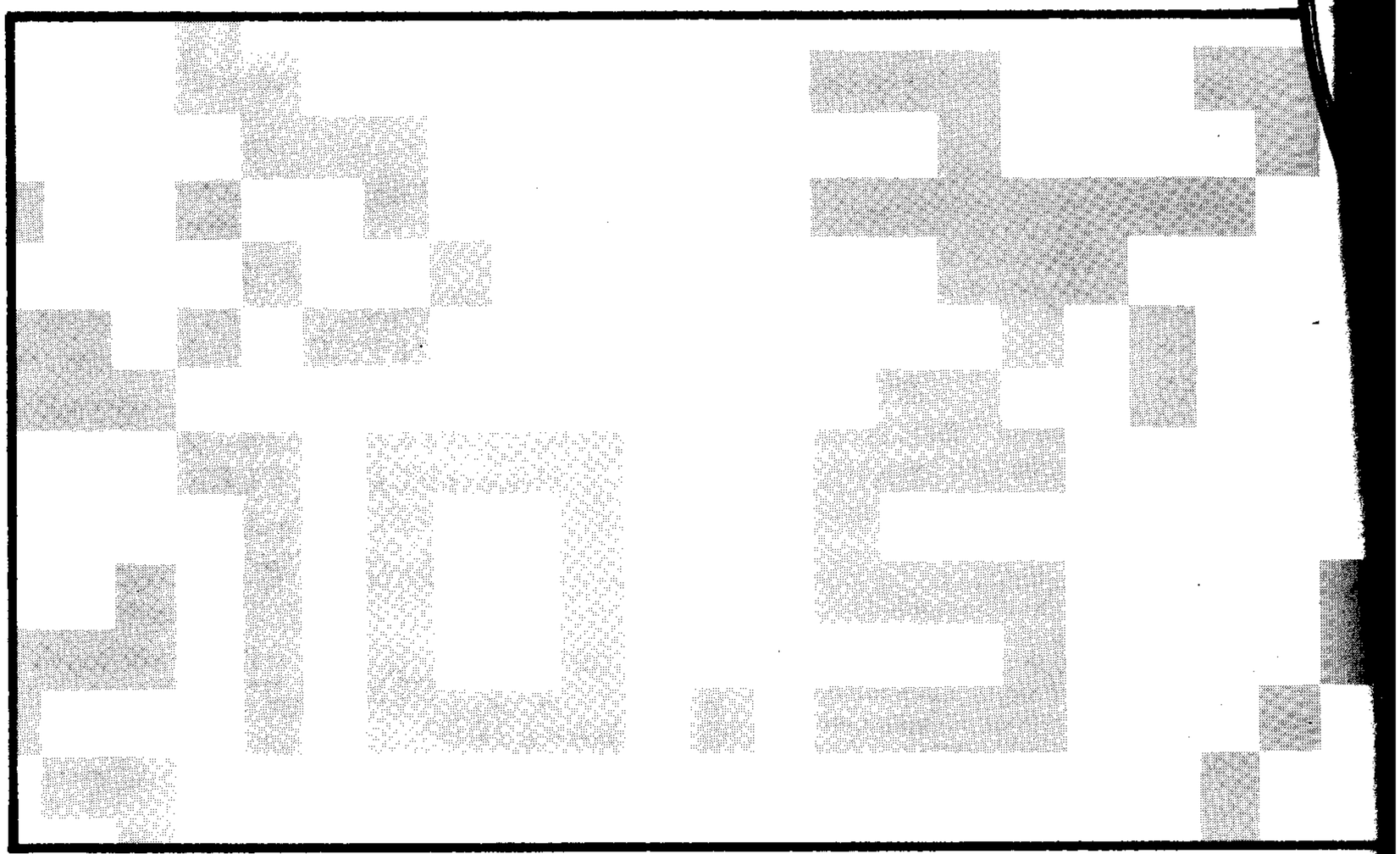
```
0035                B     *R9          ;RETURN
0036   P3           LI    R3,>1109     ;SET PAB POINTER
0037                MOV   R3,@>8356
0038                BLWP  @DSRLNK
0039                DATA  >8
0040                JEQ   P4
0041                RT
0042   P4           CLR   R2           ;I/O ERROR ROUTINE
0043                MOVB  R0,R2
0044                SWPB  R2
0045                MOVB  @NO(R2),R1
0046                LI    R0,49
0047                BLWP  @VSBW
0048                LI    R0,42
0049                LI    R1,ER
0050                LI    R2,7
0051                BLWP  @VMBW
0052                LIMI  2
0053                JMP   $
0054   ER           TEXT  'ERROR=   '
0055   NO           TEXT  '0123456789ABCDEF'
0056   *            PERIPHERAL ACCESS BUFFER (PAB)
0057   PB           BYTE  0                 ;OP-CODE
0058                BYTE  >10               ;FLAG/STATUS
0059                DATA  >0002             ;VDP BUFFER
0060                BYTE  80                ;RECORD LENGTH
0061                BYTE  62                ;# OF CHARACTERS
0062                DATA  0
0063                BYTE  0
0064                BYTE  13                ;NAME LENGTH
0065                TEXT  'RS232.BA=1200'
0066   T1           TEXT  'The quick brown fox jumps over the lazy dog''s'
0067                TEXT  ' back. 1234567890'
0068                EVEN
0069                END
0070
0071
```

ASSEMBLY LINE

YOU ASKED FOR IT, YOU GOT IT
— AN INTRODUCTION TO BIT MAP MODE

By Bill Gronos
Senior Technical Editor
9505½ S.E. 15th #B
Midwest City, OK 73130



How to use Bit Map mode is the most requested subject I receive. Almost every other letter I get asks for it. I give in.

Bit map mode, besides giving you far greater graphics power, can make tough graphics tasks far simpler than the normal graphics mode. With the proper subroutines, this special function is actually easier to use than the "build a character pattern, display a character" method that you have been chained with.

Of course, those of you who tried to understand the Editor/Assembler manual's explanation, those of you who are still sane, will find that statement very difficult to believe.

WHAT IS BIT MAP MODE? HOW DOES IT WORK?

My first encounter with Bit Map mode came ions before I ever started programming in Assembly language.

I first became involved with the International 99/4 Users-Group as a reviewer for the user written program library. I would try out the new submissions and write short descriptions for the library catalog. The main benefits of this position were the people I came in contact with. Charlie LaFara has an extensive knowledge of the 99/4 which I assimilated via osmosis by working with him. Also, there were lots of visitors to the IUG, many of whom were TI insiders.

One such visitor was a TI programmer who gave me a short description of GPL-Graphics Programming Language, which is the medium-level language used by the GROM operating system. "Of course", he said, "All the graphic capabilities of GPL can be duplicated in BASIC . . . except for Bit Map mode."

Bit Map mode? . . . add one more mystery to the 99/4 puzzle — fit a piece into place and three new ones fall out of the box. As the sage said, "The more you know, the more you know you don't know." Hopefully, this article will clear up your understanding of the 99/4A's most complex graphic mode and give you some Assembly subroutines that will allow you to use Bit Map mode whether you understand it or not. We will start the lesson with a little theory of operation for the Video Display Processor (VDP).

THE VIDEO DISPLAY PROCESSOR — MAKING THE INVISIBLE VISIBLE

Try to imagine what your computer would be like if you didn't have a monitor. OK, wise guy, pretend you don't have a printer either. How would you ever know the results of all those amazing calculations that take place within the console? If you knew Morse code you could wire a speaker up to the output of your 99/4's sound chip and "ditty-bop" the info out, but playing Parsec would be a real trick, not to mention very dull. Since a monitor screen is a vitally important part of home computer system, TI selected a top-notch video controller to maximize the capabilities of your monitor.

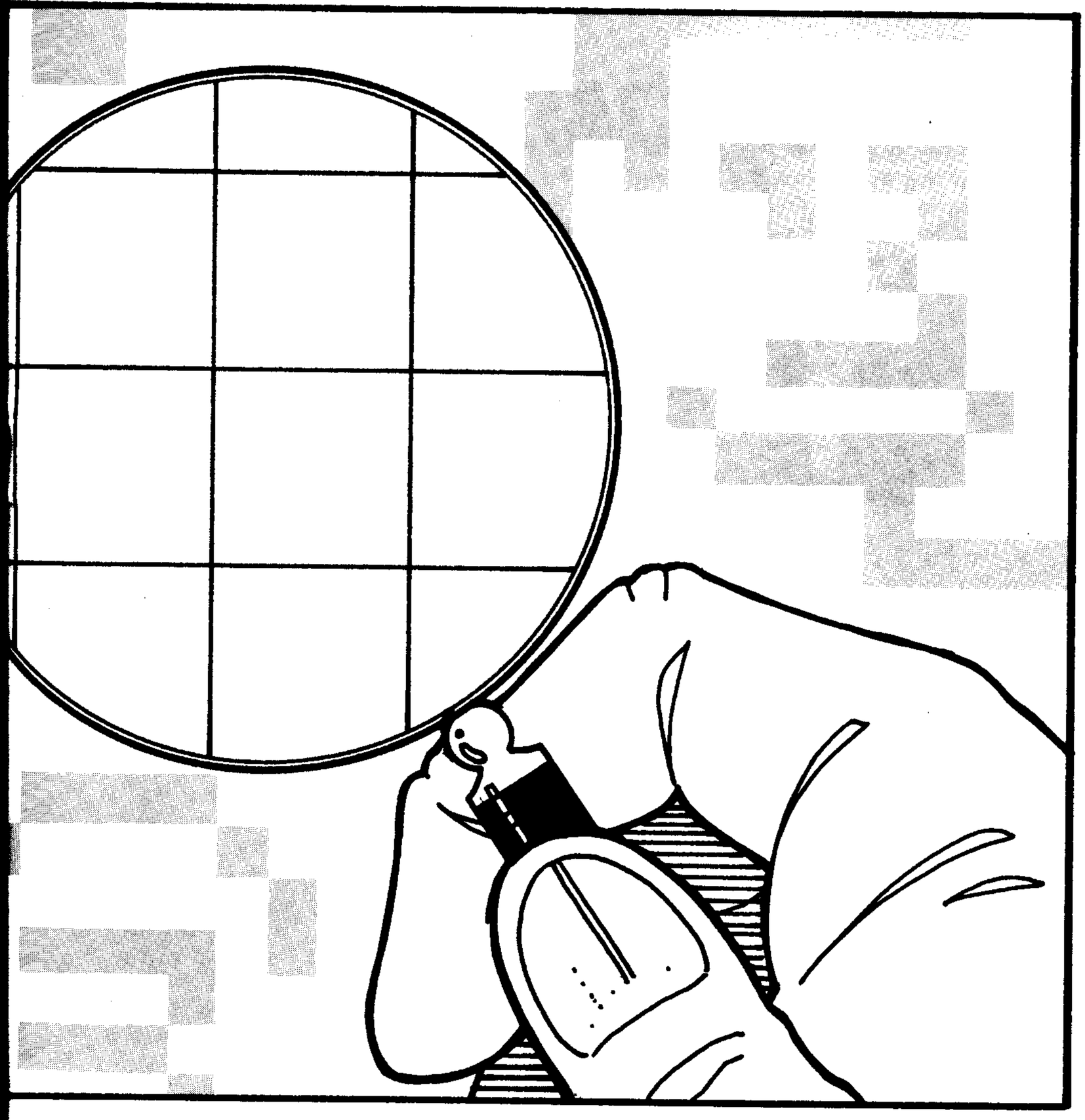
If you own the original 99/4, you have a TMS9918 video display processor. If you own a 99/4A, your console contains a TMS9918A VDI (which is where the "A" in "99/4A" comes from).

Both of these are forty pin silicon chips, but the TMS9918A has one extra feature; it can be used in bit map mode.

The 9918A VDP can operate in four software selectable modes: Graphics, Text, Multicolor and Bit Map.

Graphics mode is the only one that can normally be used in BASIC. The screen is composed of 49,152 small dots called pixels (for "picture elements"), which are arranged into 192 rows each having 256 dots. A character is composed of eight rows of eight dots, thus 768 character positions are possible. In Assembly language, you can define 256 different character patterns, but BASIC reduces this number to conserve memory.

In the 99/4 and 99/4A, the VDP has control of 16 kilobytes of RAM memory. Graphics mode requires three areas of memory: SCREEN IMAGE TABLE(SIT) — determines what characters will appear on the screen. It is also called the Pattern Name table and requires 768 bytes of memory; Pattern generator table — contains the codes that determine what the displayed characters will look like. Each character requires eight bytes of code, so if all 256 characters are used, 2048 bytes of memory are required. This is also called the character code table; COLOR TABLE — determines the foregrounding (the



pixels that are turned on) and background colors of the characters. The table is 32 bytes long and each byte determines the colors of eight consecutive characters.

Graphics mode requires a maximum of 2824 bytes of VDP RAM.

Text mode allows 24 rows of forty characters. The foreground and background colors are user selectable, but all characters must use the same two colors. The monitor screen is still composed of 256×192 pixels just like Graphics and Bit Map modes, but the character size is reduced from 8×8 to 6×8. Since a line of 40 characters that are six pixels wide only requires 240 pixels, 16 pixels remain unused on the right edge of the monitor. This explains why a monitor that loses one or two characters off the right edge in 32 character per line mode can fit an entire 40 character Text mode line on the screen with no loss.

You do pay a price when using text mode; you can not use Sprites.

Multicolor mode has the lowest resolution of all modes. The screen is composed of 48 rows of 68 jumbo pixels, each of which are equal in size to 16 regular pixels, or one quarter of a graphics mode character. Each jumbo pixel can be any of the 16 different colors. Despite multicolor's low pixel resolution, you are allowed some combinations that are not possible in grapics mode, such as having what would be one screen position in graphics mode contain four different colors. You can use sprites in this mode, but they will be composed of regular size pixels.

The last and most versatile monitor mode available to the Assembly language programmer is Bit Map mode.

There are really only two differences between bit map mode and graphics mode: In bit map mode you can define 768 character patterns rather than the 256 pattern maximum in graphics mode; Bit map mode allows much more color mixing within a character than does graphics mode. It is these two small differences that make bit map such a powerful mode; let's see why this is so.

Since a character is composed of 64 pixels it is very easy to compute the number of different characters that can be formed; since a pixel can be either "turned on" or "turned off", there are 2 to the 64th power (2 64) different characters if we don't take the colors of the pixels into account. This works out to be

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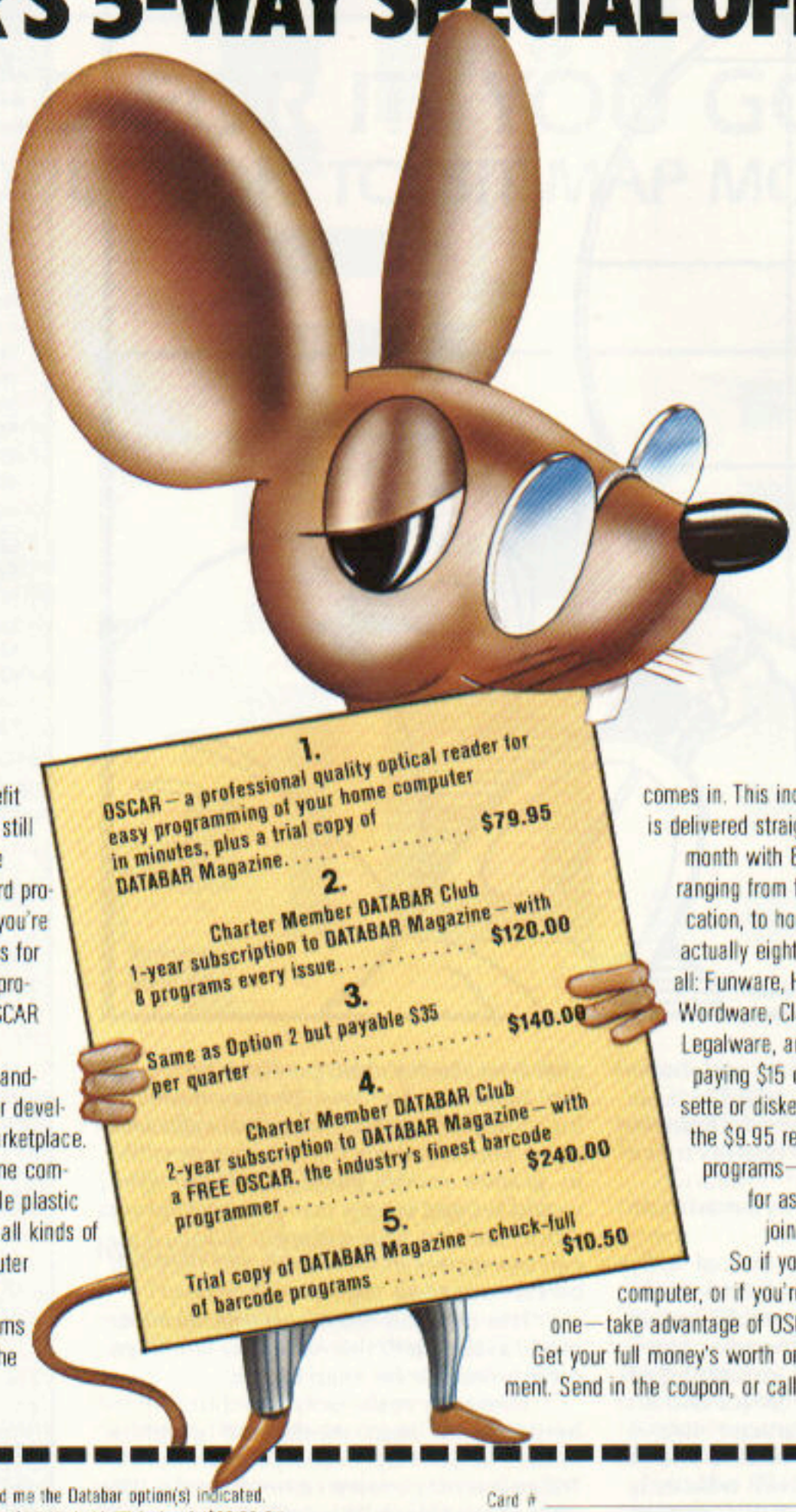

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about 184467000000000000 possible character patterns or, in case the typesetter had a bad night and alters the number of zeroes, 1864467 followed by 14 zeroes. This is such a mind boggling number that if it were pennies the United States budget deficit would be spare change by comparison. If it were grains of wheat, it would cover the entire surface of the earth to a depth of several inches.

And if you think that's a big number, consider how many different screens are possible just in graphics mode; on second thought don't even bother because the number is incomprehensible.

Trying to compare bit map and graphics modes in terms of absolute numbers is meaningless. Instead, let's think about what a programmer can do in bit map mode that can't be done in graphics mode.

Neglecting the extra color control that bit map mode offers, graphics mode can do anything that bit map mode can do. BUT ONLY IF WE LIMIT OURSELVES TO ONE THIRD OF THE SCREEN. A third of the screen requires 256 different character patterns to produce all possible designs, one for every character position. Therefore, a 768 character screen can only be filled through repetition of the 256 definable patterns. Anyone familar with Sam Moore's magnificent BASIC grapics can see that this doesn't have to be a limitation. Many graphic scenes are easily depicted by character repetition: bodies of water, cloud-filled skies, tree-filled forests, etc. After all, the blank character (space) will often fill 30 to 60 percent of most screens.

However, a highly complex screen that is densely packed with ornate graphics will eat up character patterns like a baboon eats bananas. For example, a "magic crayon" program that allows you to draw lines by stringing together individual pixels will require the entire 768 screen positions to have unique character patterns. A graphics mode program of this type would have to be limited to a third of the screen or else the pixel by pixel resolution would have to be sacrificed for a small set of lines and corners characters that could fill the screen via repetition.

Bit map mode's ability to fill a screen with distinct patterns makes screen-size graphing of complex mathematical functions possible. The screen can be treated as a 256 by 192 line sheet of graph paper whose intersections can be treated as cartesian (X,Y) coordinates. Pixels can be turned-on individually to represent ordered pairs generated by numerical functions. A sine wave graphed by this method shows excellent detail.

Couple the ability to define every screen position as a unique pattern with bit map mode's increased color detail and you have a very powerful graphics system indeed. I hope you won't be disappointed to learn that every pixel can not be a distinct color, but let's consider how much memory space would be required to do that.

Four bits of information, half a byte, are needed to define 16 different colors. Thus, 49,152 pixels would take up 24 kilobytes of memory space just to store the color information. This far exceeds the 16K of memory that the video display processor can access. Adding in the 6K of memory needed to store 768 distinct character patterns brings the total requirement to 30K!

Since that amount of memory just can't be mustered, a compromise was made. The pixels are color-coded in sets of eight. Each set of eight pixels can specify two colors, one for the "on" pixels and a second color for the "off" pixels. This reduces the memory space needed to a fourth of that which would be needed for defining pixel colors individually. Now only 6K of color memory is needed, an amount we can live with.

Even with the restriction on color, bit map mode has a heavy overhead memory requirement. Since BASIC programs are loaded into VDP memory, you can easily see why bit map mode isn't used in BASIC: your program would have to be mighty short!

Texas Instruments' ill-fated super home computer, the 99/8, was built with great gobs of memory and its BASIC did allow bit map graphics. What a pity that fine machine will only be a set of schematics stuffed away in a dusty filing cabinet.

Let's see how the mechanics of bit map mode are implemented.

The monitor screen is broken into three horizontal sections. A section has eight rows of 32 characters and fills 256 screen positions. Each section has its own pattern generator table for defining 256 characters. A pattern defined in one section will not affect the character codes in the other two sections.

So, if you fill the screen with character code 32 (normally the space character) and redefine pattern 32 in screen section one to be a small square, the 512 character code 32's in sections two and three will be unaffected. If you wanted all character code 32's to be a square you would have to put the identical pattern in all three pattern generator tables.

Likewise, if you wanted text to appear in all three screen sections, three full character sets would have to be defined. These pattern strings are constructed just like in graphics mode and each requires eight bytes of memory.

While the character patterns are defined as in graphics mode, the color table is very different. In graphics mode the color table is a mere 32 bytes long; it is 192 times larger in bit map mode. It now takes eight bytes to define a character's color where in graphics mode one byte would determine the foreground and

background colors for a set of eight characters.

Color patterns are formed like character pattern codes. Each byte of the color pattern determines what two colors a row of eight pixels will be.

Suppose we wanted to form a character that resembled a miniature American flag:

```
TTTTTTTT    T=TRANSPARENT
TTTTTTTT    B=BLUE
BBBBRRRR    R=RED
BBBBWWWW    W=WHITE
RRRRRRRR
WWWWWWWW
RRRRRRRR
TTTTTTTT
```

This character can be formed with:

```
pattern code
= ØØØØFØFØØØØØØØØ

color code
= ØØØØ484F88FF88ØØ
```

If these two patterns were placed at the beginning of each screen section one's pattern and color tables, the flag would appear everywhere character "0" appeared in the first 256 screen positions.

HOW TO USE BIT MAP MODE

You should now understand that bit map mode is really just a souped-up version of the normal graphics mode and can be used as such. To do this, however, would be to undermine its power.

Treating the monitor screen as a set of discrete boxes works well for text and simple character graphics; bit map mode will add a touch more color but other than that graphics mode can handle the job quite well. It is bit map mode's ability to treat the screen as one very large character that makes it such a powerful programming tool. This statement may have some of you scratching your heads in puzzlement, for didn't I just explain a few short paragraphs ago that character patterns are formed in the same manner as they are in graphics mode; built-up individually as 8 by 8 sized sets of dots? How, then, do we overcome this piecemeal method of piling character patterns? We use software that emulates this effect.

Let me make this clear by using an analogy. Imagine each screen character pattern to be a topless egg carton that can hold 64 eggs in eight rows. Also imagine that the monitor screen is a very large array of 768 television sets stacked 24 rows high with 32 sets in each row. These happen to be closed-circuit television sets and each one has its own individual television camera.

The egg cartons represent the pattern generator table — the area of VDP memory that holds the character patterns — and the 768 TV cameras represent the screen image table — the area of VDP memory that determines which character patterns will be displayed on the monitor. We now add the final element to this analogy; the funny little guy who has the job of filling up the egg cartons in the arrangements that we tell him to. In fact, we'll make believe we have two such hard workers: Godfrey Grafix and Bob Bitmappe.

Godfrey Grafix isn't too bright. He is a diligent worker but he just can't comprehend complex instructions. His abilities are limited to performing five tasks: He can paint any egg carton with one of the 15 possible colors or he can use turnpentine to remove the paint; He can paint the eggs that go in one particular carton all the same color or again wash the coloring off; He can fill the cartons to your specifications, leaving empty spots where you want the color of the carton to show rather than having a colored egg there; He can also paint the floor underneath the cartons and, since the cartons and the eggs are transparent plastic, the color of the floor will show through when not blocked by a colored carton or colored egg; He can point any of the 768 cameras at any of the 256 egg cartons if you tell him the camera number and the carton number. Since Godfrey Grafix gets confused easily, he is only able to work with 256 cartons.

It should be quite obvious that the egg cartons are analagous to the character set, eggs represent "turned-on" bits and empty carton spaces are "off" bits. Godfrey Grafix is the VDP chip silicon circuits that function in Graphics mode. In this far-fetched analogy, you are the foreman and you give Godfrey directions. Tell him to point a camera at any of the 256 egg cartons and the contents of the carton will then appear on one of the stacked-up TV's.

When you first start out, Godfrey has painted the floor and cartons green, painted a bunch of eggs black and arranged them in various alphanumeric shapes. Carton number 32 is empty and all 768 cameras are pointed at it. All the TV sets show pure green. This would be your monitor screen filled completely with "space" characters.

Now suppose you executed this short assembly language program:

```
LI Ø,367
LI 1,'AA'
BLWP @VSBW
JMP $
```

This would direct Godfrey to point camera number 367 at egg carton number 65, which he has prefilled with a pattern of black eggs, and the letter "A" appears in the middle of your monitor screen. In this same manner, other characters would appear in this same spot if the camera were pointed at a different egg carton. If all 768 cameras were pointed at carton number 65 the screen would be completely filled with "A"s.

You, being the brains of the operation, are required to do all the head work. You couldn't tell Godfrey to "Point whatever camera at carton 65 that will make the character appear in row 12, column 16 of the TV stack." Godfrey doesn't know what rows and columns are. Such an instruction will give him severe job stress and you'll have the union picketing the plant.

Instead, you whip out your scratch pad and calculate what camera needs to be redirected by using the following formula:

CAMERA NO. =((ROW -1) ×32)+COLUMN-1

(ROWS ARE NUMBERED 1-24, COLUMNS ARE 1-32)

If you are a very busy foreman who doesn't have time for such trivialities, you can hire another worker and train him to compute camera numbers for any given row and column and he can do the necessary calculation and issue orders to Godfrey. The person you hire is a program subroutine and you train him by giving him a detailed list of assembly language instructions. We will name this new worker Lincoln Branche and his list of instructions might be:

```
RC2VDP MOV *11+,Ø GET R
       OW #
       DEC Ø SUBTRACT 1
       SLA Ø,5 MULTI
       PLY BY 32
       A *11+,Ø ADD CO
       L #
       DEC Ø SUBTRACT 1
       MOV *11+,1 GET C
       HARACTER #
       BLWP @VSBW DIRE
       CT GODFREY
       B *11 RETURN CON
       TROL TO BOSS
```

Now that Lincoln Branche has been trained, you are able to make that "A" appear in the middle of the screen by giving him the following instruction:

```
       BL @RC2VDP
       DATA 12,16,'AA'
NEXT   LIMI 2
       JMP $
```

The first line is a Branch and Link instruction that will transfer program control to the instruction labeled RC2VDP. The address of the next memory location is stored automatically in register 11. The subroutine uses register 11 as a pointer to the parameter list, which is in the form ROW, COLUMN, CHARACTER. The double character "AA", is used because we need the parameter to be a word, not just a byte. Since only the first character is used by the Video Single Byte Write (VSBW) utility, using "AB" would still produce the same result.

The use of subroutines can certainly make graphics mode easier to use, but we are still limited to thinking of the screen as 768 separate units. While this is fine for small areas of character patterns, it isn't conducive to full screen displays. However, Bit Map mode, with its ability to define all 768 screen positions as unique character patterns, gives us the extra power we need to accomplish this task. I'll explain bit map mode by describing the analogical Bob Bitmappe.

Like Godfrey Grafix, Bob Bitmappe is no Einstein. Bob can only handle a few more tasks than Godfrey, but oh what a difference they make.

In addition to the tasks Godfrey can perform, Bob has two extra talents:

(1) His painting ability isn't limited to just two colors per 8 by 8 bit character pattern, he can work on a row by row basis. Bob can paint any row one of 15 colors or leave it transparent and he can do the same for the eggs that go in that row.

(2) Bob can handle 768 egg cartons rather than Godfrey's 256.

While Bob can perform in the same manner as described for Godfrey, His real forte is the ability to handle those 512 extra cartons. Since we now have an egg carton for each of the 768 TVs, the monitor can be treated as one gigantic character that can be manipulated on a pixel basis.

To do this we give Bob a set of initialization instructions:

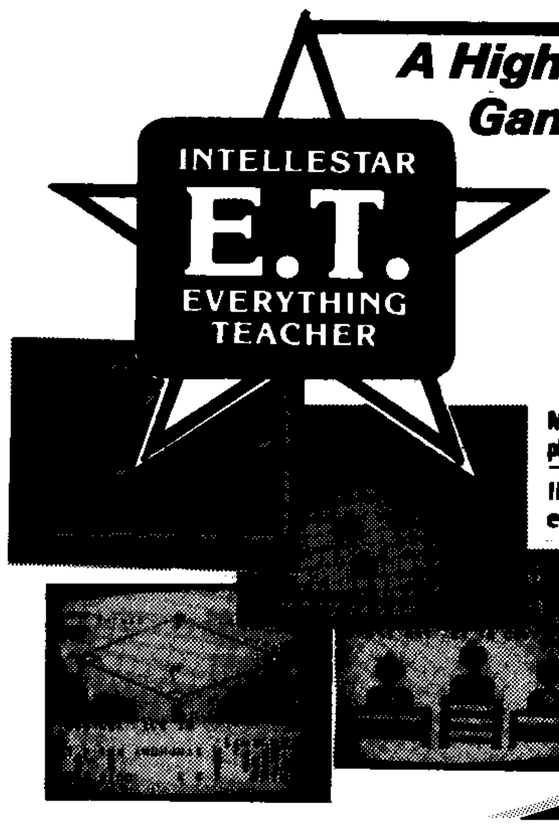
(1) Point each video camera at a different egg carton.

(2) Empty out all of the cartons.

(3) Paint all the egg cartons white.

(4) Paint all of the eggs black.

So now we have 768 cartons laid out in 24 rows of 32 cartons each and every



carton has a camera pointing at it. For every one of the stacked-up TVs there is a corresponding carton. Place an egg in any carton and a dot will appear on one of the TVs. Now we can turn-on any pixel on the entire screen just by having Bob place an egg in the appropriate row and column, treating the screen as being 192 rows by 256 columns. Of course, just like Godfrey, Bob doesn't know what rows and columns are. Unless we don't mind doing a whole lot of boring calculations, we had better teach Lincoln Branche some new skills. It is impossible to teach someone to do a task that we ourselves don't know how to do, so we must figure out the mechanics of converting pixel-rows and pixel-columns into a pattern change in a particular egg carton.

If pixels were numbered in an orderly fashion, the conversion would be as simple as the one for changing a character row and column into a screen image table position. For this to be true the first 11 pixels in the first row would have to be numbered:

0,1,2,3,4,5,6,7,8,9,10

Unfortunately, they happen to be numbered like this:

0,1,2,3,4,5,6,7,64,65,66

This bizzare numbering results because the screen is still considered to be a set of 8 by 8 pixel characters with the top left character containing pixels numbered 0 to 63. The first three rows are numbered:

0,1,2,3,4,5,6,7
8,9,10,11,12,13,14
15,16,17,18,19,20,21

This arrangement makes the math calculations a tad bit more difficult, but once Lincoln is trained correctly he will perform them flawlessly. For the reader's edification, I'll explain the conversion step by step. It is not necessary to understand this procedure to use bit map mode, so you can skip it with no ill results and treat the Assembly subroutine that performs the conversion for you as a proverbial black box.

Many Assembly language bit manipulations require a technique of number theory called Modular Arithmetic. Don't be alarmed if you aren't familiar with this; it is a very simple procedure and quite easy to understand. Modular arithmetic deals with "bases", but these bases have nothing to do with number system bases such as hexadecimal (base 16).

Stated mathematically:

A modulo B=(A/B-INTEGER(A/B))*B

Where A=any whole number and B =the modular base.

Stated simply: A modulo B =the whole number remainder of A divided B.

Still confused? How about a practical example. A person's will states that his herd of horses is to be equally divided among his four children and, if this doesn't work out evenly, the extra odd number are to be given to charity. If he has 35 horses when he dies, then the number going to charity is equal to 35 modulo 4, which works out to be three.

If you are an experienced programmer, you have probably been using modular arithmetic without even knowing it.

Getting back to the pixel row-column conversion, the task can be broken down into the following steps:

TASK: GIVEN A PIXEL ROW IN THE RANGE 0-191 AND A COLUMN FROM 0 TO 255, PLOT THE POINT AT THE INTERSECTION OF THE ROW AND COLUMN ON THE MONITOR SCREEN.

STEP 1: COMPUTE THE CHARACTER PATTERN BYTE AND BIT THAT MUST BE CHANGED USING THE GIVEN ROW AND COLUMN.

STEP 2: FETCH THE PATTERN CODE BYTE FROM VDP MEMORY.

STEP 3: SET TO ONE THE BIT TO BE PLOTTED.

STEP 4: PLACE THE NEW CHARACTER PATTERN BYTE BACK INTO VDP MEMORY.

It is step #1 that requires a little thought; the other three steps are fairly straight forward. Whenever we deal with VDP memory, we must think in terms of bytes, for that is the unit that can be accessed by the VDP memory mapping. Let's see how the bytes are numbered in the first two characters of the first two pixel rows:

PIXEL COLUMNS 0-7 8-15

	BYTE #
P	0 8
I	1 9
X	2 10
E	3 11
L	4 12
	5 13
R	6 14
O	7 15
W	
	256 264
	257 265
	258 266
	259 267
	260 268
	261 269
	262 270
	263 271

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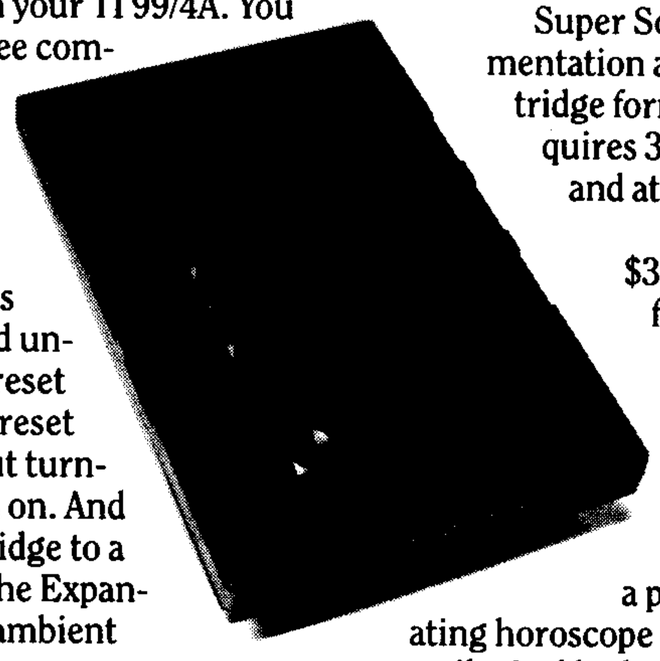

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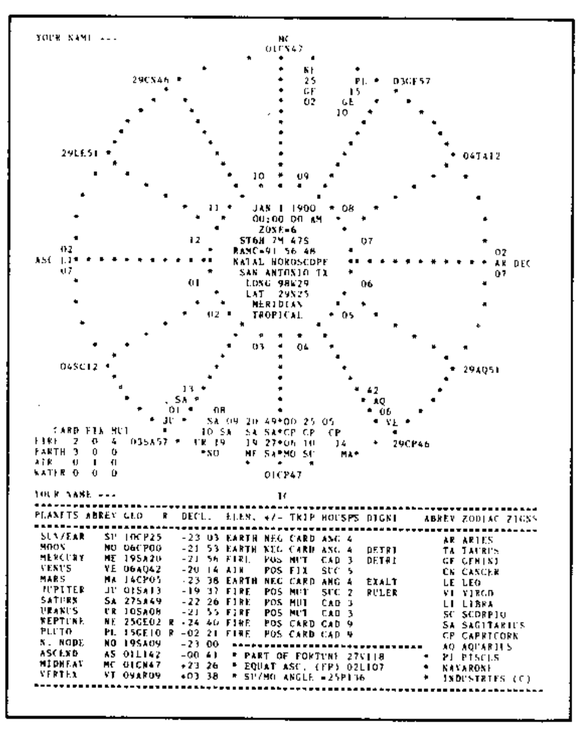

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Using this table, we can see that if we want to plot a point at row 8, column 8 we must change the 264th byte in the VDP pattern table. By further inspection of this table, we can generalize the method of computing the byte. Using "m" to abbreviate "modulo":

BYTE=(ROW-(ROWm8))+
(ROWm8)+(COL-(COLm8))

This equation appears complicated, but it is easily programmed in Assembly language. Take, for instance, the first term of the equation (ROW-(ROWm8)). Assuming the value ROW is stored in register 4, the single instruction:

ANDI 4,7

Gives us the value of (ROWm8). The single instruction:

ANDI 4, >FFF8

Would give us the value of (ROW-(ROWm8)), but since we are going to need the value of (ROWm8) anyway, it won't save any steps.

What would it take to do the same thing in BASIC?:

ROWm8=ROW-INT(ROW/8)*8

We now have an equation to compute what byte of the pattern descriptor table we need to change, but we still need to compute what bit of the pattern byte we need to turn on. This is easily done with:

BIT=COLUMNm8

If you don't follow the logic of the pattern changing calculations, don't worry; you don't have to know how an automatic transmission works in order to drive a car. Just use the subroutines given at the end of the text.

To keep things simple, I'm only giving you two subroutines for now. They are labeled BITMAP and PLOT. BITMAP is the initialization routine and it performs four functions: (1) It sets the VDP registers to the values that enable bit map mode and allocate VDP memory areas for the screen image table (SIT), the pattern descriptor table (PDT) and the color table (CT); (2) Initializes the screen image table with characters 0 to 255 repeated three times so that every screen position will display a unique character pattern; (3) It initializes the color table so that all "on" bits will be black and all "off" bits will be white; (4) Clears the pattern descriptor table by defining all 768 character patterns to be "space" characters — this will clear the screen.

The second subroutine, PLOT, will "turn on" any single pixel on the screen. Place the pixel's X and Y coordinates (column and row) into registers 3 and 4 respectively and then do a BLWP @PLOT.

If you are using the EDITOR/ASSEMBLER, you needn't include the bit map subroutines in your program. Since they are DEF'd, all you need do is REF them in your program and load the subroutine coding along with your program coding. My mailbag tells me I need to explain this in detail for three or four readers, so let me give a step by step example:

Type in the subroutine coding for BITMAP and PLOT, save it to disk and assemble it into a file name BITMAPU.

Create another file with the following coding:

```
*DRAW A LINE ACROSS THE
 MIDDLE

*OF THE SCREEN


 DEF RUN
 REF BITMAP,PLOT
*INITIALIZE BIT MAP
 MODE

RUN BLWP @BITMAP
*DRAW LINE
 LI 3,255
```

```
 LI 4,96
LOOP BLWP @PLOT
 DEC 3
 JOC LOOP
*WAIT FOR QUIT
 LIMI 2
 JMP $
 END
```

Save this program and assemble it into a file named LINE. Select the LOAD AND RUN option and when prompted for the file name type DSK1.LINE and hit enter.

When promoted for the next file name, type in DSK1.BITMAPU and enter.

When again prompted for a file name hit enter.

When prompted for a program name, type RUN and enter.

If all has gone well, you should have a solid line horizontally through the center of your screen.

Note: If you have an older 99/4A, graphics mode will not automatically be restored after a "function quit". You will get a peculiar looking title screen unless you reset the video display processor or turn off the console. This has been corrected in later 99/4A models.

Increase your understanding of bit map mode by defining your own subroutines. Write a routine that will draw a line between any two points. Program a routine that will draw a rectangle when given the two end points of one of its diagonals. The possible uses for bit map mode are endless.

GROMBUSTER EPILOGUE

I received several enthusiastic letters from people who had built a "Gronos Grombuster" (Enthusiast '99, November 1983), the most flattering of which was the following:

Dear Mr. Gronos:

I was finally moved to write by your explanation of the "grombuster". All your articles have been excellent, but this was icing on the cake. Your suggestion of wiring it into the speech synthesizer was well-made. Although I do have the "freight train" arrangement it was so easily done with the speech synthesizer that it hardly seemed worth the effort to cut down a plastic connector.

Your positioning of the word "TEST" in the demo program was somewhat devious however. I spent quite some time trying to figure out why it wouldn't work before I noticed "Instruments" was spelled "Testruments".

Overall, I've learned as much from the typo's in your articles as from their content. They force one to really understand the program instead of just running it. So you and the printer keep up the good work.

As far as subjects for future articles go, my vote goes to examples of using the floating point math routines. At the risk of nauseating you with adulation, I must say in closing, I had given up in disgust at learning Assembly language until your articles. So thanks again for the great work.

Sincerely,
Jim Matthews
Las Vegas, NV

Thanks, Jim, I'm blushing in embarrasment. I had thought of having the Grombuster turn the title screen upside down, but I figured the KISS method (keep it simple, stupid) would help the coding survive the typesetter's "good work". I had nightmares that the I/O port pins would be misnumbered with disasterous results. Hopefully, the number of typos should be reduced starting with this article. Dana, my editor, is going to rush me a copy of the proof sheets so I can review them before press time. Hope you can live without all those valuable lessons in frustration. Taking license with one of Plato's famous epigrams: "There won't be errorless articles until typesetters become programmers or programmers become typesetters".

Bill,

Enjoy your articles VERY much. Keep it up! You described Gronos Grombuster, and said

1. needs to be debounced
2. "timed properly" with IAQ on pin 41

When is the "proper time"? Does the pulse from the button need to be "anded" with another bus signal, like clock?

My wish list:
BIT MAP
I/O to cassette from Assembler
(can't get GPLLNK to do it)
Playing music WHILE game running
Thanks again for a fine research job.

Roger Harrison
Bergenfield, NJ

Thanx Roger. If you want music playing while game running, hold a harmonica between your teeth while using your hands to control the joystick (sorry, but I couldn't resist an opening like that). I'll let the next letter answer your Grombuster questions.

Dear Mr. Gronos,

I thought you might be interested in a simple software trick which will effectively debounce the Load interrupt generator switch (GROMbuster) you wrote about in the November '83 issue of Enthusiast '99. I have modified my DEBUGger to include it, where it functions very much like break points. You can return to the interrupted program with the 'Q' command.

```
INT CLR @>FFFC DISA
RM 'ONE SHOT'
   LWPI MYWS
   CLR RO
   DEC RO
   JNE $-2 WAIT FOR CON
   TACT
*TO BREAK CLEANLY
*--
*DO YOUR DEBUGGING HE
 RE-INTERRUPTED *CONTE
 XT IS IN R13-R15 OF
   MYWS
*--
   STWP RO
   MOV RO,@>FFFC REA
   RM 'ONE SHOT'
   RTWP RETURN TO INTER
   RUPTED PROGRAM
MYWS BSS 32
   AORG >FFFC
   DATA MYWS,INT
```

The key to this trick is the first instruction (at INT) which clears the workspace pointer word of the Load interrupt vector, thereby causing interrupts after the first one to discard their contexts harmlessly into ROM.

Sincerely,
C.J. Daly
New Carrollton, MD

This is the best tip I have ever received!!! I never got around to building the sophisticated Grombuster; now I don't have to. If you would have told me this before I bought the electronic components at Rip-off Shack I could have spent the money on some V-8s. I didn't try your method with the debugger, but it certainly works in other uses. You have increased the Grombuster's power ten fold! I would gladly rename the Load interrupt generator as the Gronos-Daly Grombuster.

Please make the following corrections to the program listing on page 44 of the January '84 Assembly Line article:

```
ØØ19 JGT SOUND3
ØØ25 JH NOISE1
ØØ36     ØØ42     ØØ5Ø
ØØ57     ØØ61     ØØ66
ØØ68     ØØ7Ø     ØØ71
ØØ73     ØØ86     ØØ92
CHANGE THE DOUBLE "AT
SIGNS"(@@)TO SINGLES(@)
```

ASSEMBLY LINE PROGRAM

```
0001   *BITMAPU/S DSK7  BIT MAP UTILITIES
0002   *REF BITMAP,PLOT
0003   *LINK THIS FILE WITH YOUR PROGRAM
0004
0005      DEF BITMAP,EXITBM,PLOT
0006      REF VWTR
0007   *THIS SEGMENT ENABLES BIT MAP MODE AND
0008   *INITIALIZES THE SCR IMAGE AND COLOR
0009   *TABLES.  SIT IS (0-255)3 AND CT IS 1F.
0010   *EXITBM IS INCLUDED IN THIS FILE
0011   *THIS IS THE E/A VERSION,72 WORDS
0012   SUBWS BSS 32
0013   BITMAP DATA SUBWS,$+2
0014      LI 0,2
0015      BLWP @VWTR  SET M3
0016      LI 0,>206
0017      BLWP @VWTR  CHG SIT TO >1800
0018      LI O,>403
0019      BLWP @VWTR  CHG PDT TO 0000
0020      LI O,>3FF
0021      BLWP @VWTR  CHG CT TO >2000
0022
0023   *INIT SIT
0024      LI 0,>58
0025      MOVB 0,@>8C02
0026      SWPB 0
0027      MOVB 0,@>8C02
0028      LI 0,3
0029      CLR 1
0030   A  MOVB 1,@>8C00
0031      AI 1,>100
0032      JNE A
0033      DEC 0
0034      JNE A
0035
0036   *INIT COLOR TABLE,BLK-ON;WHT-OFF
0037      LI 0,>60
0038      MOVB 0,@>8C02
0039      SWPB 0
0040      MOVB 0,@>8C02
0041      LI 0,>1800
0042      LI 1,>1F00
0043   C  MOVB 1,@>8C00
0044      DEC 0
0045      JNE C
0046
0047   *CLR PATTERN DES TABLE
0048      LI 0,>40
0049      MOVB 0,@>8C02
0050      SWPB 0
0051      MOVB 0,@>8C02
0052      LI 0,>1800
0053      CLR 1
0054   D  MOVB 1,@>8C00
```

HARDWARE

NEW PRODUCTS

OSCAR

Pictured on this issue's cover, OSCAR is now available from Databar Corporation, 10202 Crosstown Circle, Eden Prairie, MN 55344. An Optical Scanning Reader, the bar-code scanning device "reads" narrow and wide black bars separated by white space and picks up digitally encoded information in the bars in machine-readable form.

Presently the only software available for OSCAR is also from Databar Corporation, which plans to publish a monthly magazine containing a selection of eight programs as well as articles and useful information in each issue.

Those wishing to obtain more information about OSCAR should ocntact Databar Corporation at the above address or call (612) 944-5700.

MIKEL LABORATORIES

The International 99/4 Users-Group has recently learned of Mikel Laboratories, Inc. a California-based firm which will be producing many items for the TI 99/4A Home Computer.

Mikel Laboratories will be offering a free-standing RS232-C Interface system, which allows the use of a printer and modem without the otherwise required peripheral expansion unit.

In addition, Mikel plans to offer cassette interface systems, ($49.95), TI cassette cables ($11.95), printers and monitors. The firm also plans to produce memory cards, perihperal expansion boxes and a full line of personal computer accessories for the TI 99/4A.

The IUG is in the process of evaluating the above-mentioned products. For more intformation, contact Mikel Laboratories, Inc., 17360 So. Gramercy Pl., Gardena, CA 90247.

```
0055       DEC Ø
0056       JNE D
0057       RTWP
0058
0059    *BIT MAP PLOT. PUT ORDERED PAIR,X-3;
0060    *Y-4,RANGE X:Ø-255,Y:Ø-191,IN REGS
0061    *AND BLWP TO @PLOT
0062    PLOT DATA SUBWS,$+2
0063       MOV @6(13),3
0064       MOV @8(13),4
0065       MOV 4,5
0066       ANDI 5,7
0067       SZC 5,4
0068       SLA 4,5
0069       A 5,4
0070       MOV 3,Ø
0071       ANDI Ø,>FFF8
0072       S Ø,3
0073       A 4,Ø
0074       SWPB Ø
0075       MOVB Ø,@>8CØ2
0076       SWPB Ø
0077       MOVB Ø,@>8CØ2
0078       NOP
0079       MOVB @>88ØØ,1
0080       SOCB @M(3),1
0081       ORI Ø,>4ØØØ
0082       SWPB Ø
0083       MOVB Ø,@>8CØ2
0084       SWPB Ø
0085       MOVB Ø,@>8CØ2
0086       NOP
0087       MOVB 1,@>8CØØ
0088       RTWP
0089    M  DATA >8Ø4Ø,>2Ø1Ø,>Ø8Ø4,>Ø2Ø1
0090       END
```

WOMAN'S VIEW PROGRAM

```
100 CALL CLEAR
110 CALL CHAR(96,"000000FFFF")
120 CALL CHAR(97,"2070D0880905060 2")
130 PRINT "   ELECTRICAL ENGINEERING":::TAB(7);"CIRCUIT DESIGN"::::::::::
140 CALL HCHAR(16,11,96,9)
150 CALL HCHAR(16,14,97,3)
160 FOR C=98 TO 121
170 READ C$
180 CALL CHAR(C,C$)
190 NEXT C
200 DATA 000000F8F8080808,0000000F0F080808,0808080808080808,080808F8F8,0808080F0
F,000000FFFF080808,080808FFFF
210 DATA 0C0603061860300C,0603061860300C06,0306186030180808,000E11F1F1110E,00384
4C7C74438,0070888F8F887
220 DATA 000C18FFFF180C,0060 30FFFF306,0718204040818 38,E018048282C1E181,818181828
20418E,8080804040201807
230 DATA 0718204043808 08,E0188482E2818101,0101 01E2020418E,8080804340201807,00000
01818
240 REM  OPEN #1:"RS232.BA=600"
250 CALL SCREEN(2)
260 PRINT :::::::"1 SERIES RESISTANCE"::"2 PARALLEL RESISTANCE"::"3 T-PI OR Y-DE
LTA CONVERSION"
270 PRINT :"4 PI-T OR DELTA-Y CONVERSION"::"5 COMPLEX PI TO T"::"6 COMPLEX T TO
PI"::"7 END PROGRAM":::::
280 CALL SCREEN(8)
290 CALL KEY(0,K,S)
300 IF (K<49)+(K>55)THEN 290
310 CALL CLEAR
320 ON K-48 GOTO 390,830,1230,1910,2450,3060,3670
330 READ N
340 FOR I=1 TO N
350 READ X,Y,GR
360 CALL HCHAR(X,Y,GR)
370 NEXT I
380 RETURN
390 PRINT " ** SERIES RESISTANCE **":::::::
400 REM  PRINT #1::::"** SERIES RESISTANCE **":::
410 GOSUB 610
420 PRINT ::"TOTAL R = R1+R2+R3 ...":::"YOUR PROBLEM:"::
430 INPUT "HOW MANY RESISTORS? ":N
440 IF N<1 THEN 570
450 IF N>50 THEN 590
460 PRINT
470 RT=0
480 FOR I=1 TO N
490 INPUT " R"&STR$(I)&" = ":R
500 REM  PRINT #1:" R"&STR$(I)&" =";R
510 RT=RT+R
520 NEXT I
530 PRINT :" RT =";RT:::
540 REM  PRINT #1::" RT =";RT:::
550 GOSUB 3610
560 GOTO 430
```

```
570 PRINT :"YOU HAVE TO HAVE ONE OR MORE FOR A DECENT PROBLEM.":
580 GOTO 430
590 PRINT :"ARE YOU SURE?":"FOR >50 SOLVE IN STEPS.":
600 GOTO 430
610 FOR X=19 TO 23 STEP 4
620 CALL HCHAR(X,9,110)
630 CALL HCHAR(X,10,96,12)
640 CALL HCHAR(X,12,121,3)
650 CALL HCHAR(X,18,97,3)
660 NEXT X
670 X=20
680 Y=22
690 GOSUB 790
700 CALL HCHAR(19,22,98)
710 CALL HCHAR(23,Y,101)
720 CALL HCHAR(18,19,82)
730 CALL HCHAR(18,20,49)
740 CALL HCHAR(X+1,Y+1,82)
750 CALL HCHAR(X+1,Y+2,50)
760 CALL HCHAR(24,19,82)
770 CALL HCHAR(24,20,51)
780 RETURN
790 CALL VCHAR(X,Y,105)
800 CALL VCHAR(X+1,Y,106)
810 CALL VCHAR(X+2,Y,107)
820 RETURN
830 PRINT "** PARALLEL RESISTANCE **":::::::
840 REM  PRINT #1:::::"** PARALLEL RESISTANCE **":::
850 GOSUB 1090
860 PRINT ::"  1     1     1     1":" -- = -- + -- + -- + ..."
870 PRINT " RT    R1    R2    R3":::"YOUR PROBLEM:"::
880 INPUT "HOW MANY RESISTORS? ":N
890 IF N<1 THEN 1050
900 IF N>50 THEN 1070
910 PRINT
920 RTD=0
930 FOR I=1 TO N
940 INPUT " R"&STR$(I)&" = ":R
950 IF R<>0 THEN 980
960 PRINT :"SORRY - ZERO IS NOT ALLOWED"::
970 GOTO 940
980 RTD=RTD+1/R
990 REM  PRINT #1:" R"&STR$(I)&" =";R
1000 NEXT I
1010 PRINT :" RT =";1/RTD:::
1020 REM  PRINT #1::" RT =";1/RTD:::
1030 GOSUB 3610
1040 GOTO 880
1050 PRINT :"ONE OR MORE PLEASE."::
1060 GOTO 880
1070 PRINT :"REALLY?  FOR >50 RESISTORS  SOLVE IN SEVERAL STEPS."::
1080 GOTO 880
1090 FOR X=19 TO 23 STEP 4
1100 CALL HCHAR(X,10,110)
1110 CALL HCHAR(X,11,96,12)
1120 CALL HCHAR(X,12,121,3)
1130 NEXT X
1140 X=20
```

```
1150 FOR Y=17 TO 23 STEP 3
1160 GOSUB 790
1170 NEXT Y
1180 DATA 13,19,17,103,19,20,103,23,17,104,23,20,104,19,23,98,23,23,101
1190 DATA 24,16,82,24,17,49,24,19,82,24,20,50,24,22,82,24,23,51,1,1,32
1200 RESTORE 1180
1210 GOSUB 330
1220 RETURN
1230 PRINT "CONVERTING A RESISTIVE      T-SECTION TO AN EQUIALENT"
1240 PRINT "PI-SECTION (ALSO KNOWN AS   Y-DELTA CONVERSION)"::::::::
1250 REM  PRINT #1::::"CONVERTING A RESISTIVE T-SECTION TO AN EQUIVALENT"
1260 REM  PRINT #1:"PI-SECTION (ALSO KNOWN AS Y-DELTA CONVERSION)"::::
1270 XO=19
1280 GOSUB 1530
1290 PRINT "YOUR PROBLEM:":::
1300 INPUT " R1 = ":R1
1310 IF R1<>0 THEN 1340
1320 PRINT :"SORRY, R1 CANNOT BE ZERO"::
1330 GOTO 1300
1340 INPUT " R2 = ":R2
1350 IF R2<>0 THEN 1380
1360 PRINT :"SORRY, R2 CANNOT BE ZERO"::
1370 GOTO 1340
1380 INPUT " R3 = ":R3
1390 IF R3<>0 THEN 1420
1400 PRINT :"SORRY, R3 CANNOT BE ZERO"::
1410 GOTO 1380
1420 SUM=R1*R2+R1*R3+R2*R3
1430 RA=SUM/R2
1440 PRINT ::" RA =";RA
1450 RB=SUM/R3
1460 PRINT " RB =";RB
1470 RC=SUM/R1
1480 PRINT " RC =";RC::
1490 REM  PRINT #1:" R1 =";R1:" R2 = ";R2:" R3 =";R3::" RA =";RA:" RB =";RB:" RC
 =";RC:::
1500 GOSUB 3610
1510 GOSUB 1530
1520 GOTO 1300
1530 FOR X=XO TO XO+4 STEP 4
1540 CALL HCHAR(X,3,110)
1550 CALL HCHAR(X,4,96,11)
1560 CALL HCHAR(X,15,108)
1570 CALL HCHAR(X,20,110)
1580 CALL HCHAR(X,21,96,9)
1590 CALL HCHAR(X,30,108)
1600 NEXT X
1610 CALL HCHAR(XO,5,97,3)
1620 CALL HCHAR(XO,11,97,3)
1630 CALL HCHAR(XO,9,103)
1640 X=XO+1
1650 Y=9
1660 GOSUB 790
1670 CALL HCHAR(XO+4,9,104)
1680 CALL HCHAR(XO,24,97,3)
1690 CALL HCHAR(XO,22,103)
1700 Y=22
1710 GOSUB 790
```

```
1720 CALL HCHAR(XO+4,22,104)
1730 CALL HCHAR(XO,28,103)
1740 Y=28
1750 GOSUB 790
1760 CALL HCHAR(XO+4,28,104)
1770 CALL HCHAR(XO-1,6,82)
1780 CALL HCHAR(XO-1,7,49)
1790 CALL HCHAR(XO-1,12,82)
1800 CALL HCHAR(XO-1,13,50)
1810 CALL HCHAR(XO+2,10,82)
1820 CALL HCHAR(XO+2,11,51)
1830 CALL HCHAR(XO+2,23,82)
1840 CALL HCHAR(XO+2,24,65)
1850 CALL HCHAR(XO-1,25,82)
1860 CALL HCHAR(XO-1,26,66)
1870 CALL HCHAR(XO+2,29,82)
1880 CALL HCHAR(XO+2,30,67)
1890 PRINT :::
1900 RETURN
1910 PRINT "CONVERTING A RESISTIVE      PI-SECTION TO AN EQUIVALENT"
1920 PRINT "T-SECTION (ALSO KNOWN AS    DELTA-Y CONVERSION)"::::::::
1930 REM  PRINT #1::::"CONVERTING A RESISTIVE PI-SECTION TO AN EQUIVALENT"
1940 REM  PRINT #1:"T-SECTION (ALSO KNOWN AS DELTA-Y CONVERSION)"::::
1950 XO=19
1960 GOSUB 2150
1970 PRINT "YOUR PROBLEM:":::
1980 INPUT " RA = ":RA
1990 INPUT " RB = ":RB
2000 INPUT " RC = ":RC
2010 SUM=RA+RB+RC
2020 IF SUM<>0 THEN 2050
2030 PRINT ::"SORRY - THE SUM OF THE THREEVALUES
     CANNOT BE ZERO.":::
2040 GOTO 1980
2050 R1=RA*RB/SUM
2060 PRINT ::" R1 =";R1
2070 R2=RB*RC/SUM
2080 PRINT " R2 =";R2
2090 R3=RA*RC/SUM
2100 PRINT " R3 =";R3::
2110 REM  PRINT #1:::" RA =";RA:" RB =";RB:" RC =
     ";RC:::" R1 =";R1:" R2 =";R2:"
R3 =";R3:::
2120 GOSUB 3610
2130 GOSUB 2150
2140 GOTO 1980
2150 FOR X=XO TO XO+4 STEP 4
2160 CALL HCHAR(X,3,110)
2170 CALL HCHAR(X,4,96,9)
2180 CALL HCHAR(X,13,108)
2190 CALL HCHAR(X,17,110)
2200 CALL HCHAR(X,18,96,11)
2210 CALL HCHAR(X,29,108)
2220 NEXT X
2230 CALL HCHAR(XO,7,97,3)
2240 CALL HCHAR(XO,5,103)
2250 X=XO+1
2260 Y=5
2270 GOSUB 790
```

```
2280 CALL HCHAR(XO+4,5,104)
2290 CALL HCHAR(XO,11,103)
2300 Y=11
2310 GOSUB 790
2320 CALL HCHAR(XO+4,11,104)
2330 CALL HCHAR(XO,19,97,3)
2340 CALL HCHAR(XO,25,97,3)
2350 CALL HCHAR(XO,23,103)
2360 Y=23
2370 GOSUB 790
2380 CALL HCHAR(XO+4,Y,104)
2390 DATA 13,21,6,82,21,7,65,18,8,82,18,9,66,21,12,82,21,13,67
2400 DATA 18,20,82,18,21,49,18,26,82,18,27,50,21,24,82,21,25,51,1,1,32
2410 RESTORE 2390
2420 GOSUB 330
2430 PRINT :::
2440 RETURN
2450 PRINT "CONVERTING A COMPLEX        ADMITTANCE PI-SECTION TO"
2460 PRINT "AN EQUIVALENT COMPLEX       IMPEDANCE T-SECTION"::::::::
2470 REM  PRINT #1::::"CONVERTING A COMPLEX ADMITTANCE PI-SECTION TO"
2480 REM  PRINT #1:"AN EQUIVALENT COMPLEX IMPEDANCE T-SECTION"::::
2490 XO=19
2500 GOSUB 2840
2510 INPUT "  AA = ":AA
2520 INPUT "J BA = ":BA
2530 INPUT "  AB = ":AB
2540 INPUT "J BB = ":BB
2550 INPUT "  AC = ":AC
2560 INPUT "J BC = ":BC
2570 API=AA*AB-BA*BB+AA*AC-BA*BC+AB*AC-BB*BC
2580 BPI=BA*AB+AA*BB+BA*AC+AA*BC+BB*AC+AB*BC
2590 D=API*API+BPI*BPI
2600 IF D<>0 THEN 2640
2610 PRINT :"DENOMINATOR CANNOT = 0"::
2620 GOSUB 3610
2630 GOTO 2500
2640 PRINT ::"GIVEN PI-SECTION:"::
2650 PRINT " YA =";AA;" + J (";BA;")"
2660 PRINT " YB =";AB;" + J (";BB;")"
2670 PRINT " YC =";AC;" + J (";BC;")"
2680 R1=(INT(1000*((AC*API+BC*BPI)/D+.0005)))/1000
2690 X1=(INT(1000*((BC*API-AC*BPI)/D+.0005)))/1000
2700 PRINT ::"EQUIVALENT T-SECTION:"::
2710 PRINT " Z1 =";R1;" + J (";X1;")"
2720 R2=(INT(1000*((AA*API+BA*BPI)/D+.0005)))/1000
2730 X2=(INT(1000*((BA*API-AA*BPI)/D+.0005)))/1000
2740 PRINT " Z2 =";R2;" + J (";X2;")"
2750 R3=(INT(1000*((AB*API+BB*BPI)/D+.0005)))/1000
2760 X3=(INT(1000*((BB*API-AB*BPI)/D+.0005)))/1000
2770 PRINT " Z3 =";R3;" + J (";X3;")":::
2780 REM  PRINT #1:::"GIVEN COMPLEX ADMITTANCE PI-SECTION:"::" YA =";AA;" + J
;BA;")"
2790 REM  PRINT #1:" YB =";AB;" + J (";BB;")":" YC =";AC;" + J (";BC;")"
2800 REM  PRINT #1:::"EQUIVALENT COMPLEX IMPEDANCE T-SECTION:"::" Z1 =";R1;"
 (";X1;")"
2810 REM  PRINT #1:" Z2 =";R2;" + J (";X2;")":" Z3 =";R3;" + J (";X3;")":::
2820 GOSUB 3610
2830 GOTO 2500
2840 CALL HCHAR(19,5,96,9)
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```
2850 CALL HCHAR(19,8,97,3)
2860 CALL HCHAR(24,5,96,9)
2870 CALL VCHAR(20,3,100,4)
2880 CALL VCHAR(20,15,100,4)
2890 CALL VCHAR(20,19,100,4)
2900 CALL VCHAR(20,31,100,4)
2910 CALL HCHAR(24,20,96,11)
2920 CALL HCHAR(19,22,97,3)
2930 CALL HCHAR(19,26,97,3)
2940 DATA 65,21,6,105,22,6,106,23,6,107,21,12,105,22,12,106,23,12,107,21,25,105,
22,25,106,23,25,107
2950 DATA 19,3,99,19,4,109,19,6,103,20,6,100,19,12,103,20,12,100,19,14,109,19,15
,98,24,3,102
2960 DATA 24,4,109,24,14,109,24,15,101,24,6,104,24,12,104,21,2,113,21,3,114,22,3
,115,22,2,116
2970 DATA 21,14,113,21,15,114,22,15,115,22,14,116,19,19,99,19,20,112,19,21,109,1
9,25,103,20,25,100
2980 DATA 19,29,109,19,30,111,19,31,98,24,19,102,24,21,109,24,25,104,24,29,109,2
4,31,101,21,18,117
2990 DATA 21,19,118,22,19,119,22,18,120,21,30,117,21,31,118,22,31,119,22,30,120,
22,7,89,22,8,65,18,8
3000 DATA 89,18,9,66,22,10,89,22,11,67,18,22,90,18,23,49,18,27,90,18,28,50,22,26
,90,22,27,51,1,1,32
3010 RESTORE 2940
3020 GOSUB 330
3030 PRINT :::"YA=AA + J BA     Z1=R1 + J X1YB=AB + J BB     Z2=R2 + J X2"
3040 PRINT "YC=AC + J BC     Z3=R3 + J X3":::
3050 RETURN
3060 PRINT "CONVERTING A COMPLEX          IMPEDANCE T-SECTION TO"
3070 PRINT "AN EQUIVALENT COMPLEX         ADMITTANCE PI-SECTION":::::::
3080 REM  PRINT #1:"CONVERTING A COMPLEX IMPEDANCE T-SECTION TO"
3090 REM  PRINT #1:"AN EQUIVALENT COMPLEX ADMITTANCE PI-SECTION":::
3100 GOSUB 3400
3110 INPUT " R1 = ":R1
3120 INPUT " X1 = ":X1
3130 INPUT " R2 = ":R2
3140 INPUT " X2 = ":X2
3150 INPUT " R3 = ":R3
3160 INPUT " X3 = ":X3
3170 RT=R1*R2-X2*X2+R1*R3-X1*X3+R2*R3-X2*X3
3180 XT=R1*X2+R2*X1+R1*X3+R3*X1+R2*X3+R3*X2
3190 D=RT*RT+XT*XT
3200 IF D<>0 THEN 3240
3210 PRINT :"SORRY, DENOMINATOR CANNOT    EQUAL ZERO."::
3220 GOSUB 3610
3230 GOTO 3100
3240 PRINT ::"ELEMENTS OF T-SECTION:"::" Z1 =";R1;" + J (";X1;")":" Z2 =";R2;" +
 J (";X2;")"
3250 PRINT " Z3 =";R3;" + J (";X3;")"::::"EQUIVALENT PI-SECTION:"
3260 AA=(INT(1000*((R2*RT+X2*XT)/D+.0005)))/1000
3270 BA=(INT(1000*((X2*RT-R2*XT)/D+.0005)))/1000
3280 PRINT :" YA =";AA;" + J (";BA;")"
3290 AB=(INT(1000*((R3*RT+X3*XT)/D+.0005)))/1000
3300 BB=(INT(1000*((X3*RT-R3*XT)/D+.0005)))/1000
3310 PRINT " YB =";AB;" + J (";BB;")"
3320 AC=(INT(1000*((R1*RT+X1*XT)/D+.0005)))/1000
3330 BC=(INT(1000*((X1*RT-R1*XT)/D+.0005)))/1000
3340 PRINT " YC =";AC;" + J (";BC;")"::::
```

```
3350 REM  PRINT #1:"ELEMENTS OF T-SECTION:::" Z1 =";R2;" + J (";X1;")":" Z2 =
";R2;" ++ J (";X2;")"
3360 REM  PRINT #1:" Z3 =";R3;" + J (";X3;")":::"EQUIVALENT PI-SECTION:::" YA =
";AA;" + J (";BA;")"
3370 REM  PRINT #1:" YB =";AB;" + J (";BB;")":" YC =";AC;" + J (";BC;")"::::
3380 GOSUB 3610
3390 GOTO 3100
3400 CALL HCHAR(24,4,96,11)
3410 CALL HCHAR(19,6,97,3)
3420 CALL HCHAR(19,10,97,3)
3430 CALL HCHAR(19,21,96,9)
3440 CALL HCHAR(24,21,96,9)
3450 CALL VCHAR(20,19,100,4)
3460 CALL VCHAR(20,31,100,4)
3470 CALL HCHAR(19,24,97,3)
3480 DATA 69,19,3,99,19,4,112,19,5,109,19,9,103,19,13,109,19,14,111,19,15,98,20,
3,100,20,9,100
3490 DATA 20,15,100,23,3,100,23,15,100,24,3,102,24,15,101,21,2,117,21,3,118,22,3
,119,22,2,120
3500 DATA 21,14,117,21,15,118,22,15,119,22,14,120,24,5,109,24,13,109,21,9,105,22
,9,106,23,9,107
3510 DATA 24,9,104,19,19,99,19,20,109,19,22,103,19,28,103,19,30,109,19,31,98,24,
19,102,24,20,109
3520 DATA 24,30,109,24,31,101,24,22,104,24,28,104,21,18,113,21,19,114,22,19,115,
22,18,116,21,30,113
3530 DATA 21,31,114,22,31,115,22,30,116,21,22,105,22,22,106,23,22,107,21,28,105,
22,28,106,23,28,107
3540 DATA 20,22,100,20,28,100,18,7,90,18,8,49,18,11,90,18,12,50,22,10,90,22,11,5
1,22,23,89
3550 DATA 22,24,65,18,24,89,18,25,66,22,26,89,22,27,67,1,1,32
3560 RESTORE 3480
3570 GOSUB 330
3580 PRINT :::"Z1=R1 + J X1     YA=AA + J BAZ2=R2 + J X2     YB=AB + J BB"
3590 PRINT "Z3=R3 + J X3     YC=AC + J BC":::
3600 RETURN
3610 PRINT :"DO YOU HAVE MORE PROBLEMS   OF THIS TYPE? (Y/N)"
3620 CALL KEY(0,K,S)
3630 IF K=78 THEN 250
3640 IF K<>89 THEN 3620
3650 CALL CLEAR
3660 RETURN
3670 REM  CLOSE #1
3680 END
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USERS GROUP SPOTLIGHT

CIN-DAY USERS-GROUP

The Cin-Day Users-Group was formed May 4, 1981, in the living room of one of the charter members, Larry Morrow. In addition, six others attended. The first meeting saw the election of officers and decision as to the group's first name, the 99/4 Users-Group of the Cincinnati-Dayton Area. Ed York was elected president, and Jim Schwaller, vice-president. The small group exchanged information about their sytems and how they were being used (and how much they paid for them!) The remaining members were named to various offices to serve the remainder of the year, and a new Texas Instruments 99/4A Users-Group was formed.

A few more informal meetings were held throughout the summer between the initial members of the group. Being the vacation season, many 99/4A owners were still not aware that a Users-Group had been formed in their area. The group sought ways to gain exposure, and communications with TI resulted in the formal announcement of the group with Morrow's address appearing in one of TI's newsletters in August 1981. The group's first newsletter was also published in August, and yearly membership dues of $15 were established as well as publication subscriptions at $5 per year.

The first formal meeting was in the home of Jim Schwaller. Subsequent meetings were held in various locations in the Cincinnati-Dayton area, including the Shillito/Rikes, until April 1983, when they realized the group had overgrown its capacity in these locations. They now meet as two groups simultaneously, one in Cincinnati, one in Dayton. The group's last meeting, however, took place at the Middletown branch of Miami University where elections were held, and York was again chosen president for his fifth consecutive term of what had now come to be known as the Cin-Day Users-Group.

In addition to the problems the group faced trying to establish non-profit status with the Internal Revenue Service, one of the first difficulties the group experienced concerned the publication of their monthly newsletter. The letter was first printed using group member's printers, and the publication sometimes turned in to some late-night affairs, but was well worth the effort. The TI Great Rebate of 1981-82, however, and the subsequent 90 percent rise in membership of the group rendered this type of publishing too costly for the group in terms of money and manpower, and alternate methods were found.

As notice of the group's existence spread by word-of-mouth through the local area, they also gained members through exposure by Texas Instruments and local retailers such as K-Mart, Sears and J.C. Penneys, which permitted them to leave informative flyers in the computer section at their stores.

The Cin-Day Users-Group has experienced the benefits of speakers at some of their monthly meetings. Robert W. Marquardt, regional systems analyst, provided a demonstration that included slides showing the 99/4A Home Computer's capabilities. Mark Lenish demonstrated the TI 840 printer, and Frank Ricketts, Cintronics, demonstrated the Pro-Writer printer and its capabilities. Ed Weist, Users-Group coordinator, Texas Instruments, and John Phillips, one of TI's top programmers, appeared before the group in September 1983 and demonstrated TI-FORTH and other new products. In addition, three TI-Writers and one Multiplan were given away as prizes to group members.

It seems that computer news is not limited to the printed page in Ohio. A radio station carries a program called 'Computer Talk' in WAVI, from 10:00 til 11:00, A J. Austin, host. In addition to fielding telephone questions concerning computers, Austin announces meetings for the Cin-Day Users-Group and has, on occasion, received members of the Cin-Day Users-Group as guests on the program.

The group continues to meet in both the Cincinnati and Dayton areas, and membership dues and newsletter subscription fees have not increased. As the existence of Users-Groups is more crucial than ever, the Cin-Day Users-Group has pledged to continue their monthly meetings and publications well into the future.

INDEX TO ADVERTISERS

CHARLIE'S PAGE

By Charles La Fara
President, International 99/4 Users Group

CLEARING THE AIR

For the past several months the International 99/4 Users Group has been under attack from several local Users Groups, retailers and even our own members because of the way we operate this organization. The most common complaint is that we are acting as a For-Profit organization under the disguise of a Users-Group. It is now time that we clear the air and explain to everyone exactly what we are and what we do.

When I first purchased my 99/4 Home Computer in March, 1980, I felt I was the only owner of such a computer in the entire universe. I frantically searched to find software and additional equipment to best utilize my marvelous new machine. This was a very difficult task due to the fact that the product was so new, that although Texas Instruments had preannounced additional equipment and software, it would be many months before they finally brought it to the retail outlets.

Faced with either abandoning a product which had cost me over $1000 (console and monitor) or taking the initiative and doing something about it, I chose the latter. As an outside individual it was extremely difficult to interface with a company the size of Texas Instruments Incorporated. Disgruntled and frustrated, I almost gave up until I met a gentleman in Baltimore, MD, Joe Nichols, who suggested that together, we form some type of Users Organization for owners of the 99/4 Home Computer.

After many months of conversation with Texas Instruments' legal department and corporate executives, we were finally granted permission to do a mailing announcing our intentions of forming a Users-Group to 1,492 known owners of the 99/4. In the beginning, it was our intention to conduct this as a very informal group, sharing information and our own programs among ourselves. In order to limit any personal liability, we incorporated in the state of Oklahoma in September, 1980.

My full-time job as president of Southwest Meat Co.in Oklahoma City would limit my activities somewhat during our first year. Much of the work during that time was done by my wife, Virginia, in the living room of our home in Bethany. As our membership increased and we began to produce newsletters, we realized that we needed some way to support our ever-increasing costs (at that time there were no membership dues). As the International 99/4 Users-Group continued to grow, additional costs of equipment and personnel finally reached a point where a decision was made that it must become a profitable organization to continue to exist.

Over the past four years, I have plowed back nearly 70 percent of the profit from the IUG in order to better service our members. With 20 employees and a monthly operating expense in excess of $40,000, we have grown into a medium size company, fulfilling the needs of over 100,000 individuals worldwide.

Probably the one major mistake we made in our formation was that we did not realize the exact connotation the consumer has with the words "Users Group." Possibly we should have called ourselves a club or organization instead. However, who would have thought in August 1980 that we would have so many members?

Certainly we have made many mistakes along the way and I've had to deal with companies such as Texas Instruments and other third parties whose promises seldom turned into realities. Our committment to our members has always been strong and we have strived for credibility in the face of adversity.

So, what does all this boil down to? Yes, we are a profit-making organization and will continue to operate as one as long as we possibly can. No one, I think, would deny any of our employees the right to derive fruits from their labor.

As I said in an earlier editorial last year, the opera's not over until the fat lady sings. Well on October 28, 1983, she stepped on center stage of the board room at TI's corporate office in Dallas, Texas, and her first aria was a true tragedy: the announcement of TI's withdrawal from the Home Computer business.

In the second act, gasping for air and bosom swelling, she sang of price reductions which would lead to the single greatest buying spree in this fledgling computer business. Act three was performed in a foreign language and few of the 2.2 million home computer owners who heard her voice understood what was going on. Will there be software? Will there be peripherals? Will there be one more Christmas buying season for TI Home Computer products? As the curtain comes down on the final act, who remains to pick up the broken pieces? Hopefully, the Users Group that started it all--the IUG. Although others such as mass merchandisers, distributors, software producers and home computer magazine publishers have turned tail and run, the IUG is committed to continue its services to its members as long as possible.

The IUG has been criticized, threatened, and had its products pilfered by upstart schemers and opportunists; in spite of this, our membership continues to grow each month. Crucify us if you must for what we are, but without us, computing with the TI 99/4 and 99/4A would be totally different than it is today.

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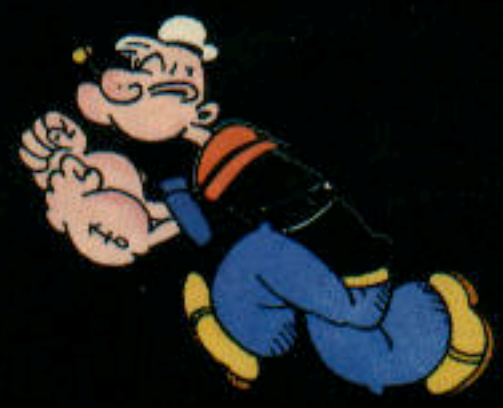

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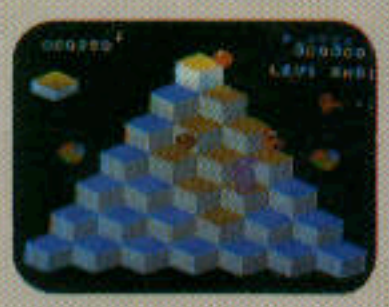

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*PARKER BROTHERS