

MARCH/APRIL '88

Vol. 4 No. 3

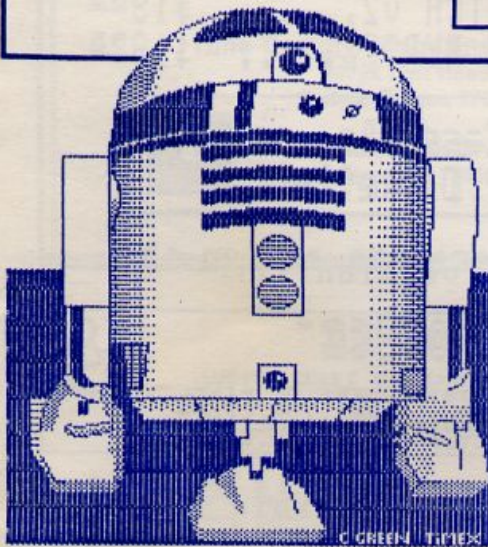
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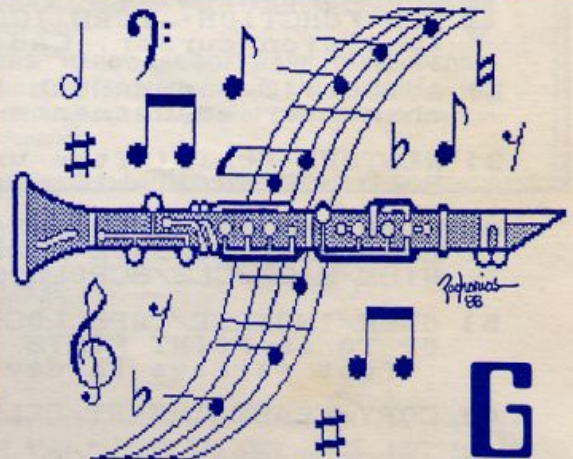
The SINCLAIR Computer Technology Magazine

Time Delians



GREAT GRAPHICS

Left: "R2D2" by Carl Green,
East Liverpool, Ohio, using
ARTWORX (Novelsoft). Right:
"Musical Art" by Dennis A.
Zacharias, Yukon, Oklahoma,
using ARTWORX and TECHDRAW
(Zebra). Below: "Winter" by
Bill Boehm, Bedford, Mass.,
using QL PAINT (Sinclair).



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The SINCLAIR
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Magazine

MARCH/APRIL '88

Time Designs Magazine Company
29722 Hult Road
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(503) 824-2658
CompuServe ID# 71350,3230

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FROM THE EDITOR'S CLUTTERED DESK

Tim Woods

Just as I had predicted in our last issue, my editorial entitled "SEND IN THE CLONES" opened a can of worms, but in a much more favorable light than I had anticipated. And, along with our on-going Reader Survey, the TDM Mail Box was literally bursting at the seams! (Only one person, however, wrote to tell me that they had caught on to the, what I thought was, an appropriate title. It's from a Judy Collins song that was made popular in the 70's--"Send In The Clowns". That one person, was my good friend, the ever-talented Paul Bingham, who thought I should have included musical notes along with the title!)

As it turns out, I now know (thank goodness) that I probably won't be the last Sinclair user around. There are many, many of you who still feel that there is quite a bit of life left in these silver and black boxes. Others of you, it seems, due to professional commitments (or whatever) dabble with the more expensive machines, but still are very interested in what is going on here in TDM and the Sinclair community.

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Then finally, there are those of you who never intended to stay with us for very long anyway. The flashier "bells and whistles" are just too much of a temptation. Please do us all a favor, and sell (or give) your Sinclair computer to someone who would use it...and also give them your back issues of TIME DESIGNS (if you no longer want to read them).

Overall, I feel that "IBM PC and Clone bashing" would be an unproductive activity for us to follow. (But lord knows how many times we've heard our favorite machines bashed to death!) There is probably a great deal of info we could gain from our PC, Atari, Apple, and Commodore friends.

I closed the "Send In The Clones" editorial on a positive note...which I would like to expand on a bit. There are those of you who have accused me of being too positive (or "sugar-coated"). Of course I am aware of folks who have left our midst, and that some of the user groups have died on the vine. But I am equally aware of groups that are still "on fire" and can pack in 50 to 60 users at meetings, and also some fascinating research and development that is being conducted right now with our computers.

Why concentrate on "belly aching" and "crying" about how bad things are? Why not instead work together on some neat hardware and software projects. Let's recruit new members (and try to find those that have "hand-me-down" computers). Let's also try to turn around such negative bad mouthing we receive, by showing others what we can do...and start by having a positive attitude ourselves!

I don't mean to get up on a high and mighty soap box, but I am tired of hearing negative comments

Continued On Page 4.

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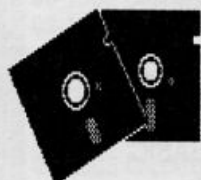
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(even from our own users). Often I have found that the root problem is frustration. There is so much that could be done by others in this area. If someone is frustrated, a simple question (or questions) answered goes a long way. More than often, its simply showing a user how to install a printer code in a program to get their full size printer going, or explaining how a disk drive is hooked up, etc. Those of you who are "more knowledgeable"...we really need your help, if you are willing to take the time to explain something in layman's terms, or solve a problem.

Enough said for the time being on the subject. Before we run out of space, I did want to share with you on what's coming up in TDM.

Our next issue's theme is TIMEX SINCLAIR USERS GROUPS. We'll try to provide the most update listing of groups in the U.S. and Canada that we know of, and also some international groups as well. We will also select the top ten newsletters produced by the TS groups (to give all those small time editor's a boost and a pat on the back). Along with the user group information, we will also list any dealer or company that still supports the Timex Sinclair community. And if that wasn't all, the May/June issue will have a complete TDM page index for the past four years of publication (this has been requested a lot!)...plus all of our regular programs, articles and features. Don't miss out (surprises as well!).

Then for the summer issue--July/August...that will be our issue devoted to STORAGE MEDIUMS. All about disk drives, program conversions, utilities, some of those "rare" Timex and Sinclair tape drives, and an excellent program by Floyd Chrysler who converted it from a published Spectrum program (with permission from the author) for the TS2068. It really speeds up things for those folks that still use tapes.

Moving on to the next section, I want to introduce you to Ralph Hammer, of Las Vegas, Nevada, who contributed a program called "CUBE-17" in the March/April '87 issue of TDM. Ralph is talented in many areas including the graphic arts. The upcoming

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USER GROUP issue is his "brain child", and he has designed a great looking cover for that issue. In addition to that, he will also be doing other art assignments from time to time. After twenty years in the Air Force, Ralph is facing retirement and a change of pace...we wish him the best of luck!

Now to kick things off for this issue, we have a number of guest editorials, letters, tips, and general mail...so we have elected to let Ralph Hammer go first. As always, we appreciate your comments and any correspondence is welcome. If you haven't filled out your READER SURVEY yet, there is still plenty of time (WHY HAVEN'T YOU!?!). Another copy of the survey is provided elsewhere in this issue. We will report on the survey findings next time. See you then!

IN THE MAILBAG

An Open Letter To The Readers

Every once in a while, Tim Woods (our Editor and Friend) will stand on a soap box, and declare his loyalty to the Timex-Sinclair community of computers. And for the larger percentage, we are right behind him. These little Z80-based computers are great to work with, and to have fun with.

A good number of people, be they common users, on up to the Dealers and the ones who keep us healthy, have stood the ground for our orphan. We putter and tinker around with these black and silver machines, making it work a little harder and a little better.

We have even banded together in small groups, meeting month after month, year after year, just for the simple pleasure of talking to someone who has a common interest--the Sinclair computer.

But I have started to notice a trend. There is a departing mode going on. People are leaving our midst, to "upgrade" to the Big Blue Compatible, and with them goes the little tidbits of invaluable information, and experience. I wish them good fortune, for they have polished their computing "baby-teeth" on our beloved brand. But let's hang onto their phone number or address...

For the negative trend is also appearing, there are groups out there that are struggling, suffering from low membership and purpose. Some of us are tucking in our tails, hiding our pride.

Let's dust off that old ZX81, loan it to someone who doesn't compute. If it's been awhile since you ordered that one little piece of software, or bought a new Disk Drive, or a full size printer or monitor, scrape your pennies together and assault your dealers (they'll love ya for it!). Bring a non-TS-user to your next group meet.

The time has come to start up a "National TSUG Organization". To think of its potential is mind-boggling. A whole continent of ideas, help, and service. Working together for standardization, software and hardware implementation, and even a logo to show our unity.

Think about it, and then take action.

Ralph Hammer
Sec/Treas.
Timex-Sinclair Users Group
of Las Vegas, Nevada

Guest Editorial: The "Sleeper Has Awaken"

If you are a "DUNE" fan (as I am), you may have recognized that the title for this editorial was taken from that book (and movie)! But, that is exactly how I feel...now that I finally broke down and bought a Disk Drive System for my TS2068. That's right, all the program development that I have been doing...Desktop Publisher and all, was 100% TAPE based! Thinking back, I shudder at the thought of all the wasted hours doing tape loads/saves and verifies. How did I even stand it?

Oh, I know you've heard all this before...I know, I was skeptical too! Why would anyone want to spend so much money on a "dead" computer...how much longer is that little grey box going to work anyway...why not spend the money and get a real computer...all very good questions!! All these (and

more) I asked myself for the better part of 4 years now. I guess it took me that long to find the answer: BECAUSE I WANT TOO! That is what it all boiled down to. This little grey box is a REAL computer, not a toy! The simply fantastic programs available on it is proof enough for that. My little grey box has been going 20 to 30 hours per week, week after week, for 4 years...and when this one dies, I'll dig out my spare, and when that one goes, I'll have had time to get a second spare...all for a lot less money than one of their "real computers". And how reliable is Big Blue (or a Clone) anyway?

But what really sold me was the new possibilities available with the disk system. The Aerco Disk Drive System has 64K of extra memory built into the interface, that is expandable. The Larken RAMdisk provides a second form of added capabilities, and can use the Aerco 64K as a RAMdisk without adding anything to the system. In each case, the MEMORY BARRIER is broken!

My new desktop program (Pixel Print Professional) uses the Aerco RAM to BANK-SWITCH a second Pixel Print column, allowing the user to load and switch between left and right columns in the Desktop Program. The "Print-a-Doc" program (part of the same package) uses BANK-SWITCHING to hold and print both left and right columns simultaneously! This provides perfect column alignment in the twin (32 character) columns, and allows real 64 column Desktop Publishing when importing files from TASWORD or other word processors that create ASCII text files, in the single 64 column format. The LARKEN version will use the RAMdisk to hold file data and provide fast data transfer similar to the Aerco Bank-Switching. Volatile or non-volatile RAM cartridges can provide quick and easy add-on memory for tape and microdrive users too!

As the add-on memory systems become more popular, watch for more and more programs to be written to use these capabilities! Certainly the desktop programs are only one of many new applications that will take advantage of this new break-through!

So, wake up your computer and do what your inner self has been wanting to do for a long time now...send in that disk drive order, you won't regret it!! (For your information, I have compiled a short list of LOAD times for a variety of programs I use regularly. These times are for comparison purposes only...like government MPG figures...but somewhat more accurate!!)

S. D. Lemke
Lemke Software Development
Wichita, Kansas

Typical AERCO DISK vs. CASSETTE load times
(time in seconds)

Program	AERCO	CASSETTE
Pixel Print v3.2	8.17	93.76
TASWORD II	7.85	116.78
Vu-File (with printer driver and typical data file)	14.33	200.70
TIMEACHINE	26.99	156.92
Pixel Print Data	4.88	111.96

I was very pleased to receive the JAN/FEB issue of TDM magazine and see your questionnaire on what track you should be taking. For myself, I am interested only in articles concerning T/S equipment from TDM; that is, if I wanted articles about IBM, I would seek out national publications or their user groups which are quite strong as we all know.

As to why I am interested in T/S, I suckered in on the PC8300 (a TS1000 clone), and through the Dallas Timex User Group, changed very quickly to a model TS2068. I am a working engineer (1950 vintage) where in my job I have access to and use daily, a nation wide IBM network system operating five 3090 machines with operating systems of M204, VMCMS, and TSO; these are networked via a high capacity data transfer system to our scientific computer center where we use VAX, CDC, and CRAY mainframes. The present CRAY XMP14 is being replaced in March with an XMP28. These machines will compile a 10,000 line Fortran program in about 1 second. My department software is being moved to the CRAY, and we will use a VAX 8800 as the front end of this system. So for many years I did not want any kind of PC in my home, but after buying a Radio Shack TRS-80 Pocket Computer at a camera fair, and being exposed to BASIC on it...then along came the PC8300. The T/S User Group recommended the TS2068, and when a T/S user went to Atari, I wound up with a TS2068, TS2040 printer, quite a bit of software; and since then I have added two disk drives with the LARKEN operating system, John McMichael's Commodore plotter, and lots of software from the SINCUS News Exchange Program.

Tim, we all wish you well in the magazine, and realize that the orphan will never be a roaring success, but the only reason I subscribe to TDM is the fact that it is a good source of T/S information and I do not have to sift through many unrelated articles. I actually would prefer a magazine devoted to only the TS2068, but know this is not practical (and many of the earlier programs for the TS1000/TS1500/ZX81 can be utilized fairly readily if you have an interest).

John D. Austin
McKinney, Texas

Puzzle Of The Month Fan

If King Xerxes of the JAN/FEB "Puzzle of the Month" could afford to have over 40 wives, he obviously could afford a computer. (Probably a Zorba.) We have to ask why he needed the last hint to determine the number of animals brought to him.

From Cedric Bastiaans' program, we know there are two possible solutions, one with 46 wives and one with 52 wives. Let's assume the king had 46 wives. I'm sure an old hacker like Xerxes wrote a program similar to Cedric's. There would be one difference. Before he received the last hint, he wouldn't yet know the number of oxen was less than half the total (this was the final hint), but he would know that the total of all the animals was equal to 46. To see what the king's earlier programs must have looked like, change one line in Cedric's program. Instead of the AND 0 (W/2) in line 65, use AND W=46. The rest of the program can stay unchanged. Run the program. You'll get exactly one answer. If Xerxes had 46 wives, he would have had the answer without asking for the final clue. So we can assume he didn't have 46 wives, and the solution totalling up to 52 is the only correct one. I hope that Xerxes wasn't a complete computer nerd who spent all his time on his machine. Can you imagine 52 computer widows?

This is a great puzzle because it requires both computer and human analysis. I came across this puzzle at the perfect time...reading TDM on the way to work! That day, my boss didn't come in, so I had all day to work on it. Since I'm not sure if my boss or anyone in his family reads this magazine, I'd better sign off as...

Name Withheld
Upon Request

I have to believe that I am not alone in my resistance to upgrading to a new computer every two years. It is not the cost--I have plenty invested in my ZX81 systems. I just feel that I could spend the next decade or so exploring all the possibilities of the ZX81 with various hardware and software improvements available.

The ZX81 is, I feel, the perfect "base" from which to explore the world of the computer and the Z80 microprocessor. In a recent letter from Fred Nachbaur (Silicon Mountain Computers), Fred sums it up much better than I ever could. Allow me to quote:

"I can't help but wonder, though, if one day the simple computer won't reappear. It seems that the whole computer industry is shooting itself in the foot by coming out with fancier computers at lower and lower prices. Already it's at a point where the best you can hope for with some of the new machines is to become a capable user. Forget about trying to understand it. At least with the ZX81 one stands a chance of learning what makes it go."

Van S. Vangor
Bethlehem Tool
Island Falls, Maine

Timex/Sinclair--"The Real Thing"

I called a man up just the other day,
"I'd like a power supply," I had to say.
"For a disk drive on my 2068."
He replied, "forty dollars."
I said, "Hey, that's GREAT!"

But then he went on to ask, "What could it do?"
I sat back and smiled and said, "How about you?"
"Oh, I started with others,"
He said with dismay,
"But look around now, where are they today?"
Too small and too slow and not much real use there.
So they sit in my closet, under the stair."

"For just a few bucks you clone an XT!"
(Having used them before) I stated, "Oh, gee."
"Move up to a machine you can DO SOMETHING with,
And you can SAVE all kinds of bucks: IF
You build it yourself, it'll be QUITE a machine.
With CP/M and MS-DOS, you can have a custom dream!"

"Why thank you," I said, "I'll keep it in mind,
And give ya' a call if I can find the time."
But Laughing quite loudly as I hung up the phone,
I thought, "I've got the REAL THING, who NEEDS a
CLONE!"

Clint Cook
Santee, California

ZEUS UTILITY Revisited

In the MAY/JUNE '87 issue of TDM, we published a short TS2068 utility by Richard Hurd, that converts ZEUS source code files into an ASCII file for either MSCRIPT and TASWORD Two. Evidently, there were some problems with the original listing. Here is the corrected version, including step-by-step instructions.

- 1) LOAD ZEUS (assembler) CODE
- 2) Enter this little BASIC listing

5 REM HERE TO ENTER CODES

```
10 LET T=0
20 FOR F=61431 TO 61624
30 IF T=0 THEN PRINT F;:LET T=6
40 INPUT N
50 POKE F,N:PRINT TAB T;N;
60 LET T=T+4:IF T>=29 THEN PRINT:LET T=0
70 NEXT F
80 STOP
```


100 REM HERE TO READ CODES

```

110 LET T=0
120 FOR F=61431 TO 61624
130 IF T=0 THEN PRINT F;:LET T=T+6
140 PRINT TAB T;PEEK F;
150 LET T=T+4:IF T>29 THEN PRINT:LET T=0
160 NEXT F

```

3) Now enter the list of 194 bytes of code I've included.
SAVE this along with the names list from ZEUS (415
bytes) as "Z_2_M/T" CODE 61015,610

4) Just add this code to the BASIC listing from the TDM
article and you have it.

Z2M/T

```

61431 33 0 128 17 79 183
61437 35 35 126 254 10 40
61443 41 254 128 48 47 254
61449 0 40 4 18 19 24
61455 238 62 13 18 35 19
61461 126 254 255 32 7 35
61467 126 254 255 40 70 43
61473 62 237 186 32 215 62
61479 255 187 48 59 24 208
61485 35 70 62 32 18 19

```



```

61491 16 252 24 199 203 191
61497 14 0 229 33 87 238
61503 185 40 18 245 35 126
61509 254 8 40 6 254 10
61515 40 2 24 244 241 12
61521 35 24 235 126 18 35
61527 126 19 254 8 40 6
61533 254 10 40 2 24 241
61539 225 24 152 235 17 79
61545 183 167 237 82 229 193
61551 201 176 185 112 126 42
61557 114 240 6 64 62 32
61563 119 35 16 252 42 112
61569 240 1 0 0 126 254
61575 13 40 8 254 255 40
61581 31 12 35 24 243 35
61587 229 237 91 114 240 42
61593 112 240 237 176 42 114
61599 240 1 64 0 9 34
61605 114 240 225 34 112 240
61611 24 199 42 114 240 1
61617 48 117 183 237 66 229
61623 193 201

```

NEWS

SUNSTATE TIMEX SINCLAIR WINTERFEST '88

A lighter attendance than expected and heavy rain didn't dampen the spirits of those T/S users who gathered in Orlando, Florida on March 5 and 6 for the Sunstate T/S Winterfest. A good time was enjoyed by all those who could make it. The area is one of the nation's most popular tourist spots, with EPCOT and Walt Disney World just a short drive away.

The dealer tables drew the most interest, with companies such as Zebra Systems, Sharp's, A+ Computer Response, Foote Software, Syncware News, WDJUP Co., and Time Designs; displayed their merchandise.

There were also some interesting Sinclair "one-of-kind" bargains to be found. For instance, A+ had boxes of items that were retrieved from the old Sinclair warehouse in Boston, when it shut down operations a few years ago. They offered packs of ZX81 ROMs, 2K RAMs, ZX80 kits which were in the original packaging, and the unique Sinclair FM Radio Watches...which were quickly snatched up.

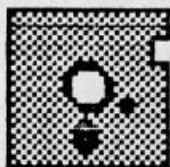
Another interesting display was put on by Mr. Eric Johnson, of Orange City, Florida, who obtained a large stock of surplus Timex Sinclair items from a relative who works for Timex in Connecticut. Among the most notable were a series of TS1500 circuit boards that had been issued by Timex, from an early prototype board, to a later compact design from Portugal. There was also a good quantity of TS2068's for sale.

Lemke Software Development

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1988 and Beyond

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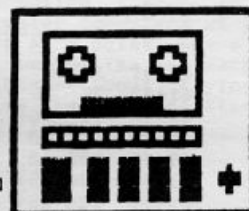


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>> TAPE
VERSION <<



- * Same as Aerco except for use with CASSETTE
- * Requires min. of 32K RAM in Cartridge Dock

* only \$29⁹⁵ ppd.

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INTRODUCING THE NEW:

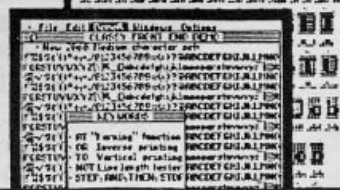
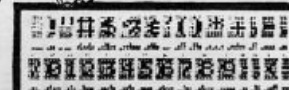
BINGHAM'S BEST INCLUDES:

- "crater" 3-D mathematical plot of the moon's surface (appeared in TDM J/A '85)
- "altaz" Converts astronomic coordinates to altitude/azimuth (in TDM N/D '85)
- "udg" Ultra-easy designer graphics for redesign of U.D.G.s (in TDM J/A '86)
- "son" "udg" version 2 allows multiple fonts and much more (in TDM N/D '86)
- "windows" BASIC full-screen window facility + restores screen (in SWN N/D '86)
- "cfe/b" BASIC Classy Front End new fonts utility (as appeared in TDM M/A '87)
- "cfe/mc" Complete Classy Front End fonts M.C. version (as in TDM J/A-N/D '87)
- PLUS this addition if you wish:
- "w&p" Windows & Portholes complete--can work with "cfe/mc" (New this issue)
- BINGHAM'S BEST.....9.95 ppd
- BINGHAM'S BEST with WINDOWS & PORTHOLES.....12.95 ppd
- (previous Bingham's Best owners can order a "w&p" update for \$3)

JAZZOFIRE INCLUDES:

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***** ALMOST 3 MEGABYTES OF STORAGE FOR LESS THAN \$5!!!

That's right. Five Top-quality TDK cassette tapes allow almost 3000K of 2068 program storage. And I'm selling them at less than \$1 each! Not seconds or blem, these are brand-new TDK D60 cassettes. In all my years of using them I've never had one sent back because it was faulty. TDK CASSETTE 5-PAK.....4.99 each
(If ordering with other software these will be shipped free, otherwise please add \$2 per pak postage and handling)

The Larken 256K RAMdisk for the TS2068 was unveiled for the first time in public. The small compact board features one-quarter Meg of non-volatile RAM, and when used with the Larken LKDOS cartridge, it operates with standard cassette-type LOAD and SAVE commands.

Along with the dealer tables, there were tables with catalogs and brochures from some absentee vendors, and a few user groups, including the Northeast Florida T/S Users Group (Jacksonville), the TASBAM group (St Petersburg and Tampa), the CATS group (from Washington, DC), and the SMUG group (from Wisconsin, had tables as well.

On Saturday evening, a meeting was held to discuss the idea of a National Timex Sinclair user Group. Some proposals were presented and comments were solicited from the audience. Overall, it was the consensus that such an organization would help unify and strengthen our TS community, and benefits such as a central Public Domain software library would be offered. (Note: read the accompanying article on the national group for further details).

A National Sinclair Organization

S.N.U.G. (Sinclair Northamerica Users Group) is an idea spawned by the organizers of the Sunstate T/S Winterfest, and has evolved from suggestions and comments from other Timex/Sinclair users.

The intent of SNUG is to provide a forum for exchange of ideas. It would be a source of information, such as a listing of active members, active user groups, Sinclair-specific BBS's, an active library of Public Domain software, and a listing of available shareware and freeware. Later on, proposed industry standards for hardware and software would be adopted. So as to not have to "re-invent the wheel", an already established national group would be used as a model to base the group on (such as CORSA--the Corvair Owners Assn.). SNUG would act as an umbrella organization, with regions being developed to tie in with established user groups in those areas.

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It is not the intent of the SNUG organizers to infringe on, or supercede any already established group or company. It is only intended to show some strength to the industry that Sinclair is not dead, and the mere fact that an organization can be formed, will show unity and interest in Sinclair computers. Even a North American "Calendar of Events" could be established to help co-ordinate future plans and events.

SNUG needs the support of every single Sinclair user in the U.S., Canada, Mexico (or for that matter--anywhere). If you have any comments, questions, ideas, etc...contact either Mel Nathanson, 7515 Arbordale Drive, Port Richey, FL 34668, (813) 843-5552; or Mary-Lynn Johnson, 190 Hickory Woods Ct., Unit 3-C, Deltona, FL 32725, (305) 860-2465. The organizers of SNUG are putting a time limit of June 30, 1988 on their idea. If there is no response or support of the idea, then they will not proceed further. If there is input, an update will appear here in TDM.

SUMMER WESTCOAST TS FAIR FEATURES AN "ALL-STAR" CAST

The "perfect" summer vacation destination for any Sinclair fan is the emphasis for the Third Annual International Great Northwest TS Mini-Fair. What was once a regional affair (held last year in Seattle), has expanded into a two-day event.

The show will be held on Saturday and Sunday, August 6 and 7, at the Cosmopolitan Hotel in Portland, Oregon. It is hosted by the CCAT/S User Group of Oregon, along with three other northwest Timex Sinclair groups, and is co-sponsored by RMG Enterprises and Time Designs Magazine.

Many of the exhibitor's and guest speakers are already committed. To date, Zebra Systems (from New York), Sharp's Inc. (from Virginia), Ed Grey Enterprises (from California), American Micro Connection (from California), Jack Dohany (from California), RMG Enterprises (from Oregon) and Time Designs (from Oregon), are signed up to participate as dealers. Confirmed guest speakers include Jack Dohany (author of many software enhancements for the TS2068), Mike de Sosa (author of "Taking The Quantum Leap"), Ed Grey (telecommunications expert), Syd Wyncoop (TS2068 software developer and TDM columnist on Z80 Machine Code), Michael Carver (programmer and TDM columnist), Vince Lyon (author of "Archive Master"), and Norm Lehfeldt (QL programmer). Tentative at press time: Fred Nachbaur (Silicon Mountain Computers), Stan Lemke (Pixel Print), Bob Orffelt (EPROM enhancements for the TS2068), Wilf Rigter (ZX81 expert), and representatives from Cambridge Computer (Z88).

User groups from California, Oregon, Washington, Nevada, British Columbia (Canada), and Wisconsin, are scheduled to participate.

On Saturday night (August 6) at 9:00pm, a Round Table Sinclair Forum will be held. This informal get-together will include a panel of noted Sinclair "experts", which will field questions from the audience. This will likely be the high point of the weekend.

One feature of the show will cater to the non-computer spouses and family members. For the kids, a professional clown will entertain, and for older folks (and the kids)...inexpensive guided bus tours will depart daily to explore attractions of the northwest (which include the Columbia River Gorge, Portland Zoo, Oregon Museum of Science and Industry, and views of Mount St Helens).

Another feature of the show, will be to invite the general public to come experience "hands on" demonstrations of Sinclair computers. This is to combat the "fear" that some people still harbor towards personal computers.

Quality accommodations at the on-site hotel are very reasonably priced. Double occupancy for only \$38 (plus tax). The hotel has a coffee shop on the ground floor, and a restaurant/lounge on the top floor--with views of the city lights at night and entertainment. The Cosmopolitan Hotel (1030 N.E. Union) is located just off of Interstate 5, and is close to bus lines, city transportation, and just a short trip from the airport. Hotel phone number is (503) 235-8433, and mention the "Timex Sinclair Mini-Fair" to the reservationist.

Start making your vacation plans to participate in this Timex Sinclair happening. For further information, contact the show producer, Rod Gowen, by writing to- 1419 1/2 7th Street, Oregon City, Oregon 97045; or call- (503) 655-7484. If you send a large self-addressed envelope with two 25 cent (first class) stamps, Rod will send you a complete packet of information including registrations forms, and brochures of area tourist attractions. A BBS is also online in the evening and morning hours (PST) for information. Phone number: (503) 656-8072. Modem setting: 8/1/None.

MIDWEST REGIONAL TS CONFERENCE

Another Sinclair gathering is planned for August 26 and 27, in Cleveland, Ohio, at the Beck Center for the Arts. The Greater Cleveland Sinclair Users Group is the host, and they are looking for other groups, guest speakers and vendors to participate. The theme of the event will be "users - learning from other users".

Inquiries about the regional conference can be directed to: Andy Kosiorek, 2192 Glenbury Ave., Lakewood, Ohio 44107, CompuServe ID# 75046,3420. Or try the Timelines BBS: phone (216) 671-6922, setting-8/1/None.

EVER HEAR OF THE T/S 3068? (AND OTHER MATTERS)

At a recent meeting of the LIST (Long Island Sinclair Timex) users group, the former head of the Research and Development department of the Timex Computer Corporation, Billy Skyrme, attended and gave a talk. Mr. Skyrme is currently the president of PSION, Inc., the manufacturer of the Organizer pocket computer.

While, Mr. Skyrme admitted that he still was under contractual agreement with Timex, and that certain information couldn't be discussed, he did mention some items that turned many members of LIST green.

The TS2068, related Skyrme, was to have been either a "cleaned-up" 48K Spectrum, or a totally re-engineered design. While a clean Spectrum was submitted for FCC approval, the later model was selected for manufacture.

Another computer was in the works, called the T/S 3068. It would have featured 1 Megabyte RAM, Virtual Memory, 256 colors and high-res graphics. "The only machine...that would be in its class today is the Amiga", stated Skyrme. The T/S 3068 would have retailed for only \$199.95.

Another interesting fact, was that the "BEU" (Bus Expansion Unit) for the TS2068, as seen in the photo published by TIME DESIGNS (see July/August '86, page 23) was, according to Skyrme, completely engineered and ready for to be production. With an internal floppy disk interface built in, Timex would have sold external 3.5" drives (in little silver boxes) for as little as \$49.95. This plan was far enough along that Timex had a supplier lined out for the drives.

Most of the information on proposed products for the TS2068 (and the TS3068) will never be made public due to a myriad of legal reasons, and the engineers involved in the project have all gone their separate ways.

Mr. Skyrme also demonstrated the Organizer and accessories to the LIST group. This hand held computer (upgradeable to 256K RAM), has sold well in markets where recording and calculation of numbers in the field, and other simple "type-in" answers are required.

The LIST group can be contacted by writing c/o Harvey Rait, 5 Peri Lane, Valley Stream, NY 11581. The above information was supplied by member, Joe Newman.

TDM COLUMNIST MAKES "BIG TIME"

Duncan Teague, a regular contributor to TIME DESIGNS and other Sinclair publications, is now a regular contributor to COMPUTE! Magazine.

Duncan's connection to COMPUTE! began when a whole chapter on a book called "USING NEWSROOM" by Gregg Keizer (and published by the COMPUTE! Library Selection division of the magazine) was devoted to how a newsletter was published by Duncan and some students. Mr. Teague is the current director of the Craigmont Planetarium in Memphis, Tennessee, which is financed and operated by the Memphis City School District; and is also a professional astronomer. The "in-house" publication is called "SKYLIGHTS"; and is produced with NEWSROOM, a Macintosh computer, and a laser printer.

NEWSROOM is a desktop publishing program which is available for many different types of PC computers (except the Sinclair...but then we have PIXEL PRINT). It was one of the early entries into this growing market, which has bred even more powerful programs.

Through the book, Duncan met the editor of COMPUTE!, and was asked to do software reviews of commercial Apple and Macintosh programs. His writings appear in the most current issues.

Rest assured, Duncan has not forsaken his Sinclair equipment, which he still uses at home (a TS2068 and Aerco disk drive system, and other equipment). In fact, most recently, he has taken over the publishing and editing of his church's newsletter, and uses Lemke's PIXEL PRINT desktop publisher for the task. (For an article on TS2068 Desktop Publishing by Duncan Teague see the Sept/Oct '87 issue of TDM). Watch for further information and tips from our resident desktop expert.

SOME OF THE BEST PROGRAMMING AROUND

If you really want your Timex Sinclair 2068 to work for you like it was originally intended to do, then you need to take a look at some of the very excellent programs written by Eric and Kris Boisvert of BYTE POWER.

To date, they have put together ten "issues" of their electronic magazine on cassette, which adds up to over 100 programs for the 2068! (Byte Power Magazine is also Spectrum compatible).

In the most current issue, the cassette contains nine programs, plus documentation in a text file. "CONFLICT" has some of the best screens we've seen, perhaps only rivaled by a few commercial Spectrum programs. There are four other games, plus a lotto number selection program, a music utility, and a boot utility for the Larken LKDOS cartridge.

If you have never seen what this brilliant software team has cooked up for the TS2068, then you need to send for a sample issue of Byte Power for only \$5.50. Write to: 1748 Meadowview Ave., Pickering, Ontario, Canada L1V-3G8. Now there is no reason for anyone to complain about the lack of good T/S software...there's plenty of it available from Byte Power!

TWO NAMES CHANGE - SERVICE REMAINS THE SAME

ED GREY ENTERPRISES (formerly Grey & Clifford Computer Products) continues to support the Timex Sinclair market. A new BBS called the "Grey Matter BBS" is now online (213-971-6260, settings: 8/1/None, supports 300/1200 baud). A FREE catalog of Timex specific products and non-specific computer items is available by writing to: PO Box 2186, Inglewood, CA 90305, or calling (213) 759-7406, and also requests can be accommodated on the BBS.

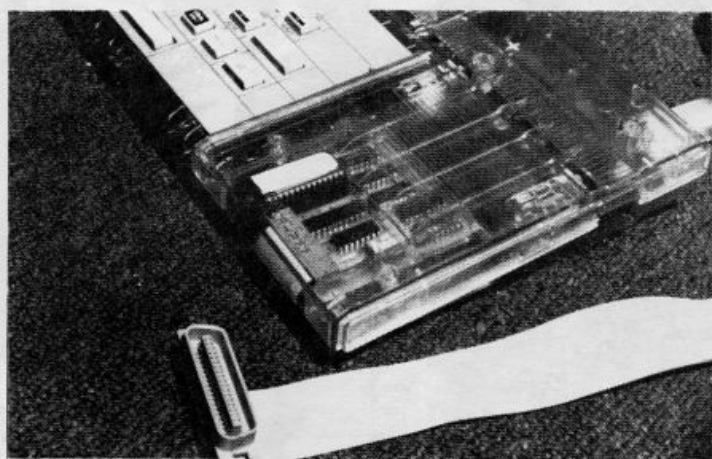
Assembled and tested versions of the popular Z-SI/O RS232 Serial Card, are no longer available. However, a new BARE BOARD PACKAGE is now available for the TS2068 computer with complete documentation, for only \$24.50 + \$2.50 S&H. Write to Ed Grey for details.

Another TS dealer, Variety Sales, has changed their name to VARIETY COMPUTERS & ELECTRONICS. You can write for their free catalog at: 325 W. Jersey St., Suite 2-D, Elizabeth, NJ 07202.

FROM THE RUMOR MILL

Fred Nachbaur, of Silicon Mountain Computers, is reportedly developing a Timex Sinclair clone of his own, which will incorporate many improvements and enhancements. No further details are available at this time.

FOOTE SOFTWARE



SPECIAL SHOW PRICE!

The FOOTE PRINT PRINTER INTERFACE

- for Centronics parallel printers
- works in both 2068 and Spectrum mode
- compatible with OS-64 & Spectrum emulators
- EPROM socket and on/off switch on board
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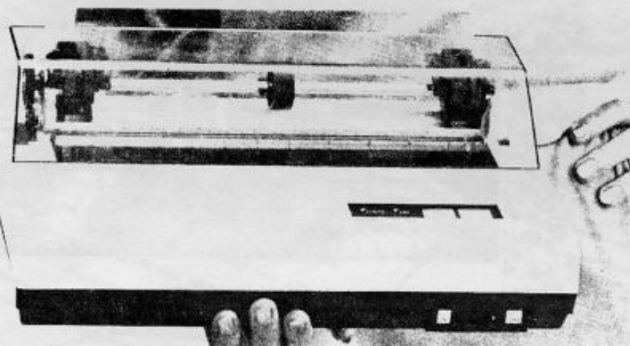
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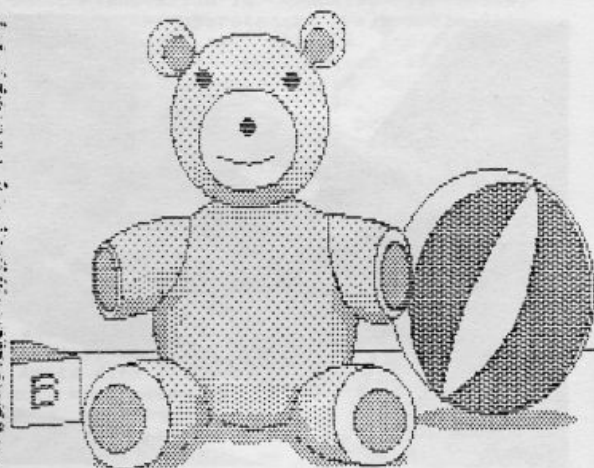
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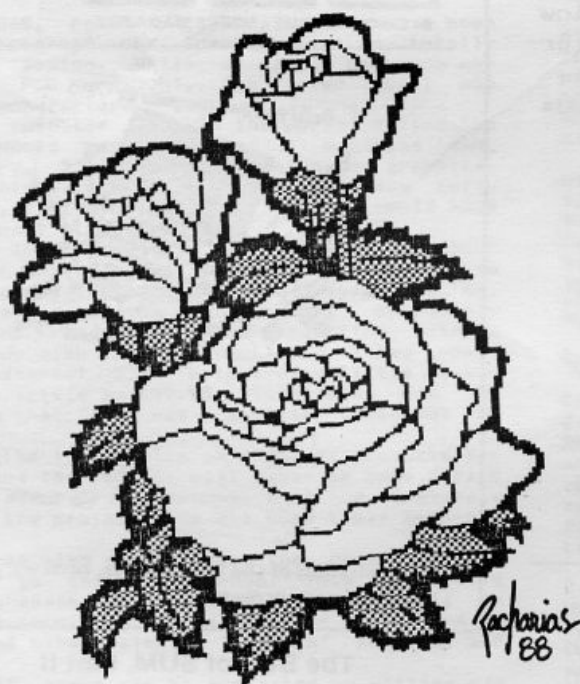
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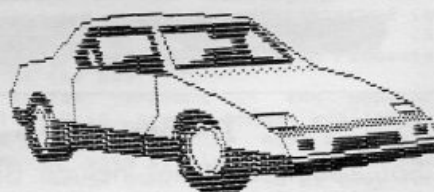
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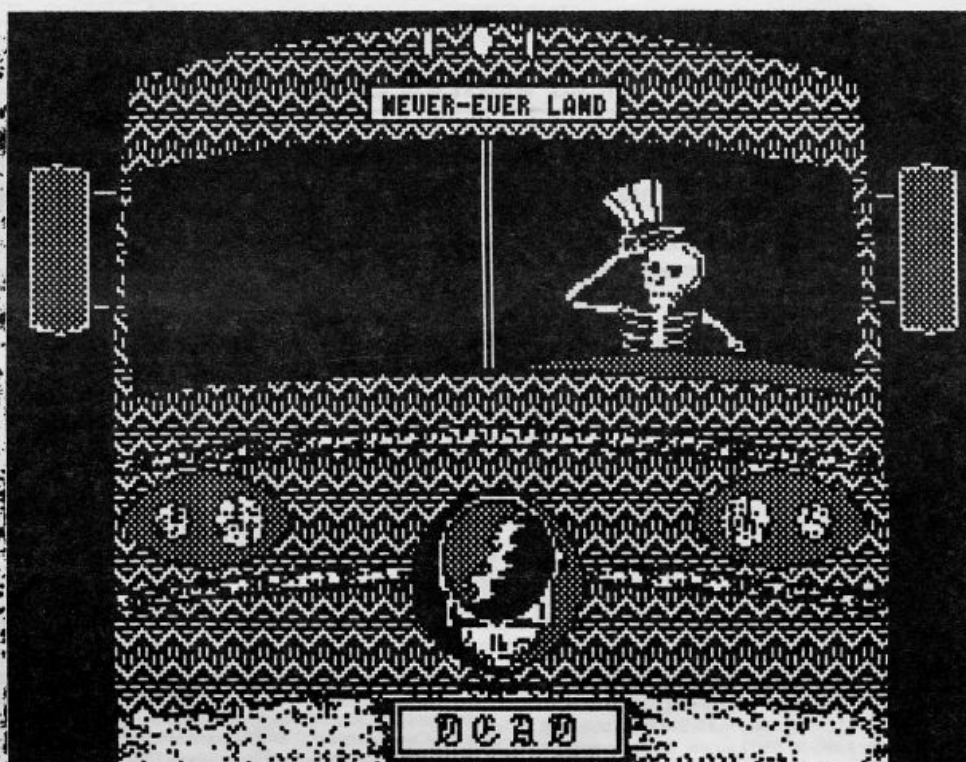
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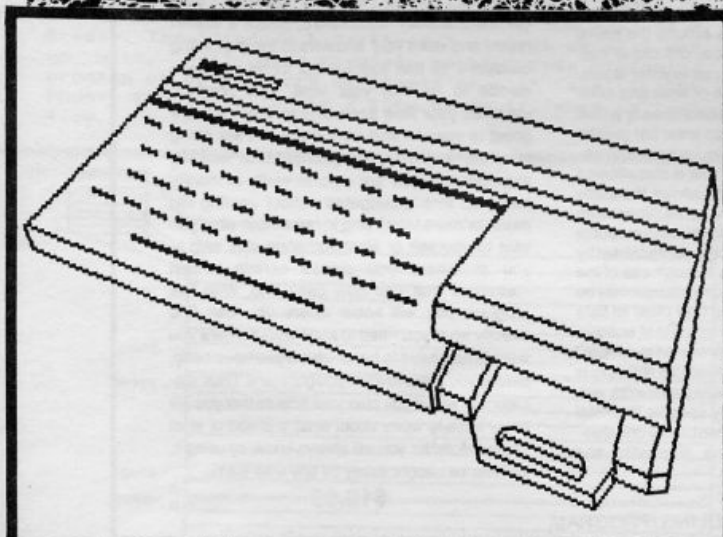
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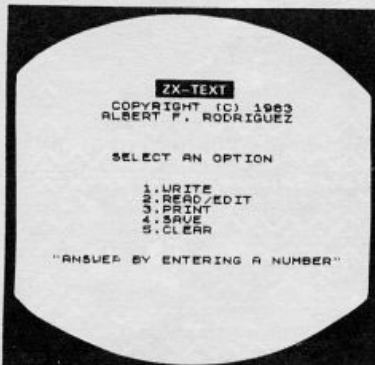


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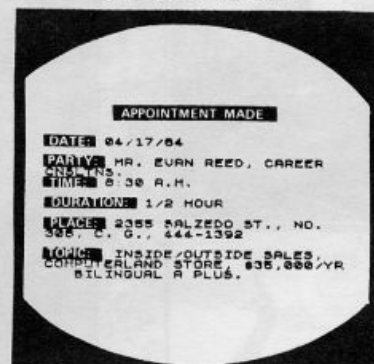


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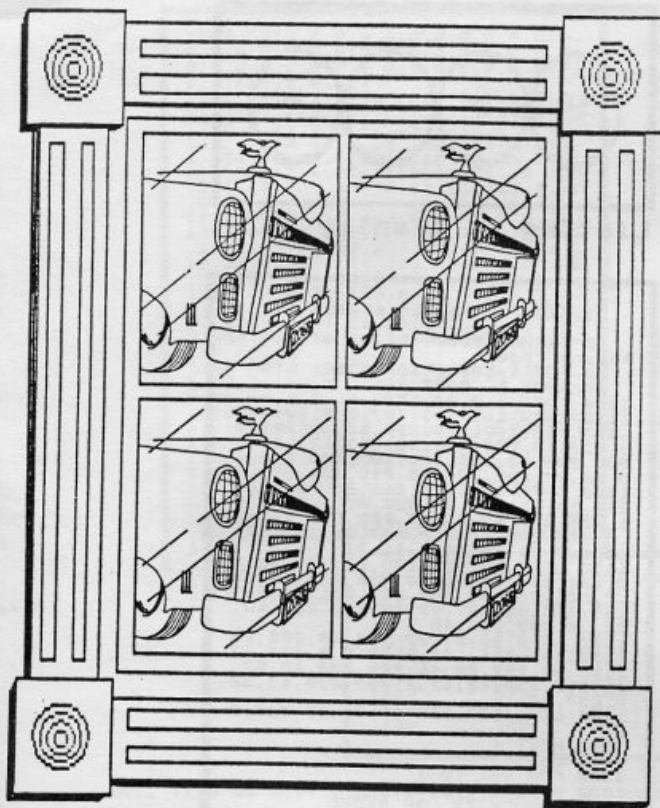
ZX-CALENDAR



Time management is an important aspect of any serious business and personal agenda. Planning how to spend our time leaves us better prepared before and while we are spending it and we remain better organized after we finish spending it. ZX-Calendar operates in 16-64K RAM affording 25 appointments in 16K, 100 in 32K or 180 in 48K and 64K. Each appointment record holds a maximum of 220 characters. The main menu includes enter, search/check/sort, change, save, clear and print any and all appointments made on a specific date or with any party. Output to either the ZX/TS printer is permissible. This program will permit you to remember to do something or to be somewhere important by cataloging your answers to six questions that you must account for in order not to waste time when it is scarce: when, with whom, at what time, for how long, where and what are you going to discuss and conclude when you get together with someone else? The program lets you permanently originate, record, classify, search, sort, calculate, modify, summarize, obtain a written report and store your answers to the preceding questions so that you will not forget what you decide to do with your time. This program identifies your time according to when you are going to spend it and with whom you are going to share it. Through these forms of labeling appointments you are able to verify or modify how your time is budgeted without wasting ink, paper or more time trying to remember what you said to yourself or what someone else said to you or where you placed certain written messages that you now can't find. With this program you will know where you can find exactly what you need to know about where you want to and have to be, or where you have been, before you get and after you get there. Thus, ZX-Calendar will let you plan your time so that you will never have to worry about what is ahead or what came before, for you will always know, by using it, to never be caught astray by any time-frame.

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CLASSY

FRONT END

by Paul Bingham

WINDOWS

Lets start our discussion on 2068 windows by discovering that the 2068 treats the standard screen as three windows already! What? That's right, Uncle Clive's little wonder addresses the screen in the display file as three separate sections. I've mapped these in Figure 1 as A,B,C (the last two lines of C being the edit lines). Now if your having trouble visualizing this, let's experiment for a moment. Type in a line like: 10 FOR t = 16384 TO 22527 : POKE t, 255 : NEXT t. Now RUN it and watch the display carefully. The program is directly poking the code for eight black pixels (255) into each consecutive address of the display file. Notice that it fills all of the window A before starting window B and so on. In the old ZX81, the display file was much simpler. With the 2068 we will have to work around these set windows to produce our own custom sizes.

Fortunately the 2068 display file does have a system which a little code can work with to produce whatever we might want. Each byte holds the information of eight bits, each of which produces a pixel. If all of the bits are sent (i.e., equal 1), like our code 255, then all the pixels are blackened in. Each of the screen bytes along one row are also consecutive in memory. Notice on our map that the first byte is address 16384 and as we progress along the 32 COLUMNS across the last in the row is 16415 (or 16384 plus 32). At the beginning of the next ROW (at address 16416) the next byte appears eight pixel elements below the previous row. This is because each screen character is eight pixels high as well as eight pixels wide. Looking at the exploded view of a screen character with our map you will see this. Each row of pixels in a character is stored at an address 256 bytes greater than the last.

Now to make sense of all of this type in Listing 1 entitled "screen address finder". The code in DATA lines 1600 to 1630 and disassembled in Figure A takes the two coordinates of a character location like we use in a PRINT AT statement and figures out the address of the top byte of that position in the display file. This is very important to us because we will need such information if we want to draw windows and also hope to restore any original stuff to the screen when we erase the window. Listing 1 randomly chooses some PRINT coordinates in the BASIC found in

It is time to begin the next phase of CLASSY FRONT END: Windowing. Now I have cooked up two kinds fo windows for CLASSY. One is the rectangular kind with shadows down two sides, and the other is a small set of round windows for quick footnotes, status reports, and the like. These round versions of post-it-notes I call PORTHOLES.

Now as usual the total program is much too long to finish up in one issue of TDM, in fact we'll be real lucky to finish it all next time. I also like to leave readers with something they can run and use each issue. So CLASSY windows has been divided up into some useful, stand-alone routines, some of which we will explore this time. If you type in the listings, try to follow the line numbering as they appear. Later, when we "put it all together" merging these smaller programs to form a big one will be a breeze. The "Windows & Portholes" program we will end up with, will be a complete machine code windowing program which can work by itself or with the CLASSY FRONT END fonts (parts 2 thru 5) we finished up last time.

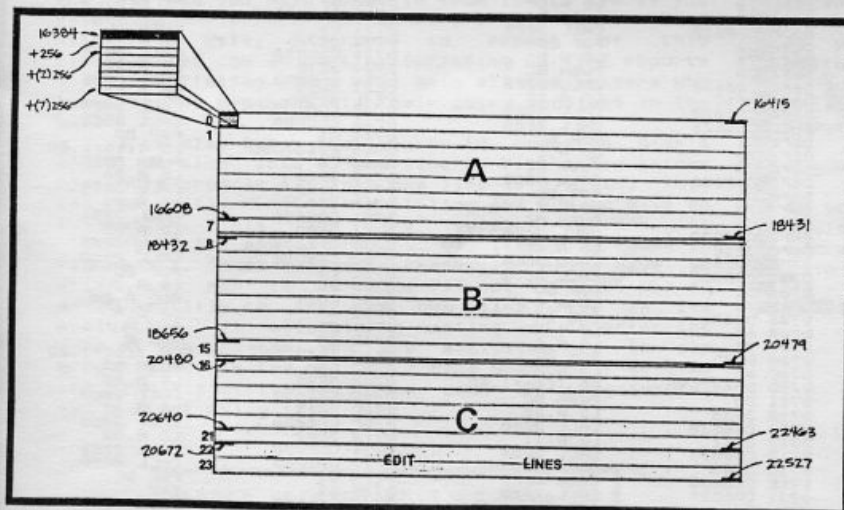


Figure 1: 2068 Display File Map

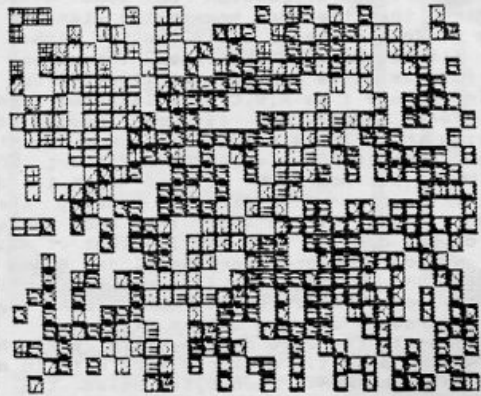
1 REM screen address finder

```
5 CLEAR 55000
10 FOR t=55000 TO 55061
1600 READ 0: POKE t,0: DATA 213,
229,17,0,0,33,15,215,229
1610 DATA 197,245,122,213,203,10
3,32,24,203,95,32,27,33,224,63,1
7,32,0,71,4,25,16,253,209,22,0,2
5,235,241,193,225,233,203,167,33
,224,79,24,232
1620 DATA 203,159,33,224,71,24,2
25
1630 DATA 237,83,176,92,225,209,
201
1700 NEXT t
1710 LET x=RND*31: LET y=RND*21
1720 POKE 55003,x: POKE 55004,y
1730 LET k=USR 55000
1740 LET a=255+PEEK 23729+PEEK 2
3728
1750 POKE a,255: POKE a+7*255,25
5: FOR t=1 TO 6: POKE a+t*255,12
9: NEXT t
1760 PRINT OVER 1;AT y,x;CHR$ (x
+y*33)
1770 GO TO 1710
```

Listing 1

screen addr CK TYPE report:

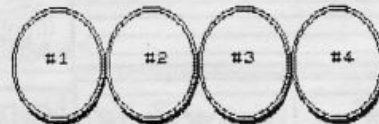
1	...	30	...	3847
5	...	13	...	1855
10	...	27	...	3008
1600	...	02	...	5813
1610	...	06	...	18429
1620	...	00	...	3035
1630	...	00	...	3
1700	...	00	...	2447
1710	...	00	...	3458
1720	...	00	...	1878
1730	...	00	...	3030
1740	...	00	...	2678
1750	...	00	...	2663
1770	...	00	...	1157



Listing 1: Display

lines 1710 through 1770 and then calls the code to get an address. Line 1740 pulls this info out of a little spare RAM address the code uses as a safe place to tuck such things. Line 1750 then "draws" a box around the periphery of this character square. By rewriting lines 1710 through 1770, one could exploit this facility in many ways.

Listing 2 is the real performer this time. It will use the code of DATA lines 1400 through 1450 to draw four portholes as shown. Again the BASIC lines 1510 through 1560 could be written to draw the porthole(s) anywhere on the screen. If you study this code's disassembly in Figure B, you will find it uses the ROM's CIRCLE and DRAW routines found at 9862 (2686 h) and 9965 (26ED h). By setting register A equal to the parameters we want and calling the ROM's integer stacking routine at 12518 (306E6 H) we circumvent the hassels of floating point.



Listing 2: Display

```

1 REM      porthole demo
5 CLEAR 55000: PRINT AT 9,9;"
poking code
10 FOR I=55000 TO 55168
20 READ O: POKE I,O
1400 DATA 1,0,88,197,205,230,48
1410 DATA 193,121,124,26,79,120,
1420 DATA 193,121,124,26,79,120,
1430 DATA 193,121,124,26,79,120,
1440 DATA 193,121,124,26,79,120,
1450 DATA 193,121,124,26,79,120,
1500 NEXT I
1510 CLS
1520 FOR X=1 TO 4
1530 POKE 55001,32+60*(X-1)
1540 RANDOMIZE USR 55000
1550 PRINT AT 10,3+7.5*(X-1);"#";
X
1560 NEXT X

```

Listing 2

porthole demo CK TYPE report:

1	...	37	...	3528
5	...	45	...	4385
10	...	27	...	1438
20	...	8	...	1874
1400	...	35	...	28944
1410	...	388	...	13625
1420	...	388	...	18754
1430	...	370	...	17461
1440	...	358	...	3804
1450	...	63	...	628
1500	...	3	...	515
1510	...	2	...	1308
1520	...	19	...	2707
1530	...	43	...	1762
1540	...	14	...	2769
1550	...	47	...	632
1560	...	3	...	

```

D608 DS      PUSH DE
D609 ES      PUSH HL
D60A 110000   LD DE,0000
D60D 210FD7   LD HL,D70F
D60E 0000     PUSH HL
D60F 0000     PUSH BC
D610 0000     PUSH AF
D611 70      LD A,D
D612 03      PUSH DE
D613 03      BIT 4,A
D614 03      JR NZ,D701
D615 03      BIT 3,A
D616 03      JR NZ,D703
D617 03      LD HL,3FE0
D618 03      LD DE,0020
D619 03      LD B,A
D61A 04      INC B
D61B 19      ADD HL,DE
D61C 10FD     DJNZ,D6F5
D61D 01      POP DE
D61E 1600     LD D,00
D61F 19      ADD HL,DE
D620 EB      EX DE,HL
D621 01      POP AF
D622 01      POP BC
D623 01      POP HL
D624 01      JP (HL)
D625 01      RES 4,A
D626 01      LD HL,4FE0
D627 01      JR D6F0
D628 01      RES 3,A
D629 01      LD HL,47E0
D62A 01      JR D6F0
D62B 01      LD (nmia),DE
D62C 01      POP HL
D62D 01      POP DE
D62E 01      RET

```

Figure A

```

D608 010053   LD BC,5800
D609 01      PUSH BC
D60A 01      POP BC
D60B 01      LD A,C
D60C 01      PUSH BC
D60D 01      CALL 30E5
D60E 01      LD A,B
D60F 01      PUSH BC
D610 01      CALL 30E5
D611 01      LD A,1C
D612 01      CALL 30E5
D613 01      CALL 2635
D614 01      POP BC
D615 01      LD A,C
D616 01      PUSH BC
D617 01      CALL 30E5
D618 01      POP BC
D619 01      LD A,B
D61A 01      PUSH BC
D61B 01      CALL 30E5
D61C 01      LD A,1E
D61D 01      CALL 30E5
D61E 01      CALL 2635
D61F 01      POP BC
D620 01      LD A,C
D621 01      PUSH BC
D622 01      CALL 30E5
D623 01      POP BC
D624 01      LD A,B
D625 01      SUB 0D
D626 01      LD B,A
D627 01      LD (coor),BC
D628 01      PUSH BC
D629 01      LD A,2E
D62A 01      CALL 30E5
D62B 01      LD A,15
D62C 01      CALL 30E5
D62D 01      LD A,02
D62E 01      CALL 30E5
D62F 01      CALL 26ED
D630 01      POP BC
D631 01      EXX
D632 01      LD HL,2B16
D633 01      EXX
D634 01      RET

```

Figure B

TS2068 DROP DOWN MENUS

Stan Lemke

One of the advantages the newer, bigger computers like the ATARI ST and AMIGA have over the TS2068 class of computers is the "User Interface" that their bigger memory and high speed affords them...specifically, such things as a mouse to sweep a cursor around the screen, and a really nice menu structure that "drops down" onto the screen when your cursor touches the menu line, and then magically disappears when you make your selection. This allows your screen to be free of most of the menu until you need it. Even then, by planning your menu layout correctly, you can show just the items the user wants for a specific operation and be able to describe the selections more fully than with the usual short word (at most), or a single letter as is more often the case.

Well, with all these advantages to "drop-down" menus, I decided to see what I could do as far as creating a TS2068 drop-down menu utility. The following program is just that, a general drop-down menu utility that will allow others to create (very easily) the type of menus found on the more expensive computers. It is also a neat little demo program that allows those who have not seen these menus in operation to get a feel of what they are like.

The utility displays 2 lines at the top of the screen, the first has a list of menu (header) topics, the second displays the program title/name. Using the LEFT joystick, the user moves a small arrow UDG sprite around on the screen. When the arrow cursor is placed on any of the menu headers, a set of menu options drops down onto the screen below that menu header. As the cursor is moved over the options, each turns INVERSE VIDEO...and then TRUE VIDEO when the cursor moves off that option. Pressing the fire button activates the selection. Moving the cursor off of the menu options (and pressing FIRE) removes the menu list, and replaces the original screen.

The menu headers and options are defined in DATA statements, in lines 9005 thru 9025. In the demo, when the DESK option is selected, a Copyright message about the program is displayed (see line 9440). This Copyright message can be user-defined...up to 3 lines and 23 characters per line. 3 more menu headers can be placed on the top line. Note: You must be careful designing these headers, as the program places two spaces between the header strings. One of these may be a "null string" (empty, two apostrophies placed side-by-side, indicating no more headers).

Listing A

8000 REM *****

TS 2068 Drop-down Menu
© by S.D. Lemke
Lemke Software Development
2144 White Oak
Wichita, KS. 67207

8800 REM (INT A(),B(),C(),D(),E()
) ,I,J,SET,MENU,ITEM,ROW,COL,LAOU
,TOP,BOT,LFT,RTT,S,BUT,ADD
8810 REM ! LIST
8820 REM ! LPRINT
8900 REM ! OPEN #
8999 REM *****

LINES 9000 - 9090 INITIALIZATION

9000 DIM a(18): DIM b(19): DIM c
(4): DIM d(3): DIM e(3): DIM s\$(
2080): PAPER 7: INK 0: BORDER 1:
CLS
9004 REM "3-Menu Headers"
9005 DATA "LIST 1","LIST 2","LIS
T 3"

9009 REM "Title Screen"
9010 DATA "Program Name"
9014 REM "Menu Options: DESK, MENU"
9015 DATA "A-001","A-002","A-003"
,"A-004","A-005","A-006","A-007"
9020 DATA "B-001","B-002","B-003"
,"B-004","B-005","B-006"
9025 DATA "C-001","C-002","C-003"
,"C-004","C-005","C-006"
9029 REM "Construct H\$ and O\$"
9030 LET H\$="DESK": LET C(I)=6:
FOR I=2 TO 4: LET C(I)=0: READ a
\$: IF LEN a\$ THEN LET C(I)=C(I-1
) +LEN a\$+2: LET H\$=H\$+" "+a\$
9032 IF C(I)>31 THEN LET C(I)=31
9033 IF LEN H\$>32 THEN LET H\$=H\$
(1 TO 32)
9035 NEXT I: READ T\$
9040 LET b(1)=0: LET O\$="": FOR
i=1 TO 18: READ a\$: LET a(i)=LEN
a\$: LET b(i+1)=b(i)+a(i): LET O
\$=O\$+a\$: NEXT i
9045 FOR i=1 TO 6: IF a(i)>d(1)
THEN LET d(1)=a(i):
9050 IF a(i+6)>d(2) THEN LET d(2
)=a(i+6)
9055 IF a(i+12)>d(3) THEN LET d(3
)=a(i+12)
9060 NEXT i: LET e(1)=c(1)+d(1):
LET e(2)=c(2)+d(2): LET e(3)=c(3
) +d(3)

Desk LIST 1 LIST 2 LIST 3
Program Name
A-001
A-002
A-003
A-004
A-005
A-006
A-007
B-001
B-002
B-003
B-004
B-005
B-006
C-001
C-002
C-003
C-004
C-005
C-006
TS-2068 "PULL DOWN MENUS"
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*** FOR ***
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TS-2068 USERS/LOVERS
screen created with the
Pixel Print Desktop Publisher

Desk Input/Output Attribute
Sample Menu
H&J Micro Drive
Cassette
Disk A
Disk B
Disk C
TS-2068 "PULL DOWN MENUS"
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screen created with the
Pixel Print Desktop Publisher

Menu selection are defined using DATA statements in lines 9015, 9020, and 9025. Six selections are available for each header, with the option of using null (empty) strings as above, to indicate no more selections.

Let's take a look at the program listing. The program is set up ready to be compiled with TIMACHINE (from Novelsoft). The program will work just as it is in BASIC too. Program execution begins at line 9000. Lines 9000 to 9090 are program initialization.

Listing A is a copy of the BASIC program in demo form. The TIMACHINE compiler directives are already set up so you can compile the demo. Although the program will work in BASIC, it is S-L-O-W!

Following the program listing is the CK-TYPE output for debugging the program (Listing B...see the May/June '87 issue of TDM). Listing C is the TIMACHINE output. Listing D is an excerpt from a sample menu that shows how to set up a 2 header menu.

Other Program Notes: Line 9066 contains the bytes for the arrow cursor UDG. Lines 9290 to 9360 perform the cursor movement. Line 9355 contains a PAUSE 4 to control cursor speed.

I hope you enjoy playing with this demo, and maybe someday we'll see some TS2068 programs using real drop down menus.

9064 REM "DE/444 UDG"
9065 DATA INT 8,16,32,127,127,32
15,0
9070 FOR i=0 TO 7: READ j: POKE
USR "a"+i,j: NEXT j
9080 LET ROW=7: LET COL=16: LET
MENU=0: LET b\$="": GO TO 9150

9095 REM *****

MENU PRINT/DRAW SUBROUTINES

9099 REM "PRINT MENU HEADER"
9100 PRINT AT 0,0,H\$: PLOT 0,168
: DRAW 255,0: PLOT 0,165: DRAW 2
55,0: PLOT 0,162: DRAW 255,0: PL
OT 0,159: DRAW 255,0: PRINT AT 1
, (31-LEN T\$)/2,T\$: RETURN
9109 REM "DRAW MENU PROGRAM"
9110 PRINT AT 2,0: OVER 1: INVER
SE 1: About this program.": RE
TURN

9119 REM "MENU: Items Option"
9120 FOR i=1 TO 6: IF a(i) THEN
PRINT AT i+1,c(i):O\$(b(i)+1 TO b
(i)+a(i)): PLOT 8+c(i)-1,167-i+8
: DRAW 0,-8: DRAW d(1)+8,0: DRAW
0,8: DRAW -d(1)+8,0: NEXT i
9125 RETURN
9129 REM "MENU: Items Option-2"
9130 FOR i=1 TO 6: LET J=i+6: IF
a(J) THEN PRINT AT i+1,c(2):O\$(
b(J)+1 TO b(J)+a(J)): PLOT 8+c(2
) -1,167-i+8: DRAW 0,-8: DRAW d(2
) +8,0: DRAW 0,8: DRAW -d(2)+8,0:
NEXT i
9135 RETURN


```

9139 REM *****
9140 FOR I=1 TO 5: LET J=I+12: I
  F A(J) THEN PRINT AT I+1,C(3)+5
  (b(J)+1 TO b(J)+8(J)): PLOT 3*(
  3)-1,167-I+8: DRAW 0,-8: DRAW d(
  3)+8,0: DRAW 0,8: DRAW -d(3)+8,0
  : NEXT I
9145 RETURN
9148 REM *****

```

```

MAIN CONTROL LOOP *****
  ENTER HERE TO SELECT AN ITEM
  SELECTION RETURNED IN "ITEM"
  1 - 0 = NO SELECTION (CANCEL)
  1 - 10 = ITEM/MENU SELECTED
*****

```

```

9149 REM ! OPEN #
9150 GO SUB 9100: PLOT 0,159: DR
  AU 0,-159: DRAW 255,0: DRAW 0,15
  9
9151 GO SUB 9180: FOR I=0 TO 7:
  POKE (USR "C"+I),PEEK (add+i+255
  ): NEXT I
9155 PRINT AT ROW,COL;"B"
9160 GO TO 9200
9170 REM ***** ADDRESS CALL *****
9180 LET add=16384+2048*INT (ROW
  /8)+32+(ROW-8*INT (ROW/8))*COL:
  RETURN
9190 REM ***** MOVE CURSOR *****
9200 LET S=STICK (1,1): IF S TH
  EN GO SUB 9300: REM *****
  MOVE CURSOR *****
9210 IF MENU THEN GO TO 9400
9220 GO TO 9200
9230 REM ***** TOP-TO-2 LINES TO ROW *****
9235 REM ***** TOP-TO-2 LINES TO ROW *****
9240 FOR I=0 TO 2079: POKE (63003
  +I),PEEK (I+16384): NEXT I: RET
  URN
9245 REM ***** RESTORE TO SCREEN *****
9250 FOR I=0 TO 2079: POKE (I+16
  384),PEEK (63031+I): NEXT I: RET
  URN
9290 REM ***** MOVE CURSOR *****
9300 GO SUB 9180: PRINT AT ROW,C
  OL;"B": REM ***** REPLACE CURSOR *****
9310 IF S=8 AND S<10 THEN LET
  COL=COL+(COL<30)
9320 IF S=4 AND S<6 THEN LET C
  OL=COL-(COL>1)
9325 IF S=1 OR S=5 OR S=9 THEN L
  ET ROW=ROW-(ROW>1)
9330 IF S=2 OR S=6 OR S=10 THEN
  LET ROW=ROW+(ROW<8)
9340 GO SUB 9180: FOR I=0 TO 7:
  POKE (USR "C"+I),PEEK (add+i+255
  ): NEXT I: REM *****
  MOVE CURSOR *****
9350 PRINT AT ROW,COL;"B": IF RO
  U=0 THEN LET MENU=1
9355 PAUSE 4: REM ***** PAUSE NOT NEED *****
  TO IN BASIC *****
9360 RETURN
9399 REM ***** MENU LINE IS ACTIVE *****
9400 IF COL=C(1) AND COL<C(2)-2
  THEN PRINT AT ROW,COL;"B": GO 3
  UB 9240: PRINT AT 0,C(1): INVERS
  E 1: OVER 1;b*(1 TO C(2)-C(1)-2)
  : GO SUB 9120: LET TOP=2: LET BO
  T=1: LET LFT=C(1): LET RIT=C(1)-
  1: LET SET=0: LET ITEM=1: GO TO
  9500
9410 IF COL=C(2) AND COL<C(3)-2
  THEN PRINT AT ROW,COL;"B": GO 3
  UB 9240: PRINT AT 0,C(2): INVERS
  E 1: OVER 1;b*(1 TO C(3)-C(2)-2)
  : GO SUB 9130: LET TOP=2: LET BO
  T=1: LET LFT=C(2): LET RIT=C(2)-
  1: LET SET=0: LET ITEM=7: GO TO
  9500
9420 IF COL=C(3) AND COL<C(4)-2
  THEN PRINT AT ROW,COL;"B": GO 3
  UB 9240: PRINT AT 0,C(3): INVERS
  E 1: OVER 1;b*(1 TO C(4)-C(3)-2)
  : GO SUB 9140: LET TOP=2: LET BO
  T=1: LET LFT=C(3): LET RIT=C(3)-
  1: LET SET=0: LET ITEM=13: GO TO
  9500
9425 IF COL>3 THEN LET MENU=0: G
  O TO 9200
9430 PRINT AT ROW,COL;"B": GO SU
  B 9240: PRINT AT 0,0: INVERSE 1:
  OVER 1;"": GO SUB 9110: PLO
  T 39,144: DRAW 185,0: DRAW 0,-25
  : DRAW -185,0: DRAW 0,25
9440 PRINT AT 4,5:"
  : PRINT AT 5,5:"@ Lem
  ke Software (1987)": PRINT AT 6,
  5:"
  REM *****
  REM *****
  REM *****
9450 BEEP ,01,20: PAUSE 0: GO SU
  B 9250: LET MENU=0: LET ROW=10:
  LET COL=16: GO TO 9151
9499 REM ***** SELECT AN OPTION *****
9500 LET S=0: INVERSE 1: GO SUB
  9300: INVERSE 0
9501 LET S=STICK (1,1): LET BUT
  =STICK (2,1): IF BUT THEN GO TO
  9500
9502 IF NOT S THEN GO TO 9501
9505 LET LROW=ROW: GO SUB 9300:
  IF LROW=ROW THEN GO TO 9501
9507 IF SET THEN PRINT AT LROW,L
  FT: OVER 1: INVERSE 1;b*(1 TO RI
  T-LFT+1)
9510 LET SET=0: IF (ROW>TOP AND
  ROW<BOT) AND (COL>LFT AND COL
  <RIT) THEN LET SET=1
9515 IF NOT SET THEN GO TO 9501

```

```

9520 PRINT AT ROW,LFT: OVER 1: I
  NVERSE 1;b*(1 TO RIT-LFT+1)
9530 GO TO 9500
9500 LET SET=0: IF (ROW>TOP AND
  ROW<BOT) AND (COL>LFT AND COL
  <RIT) THEN LET SET=1
9505 LET ITEM=ITEM+ROW-TOP+SET
  : LET MENU=0: LET SET=0: GO SUB
  9250: LET ROW=7: LET COL=16
9510 PRINT #0;AT 0,0:"ITEM SELEC
  TION = #";ITEM;TAB 30: GO TO 915
  1: REM RETURN CONTROL TO THE
  MAIN PROGRAM: DEMO RETURNS TO
  SUBROUTINE 9148
9597 REM ! CLOSE #
9598 STOP
9599 SAVE "DROP MENU": SAVE "DRO
  P MENU"CODE 57316,4557

```

Listing C

```

LINE 8900: +0
LINE 9149: +1779
LINE 8900: 57316 #DFE4
LINE 9149: 59095 #E6D7

```

```

RT1 61192 #EF08
RT2 61193 #EF09
RT7 61202 #EF12
RT8 61211 #EF13
RT9 61221 #EF14
RT10 61230 #EF15
RT11 61231 #EF16
RT12 61240 #EF17
RT13 61241 #EF18
RT14 61242 #EF19
RT15 61243 #EF20
RT16 61244 #EF21
RT17 61245 #EF22
RT18 61246 #EF23
RT19 61247 #EF24
RT20 61248 #EF25
RT21 61249 #EF26
RT22 61250 #EF27
RT23 61251 #EF28
RT24 61252 #EF29
RT25 61253 #EF30
RT26 61254 #EF31
RT27 61255 #EF32
RT28 61256 #EF33
RT29 61257 #EF34
RT30 61258 #EF35
RT31 61259 #EF36
RT32 61260 #EF37
RT33 61261 #EF38
RT34 61262 #EF39
RT35 61263 #EF40
RT36 61264 #EF41
RT37 61265 #EF42
RT38 61266 #EF43
RT39 61267 #EF44
RT40 61268 #EF45
RT41 61269 #EF46
RT42 61270 #EF47
RT43 61271 #EF48
RT44 61272 #EF49
RT45 61273 #EF50
RT46 61274 #EF51
RT47 61275 #EF52
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RT62 61290 #EF67
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RT64 61292 #EF69
RT65 61293 #EF70
RT66 61294 #EF71
RT67 61295 #EF72
RT68 61296 #EF73
RT69 61297 #EF74
RT70 61298 #EF75
RT71 61299 #EF76
RT72 61300 #EF77
RT73 61301 #EF78
RT74 61302 #EF79
RT75 61303 #EF80
RT76 61304 #EF81
RT77 61305 #EF82
RT78 61306 #EF83
RT79 61307 #EF84
RT80 61308 #EF85
RT81 61309 #EF86
RT82 61310 #EF87
RT83 61311 #EF88
RT84 61312 #EF89
RT85 61313 #EF90
RT86 61314 #EF91
RT87 61315 #EF92
RT88 61316 #EF93
RT89 61317 #EF94
RT90 61318 #EF95
RT91 61319 #EF96
RT92 61320 #EF97
RT93 61321 #EF98
RT94 61322 #EF99
RT95 61323 #F000
RT96 61324 #F001
RT97 61325 #F002
RT98 61326 #F003
RT99 61327 #F004
RT100 61328 #F005
RT101 61329 #F006
RT102 61330 #F007
RT103 61331 #F008
RT104 61332 #F009
RT105 61333 #F010
RT106 61334 #F011
RT107 61335 #F012
RT108 61336 #F013
RT109 61337 #F014
RT110 61338 #F015
RT111 61339 #F016
RT112 61340 #F017
RT113 61341 #F018
RT114 61342 #F019
RT115 61343 #F020
RT116 61344 #F021
RT117 61345 #F022
RT118 61346 #F023
RT119 61347 #F024
RT120 61348 #F025
RT121 61349 #F026
RT122 61350 #F027
RT123 61351 #F028
RT124 61352 #F029
RT125 61353 #F030
RT126 61354 #F031

```

```

i..... INTEG 61673 #F181
j..... INTEG 61674 #F182
set..... INTEG 61675 #F183
menu..... INTEG 61676 #F184
item..... INTEG 61677 #F185
row..... INTEG 61678 #F186
col..... INTEG 61679 #F187
low..... INTEG 61680 #F188
top..... INTEG 61681 #F189
bot..... INTEG 61682 #F190
lft..... INTEG 61683 #F191
rit..... INTEG 61684 #F192
s..... INTEG 61685 #F193
but..... INTEG 61686 #F194
add..... INTEG 61687 #F195
a(18)..... INTEG 61688 #F196
b(19)..... INTEG 61689 #F197
c(4)..... INTEG 61690 #F198
d(3)..... INTEG 61691 #F199
e(3)..... INTEG 61692 #F200
s..... STR (255) 61693 #F201
h..... STR (255) 61694 #F202
o..... STR (255) 61695 #F203
ss(2030)..... STR 61696 #F204
ts..... STR (255) 61697 #F205

```

TIME MACHINE @1986 Cameron Hayne
M/C: 4557 BYTES
+ 3495 BYTES FOR M/C VARIABLES
(BASIC WAS 6725 BYTES)

SAVE "m/c"CODE 57316,4557
LOAD "m/c"CODE 57316

Listing D

```

9004)REM *****
9005 DATA "Input/Output","Attrib
  ute",""
9009 REM *****
9010 DATA "Sample Menu"
9014 REM *****
9015 DATA "A&U Micro Drive","
  Cassette","Disk A","Disk
  B","Disk C","Disk D","Disk
  E","Disk F","Disk G","Disk
  H","Disk I","Disk J","Disk
  K","Disk L","Disk M","Disk
  N","Disk O","Disk P","Disk
  Q","Disk R","Disk S","Disk
  T","Disk U","Disk V","Disk
  W","Disk X","Disk Y","Disk
  Z","Disk AA","Disk AB","Disk
  AC","Disk AD","Disk AE","Disk
  AF","Disk AG","Disk AH","Disk
  AI","Disk AJ","Disk AK","Disk
  AL","Disk AM","Disk AN","Disk
  AO","Disk AP","Disk AQ","Disk
  AR","Disk AS","Disk AT","Disk
  AU","Disk AV","Disk AW","Disk
  AX","Disk AY","Disk AZ","Disk
  BA","Disk BB","Disk BC","Disk
  BD","Disk BE","Disk BF","Disk
  BG","Disk BH","Disk BI","Disk
  BJ","Disk BK","Disk BL","Disk
  BM","Disk BN","Disk BO","Disk
  BP","Disk BQ","Disk BR","Disk
  BS","Disk BT","Disk BU","Disk
  BV","Disk BW","Disk BX","Disk
  BY","Disk BZ","Disk CA","Disk
  CB","Disk CC","Disk CD","Disk
  CE","Disk CF","Disk CG","Disk
  CH","Disk CI","Disk CJ","Disk
  CK","Disk CL","Disk CM","Disk
  CN","Disk CO","Disk CP","Disk
  CQ","Disk CR","Disk CS","Disk
  CT","Disk CU","Disk CV","Disk
  CW","Disk CX","Disk CY","Disk
  CZ","Disk DA","Disk DB","Disk
  DC","Disk DD","Disk DE","Disk
  DF","Disk DG","Disk DH","Disk
  DI","Disk DJ","Disk DK","Disk
  DL","Disk DM","Disk DN","Disk
  DO","Disk DP","Disk DQ","Disk
  DR","Disk DS","Disk DT","Disk
  DU","Disk DV","Disk DW","Disk
  DX","Disk DY","Disk DZ","Disk
  EA","Disk EB","Disk EC","Disk
  ED","Disk EE","Disk EF","Disk
  EG","Disk EH","Disk EI","Disk
  EJ","Disk EK","Disk EL","Disk
  EM","Disk EN","Disk EO","Disk
  EP","Disk EQ","Disk ER","Disk
  ES","Disk ET","Disk EU","Disk
  EV","Disk EW","Disk EX","Disk
  EY","Disk EZ","Disk FA","Disk
  FB","Disk FC","Disk FD","Disk
  FE","Disk FF","Disk FG","Disk
  FH","Disk FI","Disk FJ","Disk
  FK","Disk FL","Disk FM","Disk
  FN","Disk FO","Disk FP","Disk
  FQ","Disk FR","Disk FS","Disk
  FT","Disk FU","Disk FV","Disk
  FW","Disk FX","Disk FY","Disk
  FZ","Disk GA","Disk GB","Disk
  GC","Disk GD","Disk GE","Disk
  GF","Disk GH","Disk GI","Disk
  GJ","Disk GK","Disk GL","Disk
  GM","Disk GN","Disk GO","Disk
  GP","Disk GQ","Disk GR","Disk
  GS","Disk GT","Disk GU","Disk
  GV","Disk GW","Disk GX","Disk
  GY","Disk GZ","Disk HA","Disk
  HB","Disk HC","Disk HD","Disk
  HE","Disk HF","Disk HG","Disk
  HH","Disk HI","Disk HJ","Disk
  HK","Disk HL","Disk HM","Disk
  HN","Disk HO","Disk HP","Disk
  HQ","Disk HR","Disk HS","Disk
  HT","Disk HU","Disk HV","Disk
  HW","Disk HX","Disk HY","Disk
  HZ","Disk IA","Disk IB","Disk
  IC","Disk ID","Disk IE","Disk
  IF","Disk IG","Disk IH","Disk
  II","Disk IJ","Disk IK","Disk
  IL","Disk IM","Disk IN","Disk
  IO","Disk IP","Disk IQ","Disk
  IR","Disk IS","Disk IT","Disk
  IU","Disk IV","Disk IW","Disk
  IX","Disk IY","Disk IZ","Disk
  JA","Disk JB","Disk JC","Disk
  JD","Disk JE","Disk JF","Disk
  JG","Disk JH","Disk JI","Disk
  JJ","Disk JK","Disk JL","Disk
  JM","Disk JN","Disk JO","Disk
  JP","Disk JQ","Disk JR","Disk
  JS","Disk JT","Disk JU","Disk
  JV","Disk JW","Disk JX","Disk
  JY","Disk JZ","Disk KA","Disk
  KB","Disk KC","Disk KD","Disk
  KE","Disk KF","Disk KG","Disk
  KH","Disk KI","Disk KJ","Disk
  KK","Disk KL","Disk KM","Disk
  KN","Disk KO","Disk KP","Disk
  KQ","Disk KR","Disk KS","Disk
  KT","Disk KU","Disk KV","Disk
  KW","Disk KX","Disk KY","Disk
  KZ","Disk LA","Disk LB","Disk
  LC","Disk LD","Disk LE","Disk
  LF","Disk LG","Disk LH","Disk
  LI","Disk LJ","Disk LK","Disk
  LL","Disk LM","Disk LN","Disk
  LO","Disk LP","Disk LQ","Disk
  LR","Disk LS","Disk LT","Disk
  LU","Disk LV","Disk LW","Disk
  LX","Disk LY","Disk LZ","Disk
  MA","Disk MB","Disk MC","Disk
  MD","Disk ME","Disk MF","Disk
  MG","Disk MH","Disk MI","Disk
  MJ","Disk MK","Disk ML","Disk
  MN","Disk MO","Disk MP","Disk
  MQ","Disk MR","Disk MS","Disk
  MT","Disk MU","Disk MV","Disk
  MW","Disk MX","Disk MY","Disk
  MZ","Disk NA","Disk NB","Disk
  NC","Disk ND","Disk NE","Disk
  NF","Disk NG","Disk NH","Disk
  NI","Disk NJ","Disk NK","Disk
  NL","Disk NM","Disk NO","Disk
  NP","Disk NQ","Disk NR","Disk
  NS","Disk NT","Disk NU","Disk
  NV","Disk NW","Disk NX","Disk
  NY","Disk NZ","Disk OA","Disk
  OB","Disk OC","Disk OD","Disk
  OE","Disk OF","Disk OG","Disk
  OH","Disk OI","Disk OJ","Disk
  OK","Disk OL","Disk OM","Disk
  ON","Disk OO","Disk OP","Disk
  OQ","Disk OR","Disk OS","Disk
  OT","Disk OU","Disk OV","Disk
  OW","Disk OX","Disk OY","Disk
  OZ","Disk PA","Disk PB","Disk
  PC","Disk PD","Disk PE","Disk
  PF","Disk PG","Disk PH","Disk
  PI","Disk PJ","Disk PK","Disk
  PL","Disk PM","Disk PN","Disk
  PO","Disk PP","Disk PQ","Disk
  PR","Disk PS","Disk PT","Disk
  PU","Disk PV","Disk PW","Disk
  PX","Disk PY","Disk PZ","Disk
  QA","Disk QB","Disk QC","Disk
  QD","Disk QE","Disk QF","Disk
  QG","Disk QH","Disk QI","Disk
  QJ","Disk QK","Disk QL","Disk
  QM","Disk QN","Disk QO","Disk
  QP","Disk QQ","Disk QR","Disk
  QS","Disk QT","Disk QU","Disk
  QV","Disk QW","Disk QX","Disk
  QY","Disk QZ","Disk RA","Disk
  RB","Disk RC","Disk RD","Disk
  RE","Disk RF","Disk RG","Disk
  RH","Disk RI","Disk RJ","Disk
  RK","Disk RL","Disk RM","Disk
  RN","Disk RO","Disk RP","Disk
  RQ","Disk RR","Disk RS","Disk
  RT","Disk RU","Disk RV","Disk
  RW","Disk RX","Disk RY","Disk
  RZ","Disk SA","Disk SB","Disk
  SC","Disk SD","Disk SE","Disk
  SF","Disk SG","Disk SH","Disk
  SI","Disk SJ","Disk SK","Disk
  SL","Disk SM","Disk SN","Disk
  SO","Disk SP","Disk SQ","Disk
  SR","Disk SS","Disk ST","Disk
  SU","Disk SV","Disk SW","Disk
  SX","Disk SY","Disk SZ","Disk
  TA","Disk TB","Disk TC","Disk
  TD","Disk TE","Disk TF","Disk
  TG","Disk TH","Disk TI","Disk
  TJ","Disk TK","Disk TL","Disk
  TM","Disk TN","Disk TO","Disk
  TP","Disk TQ","Disk TR","Disk
  TS","Disk TT","Disk TU","Disk
  TV","Disk TV","Disk TW","Disk
  TX","Disk TY","Disk TZ","Disk
  UA","Disk UB","Disk UC","Disk
  UD","Disk UE","Disk UF","Disk
  UG","Disk UH","Disk UI","Disk
  UJ","Disk UK","Disk UL","Disk
  UM","Disk UN","Disk UO","Disk
  UP","Disk UQ","Disk UR","Disk
  US","Disk UT","Disk UV","Disk
  UW","Disk UX","Disk UY","Disk
  UZ","Disk VA","Disk VB","Disk
  VC","Disk VD","Disk VE","Disk
  VF","Disk VG","Disk VH","Disk
  VI","Disk VJ","Disk VK","Disk
  VL","Disk VM","Disk VN","Disk
  VO","Disk VP","Disk VQ","Disk
  VR","Disk VS","Disk VT","Disk
  VU","Disk VV","Disk VW","Disk
  VX","Disk VY","Disk VZ","Disk
  WA","Disk WB","Disk WC","Disk
  WD","Disk WE","Disk WF","Disk
  WG","Disk WH","Disk WI","Disk
  WJ","Disk WK","Disk WL","Disk
  WM","Disk WN","Disk WO","Disk
  WP","Disk WQ","Disk WR","Disk
  WS","Disk WT","Disk WU","Disk
  WV","Disk WX","Disk WY","Disk
  WZ","Disk XA","Disk XB","Disk
  XC","Disk XD","Disk XE","Disk
  XF","Disk XG","Disk XH","Disk
  XI","Disk XJ","Disk XK","Disk
  XL","Disk XM","Disk XN","Disk
  XO","Disk XP","Disk XQ","Disk
  XR","Disk XS","Disk XT","Disk
  XU","Disk XV","Disk XW","Disk
  XX","Disk XY","Disk XZ","Disk
  YA","Disk YB","Disk YC","Disk
  YD","Disk YE","Disk YF","Disk
  YG","Disk YH","Disk YI","Disk
  YJ","Disk YK","Disk YL","Disk
  YM","Disk YN","Disk YO","Disk
  YP","Disk YQ","Disk YR","Disk
  YS","Disk YT","Disk YU","Disk
  YV","Disk YW","Disk YX","Disk
  YZ","Disk ZA","Disk ZB","Disk
  ZC","Disk ZD","Disk ZE","Disk
  ZF","Disk ZG","Disk ZH","Disk
  ZI","Disk ZJ","Disk ZK","Disk
  ZL","Disk ZM","Disk ZN","Disk
  ZO","Disk ZP","Disk ZQ","Disk
  ZR","Disk ZS","Disk ZT","Disk
  ZU","Disk ZV","Disk ZW","Disk
  ZX","Disk ZY","Disk ZZ"

```

REVIEW THE TS2068 AND THE COMMODORE 1520 PLOTTER

reviewed by Frank Davis

Something I have really missed, not being able to do with my TS2068 is using it with a plotter. This was most unfortunate as I had used one on an earlier system I owned...a VIC20 (by Commodore). I had used a 1520 Color Plotter Printer. I was at the point of working out the problem of interfacing the rather unusual serial port on the Commodore 1520, when I picked up a magazine and found an ad for an interface and software to run the plotter on the Timex Sinclair TS2068. I sent for some information and very shortly had the kit in my hands to begin the task. NOTE: Get the kit if you know what you are doing and are not rusty at the soldering iron...otherwise order the completed interface.

The Commodore 1520 uses paper slightly wider than that used by the TS2040 printer, but not the standard 8" (it is under 5"). However, it is regular paper and is available from Commodore, Radio Shack and many Atari dealers. They also carry the four colored pens used in the plotter. All of these brands made a similar plotter, and each set up to interface with their particular computer. The colors are black, blue, red and green. In all the years I have had this plotter, I have had but one problem with it...a small plastic gear coming loose and not being able to turn the other gears to move the paper back and forth. A small amount of super glue gel seems to have cured this. If you ever have to do this be careful not to get any in the grooves of the gear itself.

The graphics you can do with this interface and the available software for it is by no means limited. John McMichael, the designer of the interface and the programmer does not skimp on features. The Driver program that comes with the interface contains a very extensive demo of just what can be expected of this combo. You can also examine the demo program, but not copy it to the 2040 printer or LLIST it. You can also clear out the BASIC (except Line 10 which you will need to load the machine code) and use this driver for your own programs. This is a better deal than I got from Commodore when I purchased the plotter originally, it had no ready to run program with it, no driver...only a manual with a few short sample

programs of which all but two of them contained errors in the programs.

Other software available for this interface include the Following: A) SCREEN-TO-PLOTTER, which allows you to use the plotter like a connect the dots, by use of the cursor or a joystick, use text, save screens or load in previously saved screens and edit them, all in four colors. When using text you have many choices, such as solid lines or dashed lines, size of print, character rotation, centering. To change colors in pictures or text is as simple as hitting the letter "c" or changing pages by use of the letter "P". This is a user friendly program.

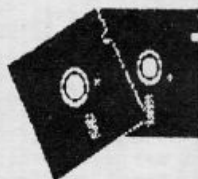
B. CMS 1520, is a program which allows you to combine Customized MSCRIPT V5 or V5.2 and the 1520. This allows the use of the 1520 as an 80 column printer in color and the use of all of the 1520 functions in a text file.

C. PIC-PLOT which allows you to do a dump of a screen to the 1520 in two sizes. You can select one color for the small plot and two colors for the larger plot. It also allows you to put colored captions or sub-titles below the pictures.

D. BANNERIFIC, a program that allows you to use the 1520 to make colored banners. You may plot up to two hundred characters using the special UDGs that come with the program, or use those of the ROM set. It has 58 selectable character sizes and each character can be whatever color you assign it. The banner may have the characters designed either as vertical or horizontal, and the characters may be inverted or done as an over character. You can select proportional spacing or not. The only thing missing here was the option to fill in the character or not to fill. It should be easy to use your own UDG's with this program.

The 1520 is an ORPHAN in its own right. It is no longer available from Commodore in the U.S. I have seen some ads for it in some British Mags...along with the VIC20, still being offered for sale. This means that you first need to get one before you invest in this nifty interface and software. They are available at many TOY-R-US stores across the nation for \$30 to \$40 (not bad when I think of the \$199 many people paid). You might just check a local Commodore Users group to see if someone wants to let go of one. Also check your local Commodore Dealer to see if he still can get you one. I saw used ones for sale at each of the computer and ham shows I went to this last year. They were also being offered for \$49.95 + \$3 S&H by ALL ELECTRONICS CORP., PO Box 20406, Los Angeles, CA 90006, 1-800-826-5432.

To get more information about this interface and the software, write to: John McMichael, 1710 Palmer Drive, Laramie, WY 82070.



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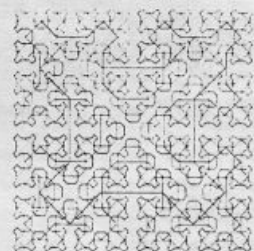
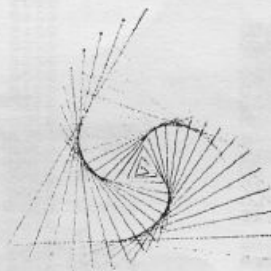
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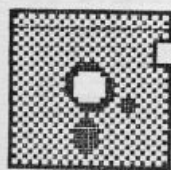
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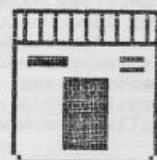
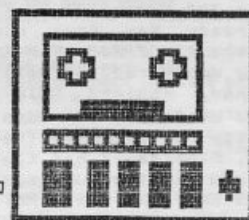
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Z-COLUMN

The "Z-COLUMN" is a new and regular (hopefully) feature of *TIME DESIGNS*. We will cover news and helpful tidbits of information for the Z88 Laptop Computer...the newest addition to the Sinclair family tree. On occasion, we may also accompany this column with an article or product review.

What better way to kick off a new column than to make a major announcement! Yes, that's right...just as Cambridge Computer (Sir Clive's new company) promised...the Z88 has passed the FCC test, and is now available here in the U.S.!

While some details were sketchy at press time, we do know that Cambridge Computer has signed a deal with a U.S. distributor, and that the new computers are being assembled by SCI in Huntsville, Alabama, with foreign parts. SCI is a U.S. based corporation that has worldwide concerns, and is in fact manufacturing the European Z88 for Cambridge, in a Scotland factory.

The U.S. Z88 is reported to have an updated ROM. It also has a steeper retail price than what most of us anticipated...\$549.90. No getting around this, the weak dollar has driven prices up. (In fact all personal computers are going up in price for the first time in years. And Japanese RAM chips are once again expensive.) Some folks will certainly shy away from the price, but this is the most powerful (for its size and weight) laptop computer currently on the market.

1/2 Meg RAM cartridges are now available for right around \$400. With three of them installed, it gives the user 1 1/2 Meg to play with "on the go". The 1 Meg. cartridges, are still supposed to be released in a couple of months.

Lots of third-party support taking off now in Europe. Here are a few of the most recent developments:

Z-TERM is a new telecommunications package (a U.S. version is available) that supports XMODEM, it autodials, and can drive virtually any modem, including the new miniature Z88 modem from *Miracle Systems*.

Cummanah will have their disk drive interface (with RGB monitor output) available soon for \$199. It works similar to the Radio Shack floppy drive system for the Model 100.

Focus Magazines (the publishers of *QL WORLD Magazine*), will launch their new Z88-specific magazine this month.

The *Z88 Users' Club* of Great Britain has formed, and already has four club newsletters published, called the *Z88 EPROM*. For further information, write to: Roy Woodward, 68 Wellington Street, Long Eaton, Nottingham, England NG10-4NG. (Thanks to Larry Chavarie of Canada for supplying this information.)

While I attended the *SUNSTATE TS WINTERFEST* in Orlando, Florida, I had the privilege of meeting *Stan Veit*, who is the Publisher/Owner/Editor-in-Chief of *COMPUTER SHOPPER*. While Mr. Veit had attended the *Fall Comdex* in Las Vegas, a representative from Cambridge gave him a Z88 for review (see the March '88 issue of *Computer Shopper*). Stan uses the Z88 as his "electronic notebook" wherever he goes. Now here is someone who has access to virtually any PC or laptop...and actually prefers the Z88 for some applications over the others. He mentioned that the "silent keyboard" is a big plus in conferences.

Well, no doubt, many of you are skeptical about this new computer, and the price alone will drive a big share of the "hardcore" Sinclair types away. But nevertheless, this is an excellent laptop computer,

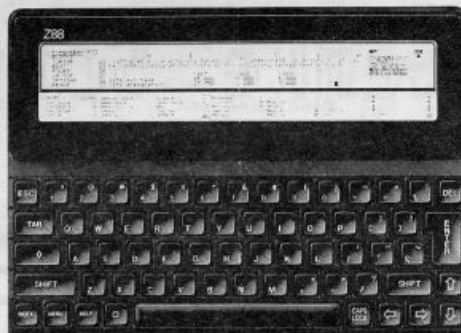
and the finest computer for Sir Clive to date. It's not another Sinclair "Boondoggle" (as one newsletter editor called it...yet admitted he had never used one before). While at the Florida Winterfest, the same comment was heard time, and time again at the *SHARP'S* booth: "This is what the QL *should* have been!" (I'm not knocking the QL though, as it does have merits of its own.)

Sir Clive himself is very serious about this computer, and wants to insure its success. *Bryan Davies*, a columnist for *QL WORLD*, recently told me on the phone, that the last *MICROFAIR* (a trade show open to the public) he attended, found Sir Clive up on the stands demonstrating the little "Z" to attendees.

That's about it for this issue. Hope to be back next issue with more stuff. Until then, you can send a S.A.S.E. to me in care of *TIME DESIGNS*, and I'll send you some info on a user group starting up here in North America. (If you have already sent your envelope...I will finally have responded to your request by the time you read this--promise!).

— Tim Woods

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Beginning Z80 Machine Code

FINAL LESSON

by Syd Wyncoop

This is it folks. I leave it to you to progress from here. There are many other instructions I could have discussed, such as CP (Confuse Programmer), but they will be discovered soon enough, without my assistance.

As a wrap-up to this series, I present a special treat...a full fledged MC program. Additionally, it is written to support the many CP/M systems which are running on our humble "doorstops". Those of you without CP/M will need to replace all the calls to CP/M's BDOS with your own routines. I have provided the necessary PRINTING and INPUTING routines in previous lessons.

As usual, the program is presented as a source file, to allow for easy modification by you. The "DATA STORAGE" area is where your customization takes place. The menus and messages can be changed to suit your taste but it is generally best to assemble the program prior to making changes.

Next, and most important, are the printer command tables. These must be changed to reflect your printer commands. All entries are four bytes long and the fourth byte must contain OFFh. Your printer manual will provide the necessary entries for these tables.

As the program is self-explanatory and fairly long, let's get to it!

Printer Set-Up Program

Written for CP/M and the Epson FX-286
by Syd Wyncoop, S & K Enterprises

Operation: The printer is cleared of all prior settings by sending the printer its start-up initialization code first, followed by your selected options. A bell will sound to let you know the settings have been properly received by the printer. The printer must be turned on, or your system may hang-up. If it hangs, you need only turn on the printer to get things working properly.

In the interest of brevity, there is no documentation, save this source. The comments and labels should prove to be self-explanatory. All customization is done in the tables and/or program defines, prior to assembly.

There is minimum of error checking. If the program will be used by an inexperienced user or employee, you may wish to trap a few additional errors to avoid a crash.

Follow the prompts. You may press ENTER at most of them to either accept a default value or skip selection...the choice will be obvious.

This program is donated to the CP/M Public Domain. Please feel free to modify and use it for your own purposes. I hope you find it of use. In any event, Have Fun!

```

;-----
;Vers 1.0, Rev 0
;Program Defines:
;-----
bell equ 07h ;ascii bell
bs equ 08h ;ascii backspace
lf equ 0Ah ;ascii linefeed
ff equ 0Ch ;ascii formfeed, your terminal may need
;a series of linefeeds instead of a ff
cr equ 0Dh ;ascii carriage return
esc equ 1Bh ;ascii escape code
bdos equ 0005h ;entry to CP/M functions
warm_boot equ 0000h ;re-entry to CP/M CCP
;-----
MAIN PROGRAM
;-----
org 100h ;standard TPA
;-----
start ld hl,init_tbl ;get pointer to printer initialization
call fil_prt_bf ;and pre-load print buffer with it
style call prt_style ;print style selection menu
get_style call get_num ;get menu selection
jr c,skp_style ;if no selection, skip ahead
cp 1dh ;check if in valid range (<=28)
jr nc,get_style ;else, reject it
ld hl,style_tbl ;base of style selection table
;-----
skp_style add hl,bs ;add the offset for table entry
call fil_prt_bf ;and move table entry to print buffer
call prt_again? ;print select again message
jr z,style ;go get another selection
call prt_done? ;print exit message
jp z,ring_bell ;and exit if requested
;-----
ttype call prt_type ;print type selection menu
get_type call get_num ;get menu selection
jr c,skp_type ;if no selection, skip ahead
cp 8 ;check if offset in valid range (<=8)
jr nc,get_type ;else, reject it
ld hl,type_tbl ;base of type selection table
add hl,bs ;add the offset for table entry
call fil_prt_bf ;and move table entry to print buffer
skp_type call prt_again? ;print select again message
jr z,ttype ;go get another selection
call prt_done? ;print exit message
jr z,ring_bell ;and exit if requested
;-----
left_margin call prt_heading ;clear screen and print heading
ld de,l_marg_inq ;point to left margin prompt
ld c,9 ;print string$ function
call bdos ;print left margin prompt
call dec_inpt ;get a decimal number
ld (left_marg),a ;load new value into table entry
ld hl,l_marg_tbl ;get left margin table entry
call fil_prt_bf ;and move it to the print buffer
;-----
right_margin ld de,r_marg_inq ;point to right margin prompt
ld c,9 ;print string$ function
call bdos ;print right margin prompt
call dec_inpt ;get a decimal number
jr c,dflt_rmarg ;assume default value
ld a,(left_marg) ;minimum margin error check
cp e ;is right value > left value?
jr c,valid_r_m ;accept valid entry
call prt_errmsg ;else, print error message
jr get_right ;and get another input
ld a,e ;retrieve value
jr rmarg_ok ;skip ahead w/valid entry
ld a,80 ;else, load default value
ld (right_marg),a ;store value in table
ld hl,r_marg_tbl ;get right margin table entry
call fil_prt_bf ;and move it to the print buffer
;-----
page_length ld de,pg_len_inq ;point to page length prompt
ld c,9 ;print string$ function
call bdos ;print page length prompt
call dec_inpt ;get a decimal number
jr c,skp_perf ;accept default value of 66 lines
ld (page_len),a ;store value in table
ld hl,pglen_tbl ;get page length table entry
call fil_prt_bf ;and move it into the print buffer
;-----
skp_perf ld de,skip_perf? ;point to skip perforation prompt
ld c,9 ;print string$ function
call bdos ;print skip perforation prompt
call get_yn ;go get response
jr nz,ring_bell ;exit if no
ld de,skp_nlines ;else, point to # of lines prompt
ld c,9 ;print string$ function
call bdos ;ask how many lines to skip
call dec_inpt ;get a decimal number
jr nc,nlines_ok ;skip ahead w/valid entry
ld a,6 ;else, set default at 6
ld (skp_nline),a ;store value in table entry
ld hl,skp_tbl ;get skip lines table entry
call fil_prt_bf ;and move it into the print buffer
;-----
ring_bell ld hl,bell_tbl ;store a few bell rings
call fil_prt_bf ;in the print buffer
ld (hl),OFFh ;lastly, store a terminating byte
;-----
send_2_ptrtr ld hl,prt_buffer ;get the start of the print buffer
send_lp ld a,(hl) ;and check each byte
cp OFFh ;have we found the last byte yet?
jr z,end_send ;if so, exit loop
ld e,(hl) ;else, send it to the printer
ld c,5 ;with the list output function
push hl ;but, save our pointer first
call bdos ;ok, send it
pop hl ;retrieve the print buffer pointer
inc hl ;and adjust it for next byte
jr send_lp ;stay in loop until done
ld de,all_done ;point to finished message
ld c,9 ;print string$ function
call bdos ;print message to let the dumb human
;know we are finished
exit jp warm_boot ;and return to CP/M
;-----
SUBROUTINES
;-----
Print Menu Heading
;-----
Inputs:none
;-----
Outputs:GRT is cleared and menu heading printed in preparation for the
rest of the selection panel.
;-----
prt_heading ld de,heading ;initialize pointer for CPM
ld c,9 ;print string$ function
jp bdos ;go do it

```

```

Print Style Menu
Inputs:none
Outputs:Print style selection panel is sent to CRT
prt_style      call prt_heading ;clear CRT and print heading
                ld de,style_menu ;initialize pointer for CPM
                ld c,9           ;print strings function
                jp bdos          ;go do it

Print Type Menu
Inputs:none
Outputs:Print type selection panel is sent to CRT
prt_type       call prt_heading ;clear CRT and print heading
                ld de,type_menu ;initialize pointer for CPM
                ld c,9           ;print strings function
                jp bdos          ;go do it

Print Another Selection?
Inputs:none
Outputs:Print another selection message
prt_again?     ld de,another? ;initialize pointer for CPM
                ld c,9           ;print strings function
                call bdos        ;go do it
                jp get_yn        ;get response

Print Done Yet?
Inputs:none
Outputs:Print are we done enquiry
prt_done?      ld de,done_yet? ;initialize pointer for CPM
                ld c,9           ;print strings function
                call bdos        ;go do it
                jp get_yn        ;get response

Fill Print Buffer
Inputs:HL = address of the table entry to be moved to print buffer
Outputs:none
fil_prt_bf     ex de,hl ;move pointer to DE
                ld hl,(buf_ptr) ;retrieve print buffer pointer
fill_loop      ld a,(de) ;get byte to put in print buffer
                cp 0FFh ;and check for terminating byte
                jr z,end_fill ;exit loop if found
                ld (hl),a ;else, move it to print buffer
                inc hl ;and adjust pointers
                inc de
                jr fill_loop ;stay in loop until done
end_fill       ld (buf_ptr),hl ;store print buffer pointer for next move
                ret

Get Y/N Response
Inputs:none
Outputs:A = 0 if yes or if cr
            A = 'N' if no
get_yn         call direct_io ;get y/n response
                cp 'Y' ;was it yes?
                jr z,yes ;go set zero flag
                cp cr ;was it a cr?
                jr z,yes ;go set zero flag
                cp 'N' ;was it no?
                jr nz,get_yn ;do again, was not valid input
                and a ;clear zero flag
                ret ;A = 'N'
yes            jr get_yn ;do again, was not valid input
                xor a ;indicate yes or cr
                ret

```

```

Direct Keyboard I/O
Inputs:none
Outputs:A = carriage return, or capital ascii key pressed
direct_io      ld c,1 ;console input function
                call bdos
                res 5,a ;ensure is capital w/o destroying CR
                ret

Console Input
Inputs:none
Outputs:A = numeric keyboard entry - 1 x 4, or a carriage return
            BC = numeric keyboard entry - 1 x 4, if valid entry
            CARRY = set if carriage return pressed
get_num        ld c,1 ;console input function
                call bdos
                cp cr ;check for default request
                jr z,cr_only ;return if found
                call numeric? ;test for valid digit
                jr c,erase_inpt ;and reject if not
                sub '1' ;remove ascii bias
                jp m,erase_inpt ;reject 0 entry
                add a,a ;multiply by 4
                add a,a
                ld c,a ;and convert to 16 bits
                ld b,0
                ret

erase_inpt     ld e,bs ;back-up the cursor one space
                ld c,2 ;print a character function
                call bdos
                jr get_num ;go get a good digit

cr_only        scf ;indicate CR pressed
                ret

Numeric Input?
Inputs:A = ascii character code from keyboard input
Outputs: CARRY = reset, if is valid numeric input
            A = number
numeric?       cp '0' ;is it < 0?
                ret c ;exit if so
                cp 3Ah ;is it <= 9?
                ccf ;ensure carry reset
                ret

Decimal Input
Inputs:none
Outputs:A = numeric number in the range 0-255 (DE mod 256)
            DE = numeric number in the range 0-999
            CARRY = set if CR is used for defaults
dec_inpt       ld hl,inpt_buf ;set-up input buffer
                ld (hl),3 ;for 3 digits maximum
                inc hl ;advance pointer
                ld (hl),0 ;and clear digit counter
                inc hl ;advance pointer
                ld b,06h ;set counter
                clr_bf_lp ;and prefill buffer with CR's
                djnz clr_bf_lp

                ld de,inpt_buf ;point to buffer, which is now ready for
                ld c,0Ah ;read console buffer until CR function
                call bdos ;go get input
                ld a,(buf_cnt) ;get # of digits received
                and a ;did we get any digits?
                jr z,cr_only ;if not, assume default values

                ld hl,real_buf ;else, get pointer to buffer contents
                ld de,0000h ;ensure 0 result
                ld b,02h ;pre-load B, for later use
                push hl ;save digit pointer
                ld a,(hl) ;retrieve digit
                call numeric? ;is it a number?
                jr c,error_dec ;exit if not

                sub '0' ;remove ascii bias
                ld c,a ;store it temporarily
                ex de,hl ;get old number
                add hl,hl ;multiply x 2
                ld d,h ;and save it
                ld e,l
                add hl,hl ;multiply x 4
                add hl,hl ;multiply x 8
                add hl,de ;multiply x 10
                add hl,bc ;add in current digit
                ex de,hl ;put number back in DE

                ld hl,buf_cnt ;and adjust the input buffer counter
                dec (hl)
                pop hl ;retrieve digit pointer
                jr z,end_dec ;exit if done
                inc hl ;else, adjust pointer
                jr dec_2_bin ;and convert next digit

dec_2_bin      ld a,e ;put number in A as we expect 0-255
                ret
end_dec

```

TS-2068 UP-DATE the user's NEWS



A Quarterly Magazine for the users

TS-2068 UP-DATE
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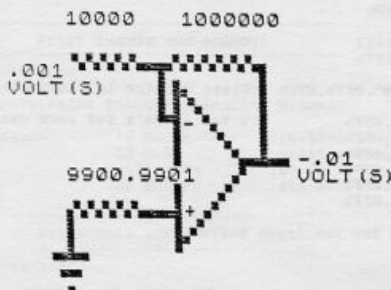

```

TYPE.....:INVERTING
FREQ.....:100000          HERTZ
AV.....:100              VOLTS
VIN.....:0.001            VOLTS

VCC=VEE....:15            VOLTS
R1.....:10000             OHMS
VOUT.....:-.01            VOLTS
BW(-3DB)..:10000          HERTZ
ZOUT.....:68.181818       OHMS
RF.....:1000000           OHMS
RS.....:9900.9901         OHMS
PH ANGLE...:-254.28941    DEGREES
ZIN.....:100909.09       OHMS

```

ENTER 0 TO SEE SCHEMATIC
ENTER 0 IF YOU WANT TO SEE THE LIST AGAIN



```

5 REM "OP-AMP DESIGN"
10 PRINT AT 0,0;"ENTER TYPE:1=
INVERTING,2=NON-INVERTING,3=DIFF
ENTIAL"
15 INPUT T
200 CLS
205 GOSUB 2000
300 PRINT AT 1,0;"ENTER FREQ"
305 INPUT FREQ
400 LET GBP=1000000
405 LET R1=1000000
410 LET R0=75
415 LET AOL=GBP/FREQ
500 GOSUB 2020
505 PRINT "ENTER AV"
700 INPUT AV
705 GOSUB 2030
80 IF T=3 THEN PRINT "ENTER V1
85 IF T=3 THEN INPUT V1
90 IF T=3 THEN GOSUB 2100
95 IF T=3 THEN PRINT "ENTER V2
100 IF T=3 THEN INPUT V2
105 IF T=3 THEN GOSUB 2110
110 IF T=3 THEN GOTO 130
115 PRINT "ENTER VIN"
120 INPUT VIN
125 GOSUB 2120
130 PRINT AT 5,0;"ENTER VCC=VEE
135 INPUT VCC
140 GOSUB 2150
145 PRINT AT 6,0;"ENTER R1"
150 INPUT R1
155 GOSUB 2130
160 GOTO 3000
2000 IF T=1 THEN PRINT AT 0,0;"T
YPE.....:INVERTING"
2005 IF T=2 THEN PRINT AT 0,0;"T
YPE.....:NON-INVERTING"
2010 IF T=3 THEN PRINT AT 0,0;"T
YPE.....:DIFFERENTIAL"
2015 RETURN
2020 PRINT AT 1,0;"FREQ..... "
:FREQ;TAB 23;"HERTZ"
2025 RETURN
2030 PRINT AT 7,0;"VOUT..... "
:VOUT;TAB 23;"VOLTS"
2035 IF ABS VOUT=VCC THEN PRINT
AT 7,16;"CLIP"
2035 RETURN
2040 PRINT AT 13,0;"ZIN..... "
:ZIN;TAB 23;"OHMS"
2045 PRINT AT 21,0;"ENTER 0 TO S
EE SCHEMATIC"
2050 INPUT S
2055 IF S=0 THEN GOTO 3995
2060 STOP
2065 PRINT AT 9,0;"ZOUT....."
:ZOUT;TAB 23;"OHMS"
2070 RETURN
2075 PRINT AT 12,0;"PH ANGLE....
"
:PH ANGLE;TAB 23;"DEGREES"
2077 RETURN
2080 PRINT AT 8,0;"BW(-3DB)..";B
W;TAB 23;"HERTZ"
2085 RETURN
2090 PRINT AT 2,0;"AV..... "
:AV
2095 RETURN
2100 PRINT AT 3,0;"V1..... "
:V1;TAB 23;"VOLTS"
2105 RETURN
2110 PRINT AT 4,0;"V2..... "
:V2;TAB 23;"VOLTS"
2115 RETURN
2120 PRINT AT 3,0;"VIN..... "
:VIN;TAB 23;"VOLTS"
2125 RETURN

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2130 PRINT AT 5,0;"R1..... "
:R1;TAB 23;"OHMS"
2135 RETURN
2140 PRINT AT 10,0;"RF..... "
:RF;TAB 23;"OHMS"
2145 RETURN
2150 PRINT AT 11,0;"RS..... "
:RS;TAB 23;"OHMS"
2155 RETURN
2160 PRINT AT 5,0;"VCC=VEE...."
:VCC;TAB 23;"VOLTS"
2165 RETURN
3000 LET AOL=GBP/FREQ
3005 GOSUB 2000
3015 IF T=3 AND AV<AOL THEN LET
VOUT=(V2-V1)*AV
3020 IF T=3 AND AV>AOL THEN LET
VOUT=(V2-V1)/AOL
3025 IF T=1 AND AV<AOL THEN LET
VOUT=VIN*AV
3030 IF T=1 AND AV>AOL THEN LET
VOUT=VIN/AOL
3035 IF T=2 AND AV<AOL THEN LET
VOUT=VIN*AV
3040 IF T=2 AND AV>AOL THEN LET
VOUT=VIN/AOL
3045 IF T=1 OR T=2 THEN GOTO 305
5
3050 IF T=3 AND V2>V1 AND ABS V
OUT>VCC THEN LET VOUT=VCC
3052 IF T=3 AND V2<V1 AND ABS V
OUT>VCC THEN LET VOUT=-VCC
3055 LET BW=ABS (GBP/AV)
3056 IF T=3 THEN GOTO 3065
3057 IF T=2 AND (VIN+AOL)*VCC TH
EN LET VOUT=VCC
3058 IF T=2 AND (VIN+AV)*VCC TH
EN LET VOUT=VCC
3059 IF T=1 AND (VIN+AV)*VCC TH
EN LET VOUT=-VCC
3061 IF T=1 AND (VIN+AOL)*VCC TH
EN LET VOUT=-VCC
3065 IF T=1 OR T=3 THEN LET PH A
NGLE=-180-(ATN (FREQ/BW)*57.295
77951)
3070 IF T=2 THEN LET PH ANGLE=-A
TN (FREQ/BW)*57.29577951
3071 IF T=1 OR T=2 THEN GOTO 307
8
3072 IF T=3 AND V1=0 THEN LET PH
ANGLE=ATN (FREQ/BW)*57.29577951
3075 LET B=1/AV
3080 IF T=2 THEN LET RF=(AV-1)*R
1
3085 IF T=1 OR T=3 THEN LET RF=A
V*R1
3090 IF T=1 THEN LET ZIN=R1+(RF)
/(1+AOL)
3095 IF T=2 THEN LET ZIN=ABS (1+
B*AOL)*R1
3100 IF T=3 THEN LET ZIN=2*R1+(R
F/(1+AOL))
3101 IF T=1 OR T=2 THEN GOTO 310
2
3102 IF T=3 AND V2=0 THEN LET ZI
N=R1+(RF)/(1+AOL)
3104 IF T=3 AND V1=0 THEN LET ZI
N=((R1+RF)*(1+B*AOL)*R1)/((R1+
RF)+(1+B*AOL)*R1)
3105 LET ZOUT=RO/(1+B*AOL)
3110 IF T=1 OR T=2 THEN LET RS=(
RF+R1)/(RF+R1)
3115 IF T=3 THEN LET RS=R1
3120 GOSUB 2090
3125 IF T=3 THEN GOSUB 3135
3130 IF T=1 OR T=2 THEN GOSUB 21
20
3135 GOSUB 2160
3140 GOSUB 2030
3145 GOSUB 2030
3150 GOSUB 2065
3155 GOSUB 2140
3160 IF T=3 THEN GOTO 3170
3165 GOSUB 2150
3170 GOSUB 2075
3175 GOSUB 2040
3180 CLS
3990 REM :GRAPHICS
3995 CLS
4000 FOR B=11 TO 29
4005 LET A=23
4010 GOSUB 9500
4015 FOR C=23 TO 23
4020 FOR D=10 TO 20
4025 PLOT C,D
4030 NEXT D
4035 NEXT C
4040 FOR A=23 TO 23
4045 FOR B=29 TO 20 STEP -1
4050 PLOT A,B
4055 NEXT A
4060 NEXT B
4065 PLOT 34,20
4070 PLOT 35,20
4075 PLOT 36,20
4080 PLOT 37,20
4085 PLOT 38,20
4090 FOR B=11 TO 29
4095 PRINT AT 11,20;VOUT
4097 PRINT AT 12,20;"VOLT(S)"
4098 IF ABS VOUT>VCC THEN PRINT
AT 13,20;"CLIPPED"
4100 PLOT 23,14
4105 PRINT "4"
4110 PLOT 23,25
4115 PRINT "-"
4120 FOR A=21 TO 23
4125 LET B=25
4130 GOSUB 9000
4135 FOR A=19 TO 23
4140 LET B=14
4145 GOSUB 9000
4150 FOR A=10 TO 18 STEP 2

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4155 LET B=14
4160 GOSUB 9000
4165 FOR A=9 TO 17 STEP 2
4170 LET B=15
4175 GOSUB 9000
4180 FOR A=10 TO 18 STEP 2
4185 LET B=31
4190 GOSUB 9000
4195 FOR A=9 TO 17 STEP 2
4200 LET B=32
4205 GOSUB 9000
4210 PLOT 19,31
4215 PLOT 21,31
4220 PLOT 22,31
4225 PLOT 22,31
4230 FOR B=26 TO 30
4235 LET A=21
4240 GOSUB 9500
4245 FOR A=22 TO 34 STEP 2
4250 LET B=31
4255 GOSUB 9000
4260 FOR A=23 TO 33 STEP 2
4265 LET B=32
4270 GOSUB 9000
4275 FOR A=20 TO 31
4280 LET A=35
4285 GOSUB 9500
4290 IF T=3 THEN PRINT AT 7,0;V1
4295 FOR B=20 TO 31
4300 IF T=3 THEN PRINT AT 8,0;V
OLT(S)
4305 IF T=3 THEN PRINT AT 15,0;V
2
4307 IF T=3 THEN PRINT AT 7,0;V1
4308 IF T=3 THEN PRINT AT 8,0;V
OLT(S)
4310 IF T=3 THEN PRINT AT 16,0;"
VOLT(S)"
4315 PRINT AT 3,12;RF
4320 PRINT AT 3,4;R1
4325 PRINT AT 12,4;RS
4330 IF T=1 THEN PRINT AT 6,0;V
IN
4335 IF T=1 THEN PRINT AT 7,0;V
OLT(S)
4340 IF T=2 THEN PRINT AT 15,0;V
IN
4345 IF T=2 THEN PRINT AT 16,0;"
VOLT(S)"
4350 IF T=2 THEN GOTO 4425
4355 IF T=3 THEN GOTO 4485
4360 REM INVERTING GROUND(+SIDE)
4365 FOR B=10 TO 14
4370 LET A=8
4375 GOSUB 9500
4380 FOR A=6 TO 10
4385 LET B=9
4390 GOSUB 9000
4395 FOR A=7 TO 9
4400 LET B=7
4405 GOSUB 9000
4410 PLOT 8,5
4415 GOTO 4535
4420 REM NON INV. GND.(-SIDE)
4425 FOR B=27 TO 31
4430 LET A=8
4435 GOSUB 9500
4440 FOR A=6 TO 10
4445 LET B=25
4450 GOSUB 9000
4455 FOR A=7 TO 9
4460 LET B=24
4465 GOSUB 9000
4470 PLOT 8,22
4475 GOTO 4535
4480 REM DIFFERENTIAL
4485 FOR B=8 TO 13
4490 LET A=21
4495 GOSUB 9500
4500 FOR A=22 TO 34 STEP 2
4505 LET B=8
4510 GOSUB 9000
4515 FOR A=23 TO 33 STEP 2
4520 LET B=7
4525 GOSUB 9000
4530 FOR A=33 TO 37
4535 LET B=4
4540 GOSUB 9000
4545 FOR A=34 TO 36
4550 LET B=2
4555 GOSUB 9000
4560 PLOT 35,0
4565 FOR B=4 TO 8
4570 LET A=35
4575 GOSUB 9500
4580 PRINT AT 16,13;RF
4585 PRINT AT 0,0;"ENTER 0 IF YO
U WANT TO SEE THE LIST AGAIN"
4590 INPUT L
4595 IF L=0 THEN GOTO 4605
4600 STOP
4605 CLS
4610 GOSUB 2000
4615 GOSUB 2020
4620 GOSUB 2090
4625 IF T=3 THEN GOSUB 2100
4630 IF T=3 THEN GOSUB 2110
4635 IF T=1 OR T=2 THEN GOSUB 21
20
4640 GOSUB 2160
4645 GOSUB 2130
4650 GOSUB 2030
4660 GOSUB 2065
4665 GOSUB 2140
4670 GOSUB 2150
4675 IF T=3 THEN GOTO 4685
4680 GOSUB 2150
4685 GOSUB 2075
4690 GOSUB 2040
4695 CLS
9000 PLOT A,B
9005 NEXT A
9010 RETURN
9500 PLOT A,B
9505 NEXT B
9510 RETURN

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Hatch Your Own...

MICKEY-MOUSE GRAPHICS

by Fred Nachbaur, D.I.M.W.I.T. *

I'll start this article with a little T/S soap-boxing. Perhaps I should add the disclaimer that these are my views, not necessarily those of this magazine (or anyone else, for that matter).

Recent times have seen a lot of attention to video digitizing; converting an image from a video signal or from hardcopy, into an image in computer RAM, which can then be displayed on the CRT screen. This results in realistic images ONLY if you happen to have a color Mac or an Amiga, with their ultra-high resolution, huge color palette, and correspondingly humungous RAM.

However, when using the Timexes and Sinclairs (even the 2068 and QL), this has always struck me as a case of the tail wagging the dog. Even the best images that result are grainy, with unrealistic colors. In short, "Mickey-Mouse."

The situation gets even worse when converting such images back to hardcopy. When using a printer, even the finest software gives only rather primitive grey-scales. Color plotters might seem to be an improvement at first glance, but with their palette of (typically) four colors, the pictures that result are usually little more than interesting curiosities.

What has always fascinated me about the computer is its capability to GENERATE graphic images. What does a computer do best? Compute! I.e., crunch numbers, slavishly running complex mathematical formulas and displaying the results in graphical form. From this viewpoint, the only difference between the ZX81 and the Cray II is speed of execution. (Well, ok. There may be one or two other, albeit minor, differences.) To paraphrase an ancient philosopher, "Give unto VCR's that which is video, and to computers that which computes."

It is entirely thanks to the computer that a whole new geometry has emerged; the "fractal" geometry discovered and pioneered by Benoit Mandelbrot and friends, and explored by countless amateur computerists. Fractals are not the only "interface" between mathematics and art; the side-panels accompanying this article, showing how a mouse hatches from an egg, was done with Fourier analysis, a mathematical procedure two centuries old. Want more? How about wire-frame graphics of geometric shapes, "wallpaper" algorithms, "Navajo rugs," spirograms, and on and on.

Very well, now that your computer has taken some nifty algorithm and transformed it into a breath-taking display, how do you save it for posterity? Sure, you can save screens and recall them later, but what if you want faithful hardcopy? As mentioned earlier, ordinary printers work fine with monochrome images and line-drawings. Inexpensive color printers or plotters do a little better, since they can print in red, green and blue in addition to black. Such images still fall far short of the color capability of the QL, TS2068, or TS1000 with Oliver TI video. Darn. Guess we'll just have to go out and buy a \$2000 color laser printer. WRONG!!!

Super-CHEAP Super-GRAPHICS

Timexers have become renowned for finding simple solutions to hairy problems. Is there an inexpensive way of getting faithful hardcopy of even the most complex color screens? Going further, is there any way of getting color hardcopy from a completely stock TS1000 with its black-and-white TV? The answer to both questions is YES. Would you believe that the first is possible with hardware you probably already own, no additional software, at a cost for supplies under 50 cents per copy? Or that breath-taking color from a ZX81 takes just a little more software savvy, patience, and experience?

The solution lies in something that might seem pretty "Mickey-Mouse" at first, but is really very elegant and simple. We're going to take a look at an "ancient" technology, going way back to a certain Mssr. Daguerre. That's right; ordinary, everyday photography. Many people are under the delusion that taking a picture of a CRT screen is impossible, or at best, very difficult. In actual fact, it's barely more involved than taking a snapshot of your fishing buddy proudly displaying his prize minnow.

* Dabbler In Many Weird, Interesting Technologies

THE POLAROID APPROACH

I have seen acceptable snapshots done with some of the newer Polaroid or Kodak "instant cameras." These have the advantage of providing hardcopy within seconds of taking the snap. However, there are a few problems associated with these that make them less than ideal, assuming that you don't need the "instant" feature.

One problem has to do with parallax. At the close range that is required, these and other "viewfinder" cameras will displace the image because of the distance between the viewfinder and the "taking" lens. Another problem is that the user seldom has full control over exposure time and lens aperture. Further insight into this may come when you read the following section. Lastly, your acquired picture is the only one of its kind. There is no cheap way of making dupes and enlargements, or correcting minor exposure or framing errors.

THE VERSATILE SLR

I've found the SLR (single-lens reflex) 35 mm. camera to be the best tool for taking photos of computer-generated images. Even a cheap, used, off-brand model will be fine for the task at hand. Since focusing and framing is done via the same lens as is used for taking the actual picture, there is never a parallax problem. Furthermore, you generally have full control over exposure time (shutter speed) and aperture, the two main variables determining your final picture.

A tripod is very helpful, almost essential. You CAN do without it, by bracing your camera atop a stack of books or other props, but a decent tripod makes it SO much easier and less frustrating.

SHUTTER SPEED

The reason that a tripod is needed, is because acceptable pictures are only produced at slow shutter speeds. Consider that a TV or monitor screen is basically a serial device, scanning a complete picture in 1/60th of a second. If shutter speed is less than 1/60, then only a portion of the screen will actually expose the film. Also, actual shutter speed at 1/60th will rarely be EXACTLY the same as the vertical interval of your computer, nor will it be in "sync". The result can be narrow bands of darkness (not exposed), or brightness (partially double-exposed). Since most SLR's have a "focal-plane" shutter, they will also tend to introduce diagonal bars or "tears" in your picture if the timing isn't perfect. Shooting at 1/30th reduces both effects, and shooting at 1/15 virtually eliminates them. However, to be completely safe, you might consider shooting at 1/4 sec. This corresponds to an exposure of 15 frames; one partial exposure out of 15 full ones will never be noticed.

APERTURE

The other control that varies the amount of light that reaches the film is the lens aperture setting. There are basically two ways of setting this; by using a light-meter, and by trial and error. If you use a light meter, fill your screen with a representative image, to get a reasonable starting point.

WARNING TO ADVANCED SHUTTER-BUGS: Even though your CRT is actually emitting light, DON'T use an incident light meter. Use your good old reflected light meter. The reason is that the CRT behaves photographically AS THOUGH it were reflecting light from an external source.

If you use the trial-and-error approach, shoot a test roll at various apertures, at both 1/8 and 1/15 second shutter speeds. Fill the screen with a representative image, containing approximately equal areas of all colors. When the roll comes back, look at the NEGATIVES to find the one(s) that have the best exposure. HINT: use a B&W film of the same speed as your proposed color film, and "develop only" to keep costs down.

Whether you use your light meter, or the trial-and-error approach, don't go whole-hog on your first session. Have your first run of pictures developed first. You can thereby inspect the negatives to make any necessary corrections. One reason is that some films exhibit "reciprocity effect" at long exposure times, making light meter readings less accurate. Another is that the garden-variety "averaging" meter may not give a true reading with the photographically "unusual" subject matter.



Adjust your contrast and brightness as well as the color controls to give the clearest picture possible. A lower "brightness" than usual will generally give superior photos. At the other end, extremely dim screens will typically have a bright "edge" or "flare" at the juncture of different colors. If you have a video peaking control, adjust it to give a sharp image without flares. Mark the optimum settings with a Jiffy-marker, to make your setup easy to duplicate next time. Unless you're experimenting with special effects (as below), be wary of changing your monitor settings during a photo session.

I found that when using my 13" SaKata color monitor with the QL, and shooting on 200 ASA Fuji film, my optimum setting was f11 at 1/15 sec., and f16 at 1/8 second. The pictures shot at 1/15 were indistinguishable from 1/8 second, using an older-model Canon SLR.

If you have several monitors, use your best one for your photo sessions. Look at color saturation, sharpness, and geometry (are rectangles truly rectangular? Are circles circular?).

LIGHTS OUT!

This is important. If you ignore this, you'll be sorry when you get your prints back. When taking your picture, the room should be completely darkened. The ONLY light source should be your monitor. The reason is that any light in the room will cause reflections from the front glass of the monitor. "Anti-reflective" coatings or glass will NOT eliminate this effect! You may not even notice it while taking the picture; the eye (brain) is remarkably adept at tuning out such "noise." The camera, however, is adamantly unforgiving.

Other advantages to "lights out" are that blacks will truly be black, and that the frame of the monitor will usually not show. If it does, consider painting it black (or covering with black camera tape) before further experiments.

This next admonition may sound silly to advanced shutter-bugs, but you'd be surprised at how many people will make this error; using an electronic flash. Pictures taken with a flash will only be pictures of a blank white screen. Remember, the video display is a light SOURCE. It does NOT operate by reflecting incident light. Using a flash will completely wash it out.

FRAMING

As mentioned earlier, using an SLR will allow you to exactly frame your picture. Take the time to frame your screen properly. Not only should the TV screen be centered in your viewfinder, but it should also be free of distortion because of an improper viewing angle. Pay close attention to the top and bottom; if the top is wider than the bottom you'll have to physically lower the camera, and vice versa. Same goes for left-right alignment. Stand back from your setup as another check; the plane of the TV screen should be exactly perpendicular to the camera lens' line of sight. (Now do you see why I recommend using a tripod?)

Finally, don't fill the entire viewfinder frame. Most cameras (the inexpensive ones, anyway) don't have an exact correlation between the borders of the viewscreen, and the actual edge of the film image. Furthermore, in process of printing, a little bit of the image is always lost around the edges. Keep the TV screen image in an area about 90% of the full viewscreen, and you should be alright.

Advanced Topics

If you're a more advanced photographic enthusiast (perhaps even a professional), there is really no limit to the magic you can do with your computer and camera. I'll touch on some ideas for you to experiment with.

MULTIPLE EXPOSURES

If your camera allows double or multiple exposures, and if you have at least some software expertise, you can have yourself a field day.

How about unlimited colors? One way to do this is by using your TINT control to give colors not "normal" for your machine; e.g. browns, fleshtones, violet, etc. The reason I mention software expertise is that you'll have to figure out some way of "filtering" all but the desired color(s), leaving the rest black. Make an exposure of these, then reprint the screen with your "alternate" colors, adjusting TINT to give the desired effect. Make the second exposure. Continue as far as practical, or you have patience for.

At the beginning of this article I promised a way of displaying full-color images from a stock ZX81, using an ordinary white-screen TV set. Again, multiple exposures can be used to display as many colors as you like. This time, however, you'll need a set of optical filters of the desired colors, as well as the ability to do "software filters" to display only the material of each color, for each exposure. Ordinary colored cellophane actually works surprisingly well. If you're in a larger city that has a motion-picture supply house, try to get a booklet (usually free) of "sample" lighting filters, as supplied by Lee and other companies.

When using optical filters, you'll also have to know the "filter factor" for each color filter used. If not given, you can get an approximation by using your light meter; point the camera at a blank white wall, and note the f-stop reading. Put the filter in front of the lens, and determine by how many stops the light has been decreased by the filter. This will typically be between 1/2 and 2 f-stops. Use this data to compensate your aperture opening during exposure.

Let's say you want to do a color picture of a particularly neat fractal. Plot only those points corresponding to each color, then shoot it with the appropriate filter. Continue to your heart's content. In principle, especially if you are doing the picture in WRX16 hi-res, you can come up with pictures that look as if they were done on a Mac.

When doing multiple exposures, a GOOD tripod is absolutely essential. So is a bulb or cable release. The SLIGHTEST movement will throw your picture out of registration, and thus betray your "secret."

Another factor that affects registration is electronic in nature. Especially at high brightness, the distribution of light and dark on a CRT can affect the width (and sometimes even the height) of the displayed image. This is called "blooming." Reduce blooming to a minimum by using the lowest brightness that will give an acceptable picture.

Many cameras, especially the more modern ones, are extensively interlocked against accidental multiple exposures. Fine for the ordinary snap-shooter, but a real bane for advanced amateurs and beyond. Some cameras can be "tricked" into multiple exposures by holding the rewind release button while advancing the film. I say "some," because while many will allow this, they may not

Keep perfect registration. The only way to find out if your camera holds the film securely enough during this operation, is to experiment.

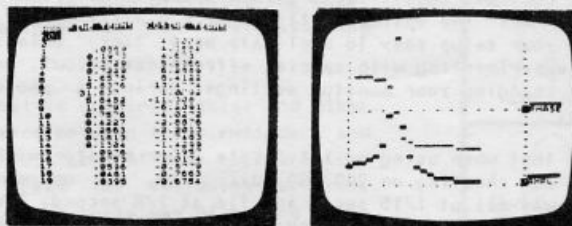
This next suggestion might curl the toe-nails of pro's and semi-pro's, but don't write it off as "just one of ol' Fred's ravings." Remember the Argus C-3? These were made by the millions in the '50's, and are still giving camera reviewers flashback nightmares. However, it is IDEAL for playing around with computer photography. Why? Let me count the ways. It can be picked up CHEAP at any photographic junk shop. It uses readily available 35mm film. It has a between-the-lens leaf shutter, causing much less trouble with video images than do focal-plane shutters. It are almost too easy to double-expose. Its blocky shape is a boon if you don't have a tripod, and rely on a stack of bricks to keep your act together. Focusing is easy with its split-image rangefinder. The only thing you'll really have to worry about, is parallax. However, this won't take you long to compensate, with a little experimentation.

SELECTIVE DEFOCUSING

Getting back to our friend, the SLR, there is another trick you can use to actually IMPROVE the image you see on the TV, especially with color monitors. Since these have discrete dots making up the plane of the display, the photos that result can have an obviously grainy "video" look.

Most SLR's automatically open the aperture all the way during set-up and focusing, both to allow for maximum brightness and to narrow the depth-of-field to make focusing easier. However, all but the cheapest ones have a way to override this, so you can view your scene at the actual aperture selected. You can use this feature to slightly de-focus your image, causing the discrete phosphor dots on the CRT to blend together.

You'll have to use judgement, and the wisdom of experience, to determine how much defocusing is ideal. Not enough, and you still have the grain. Too much, and you lose resolution, making the picture look obviously out of focus. Done right, however, it will be difficult to tell that the resulting photos were shot from a TV or monitor screen.



A PARTING SHOT....

I'll leave you with a little anecdote. Shortly after the ZX81 came out, I worked up my first "big" program. The TS2040 was not yet available, and I refused to buy that awful "ZX" printer. Guess how I generated program listings, and screen dumps for my documentation? That's right, I used my trusty rusty SLR to shoot each screen, then had the film contact-printed. Early purchasers of my original FOURIER package (the predecessor to the program that did the side-panels shown here) may still be wondering to this day, how I got those clean, sharp "mini screen-dumps" back in those bad old days. Well now you know.

The circle is complete. From a stop-gap measure because suitable printers didn't exist, to high-res color fractals, good old conventional photography STILL has little competition if you want striking color hardcopy of your graphic computer displays. Especially if you consider the cost!

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All the games listed in this ad will run on the ZX81, TS1000 or TS1500 with 8K static RAM and 16K user RAM. ("VOYAGE OF THE SEAWITCH" requires 32K or more.)

DUNGEON OF YMIR - V3: The Classic adventure game. The author set out to write the best game ever produced for the ZX computers. The word is in - he has succeeded. You can't imagine it until you've played it. Includes Zebra joystick version. Price: \$19.95

BARGAIN PAK #1: (by F. Nachbaur) Includes BLACKJACK, HI-RES CHESS, and INVADERS. Arcade action, casino fun, and thought-provoking entertainment all on one inexpensive tape. Only \$14.95!

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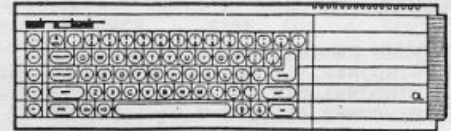
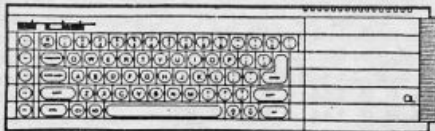
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PLAYING WITH ELECTRICITY

Harvey Taylor



Tucked away in a description of the QL hardware in the Technical Guide is mention of the fact that bit 7 of the Display Control Register "can be used to switch the base of screen memory from \$20000 to \$28000". Hmm, interesting I thought and went on to more pressing concerns.

Recently, I went back to investigate the dual screen display. There is a discussion & program dealing with it in Adrian Dickens "QL Advanced User Guide". The news is it is real; but flawed. First a quick overview of the QL memory map.

K	HEX	USE
256K	00040000	Top of On Board RAM
192K	00030000	Top of Screen1 Top of Common Heap Base of Common Heap
	00028480	Top of Sys_Var
160K	00028000	System Variables & Base of Screen1
	00027FFF	Top of Screen0
128K	00020000	Base of Screen0

The immediate problem with the second Screen is the fact that the System Variables are locked into \$28000 which is the base of Screen1. This means that if you simply flick the bit which controls the base of the display, you will get a bunch of garbage on the top of your screen. The garbage is the video representation of the System Variables.

You can take a look at this effect with the following short Superbasic Procedure.

```

100 REMark switch in Screen 2
110 :
120 DEFine PROCedure SWITCH
130   SV_MCSTA=163892 : REMark $28034
135   DC_REG =98403 : REMark $18063
140   DCR_STATUS=PEEK(SV_MCSTA)
150   DCR_STATUS=DCR_STATUS ^ 128: REMark toggle bit 7
160   POKE SV_MCSTA,DCR_STATUS : REMark tell Sys_Var
170   POKE DC_REG,DCR_STATUS : REMark tell hardware
180 END DEFine SWITCH
190 :
```

This is interesting, but useless. To make a useable display, one has to be a little trickier. One of the neat things about the QL is that QDOS is extensible. In particular, one can link in tasks for the QL to perform after each interrupt. There is a level 2 Interrupt (called a Frame Interrupt) on the QL every 1/60 second; which is related to the Vertical Sync signal.

What we need to do is link in a short Task which checks what screen we are displaying; then if we are displaying Screen0, do nothing, while if we are displaying Screen1, wait until the display has passed the 5K or so of System Variables then switch in Screen1.

The assembly language code to do this is listed below in the file DualScr.asm. Once you have this code installed, you will run into the next problem. There is no support in QDOS for writing to Screen1. It is evident that in the development of the QL, this was a matter of some debate, because in the SCR/CON Channel Definition Block (CD_Blk), there is an entry (SD_SCRB) Base address of screen. The unfortunate fact is that the SCR/CON device driver does not use this variable. Instead the base address (\$20000) is hardcoded into the driver. This was no doubt done in concert with the decision to tie the System Variables at \$28000.

As the QL is at present, if the driver did use the CD_Blk variable, clearing the screen would erase all the System Variables; so it is just as well that it is not implemented!

What's to do? It seemed to me that the simplest method to use would be to simply copy Screen0 into the useable part of Screen1. The Superbasic extension SCOPY performs this task. I wanted a Clear Screen1 capability as well, so I added the PROCedure SCLR. This procedure expects one parameter which is used to colour Screen1. The video ram of the QL display is arranged thus:

```

Mode 4
Even Byte : Odd Byte
76543210 76543210 - Bits
GGGGGGGG : RRRRRRRR      G - Green
                                R - Red
                                F - Flash
                                B - Blue

Mode 8
Even Byte : Odd Byte
76543210 76543210 - Bits
GFGFGFGF : RRRRRRRR
```

Passing SCLR the parameter 0, will paint the screen black. You can play with other parameters to see the effect of setting various bits. If you use 65280 for Green, the interpreter returns an overflow error; but -256 works fine. 255 paints the screen red.

The procedure SCR0 turns off the Auto-Toggle and gives you the default display, ie. Screen0. The procedure SCR1 turns off the Auto-Toggle and gives you Screen1. The procedure SCRA turns on the Auto-Toggle; ie. switch between the two screen using <CTRL><F5>.

The function SCRNUM tells you which screen is currently being displayed, 0 or 1. The function SWHERE tell you the base of the Common Heap Memory reserved by the initialization code.

There are some proviso's with this code. It should be initialized from a boot: in particular before a directory of a second device is done. This is because we want Screen1 to begin as close to the Base of the Common Heap as possible. If you do a directory of another device before initializing; QDOS reserves some common heap as a Channel Definition Block and a Physical Definition Block. This will show up as a white band similar to what SWITCH produces.

Related to this situation is the value of the Timeout value used to wait before switching Screen1 on. See the comments in the .asm file.

The other proviso, is that the dividing line where Screen1 switches in is not stable. The easiest way to handle this problem, is to put a black border over the region similar to the PROCedure SDEMO below.

The first SBasic program below creates a file DSCR_ext which is used by the second the SBasic program SDEMO.

```

100 REMark PLAY WITH SCREEN UTIL
110 :
120 LAYOUT
130 INIT
140 DEMO
150 STOP
160 :
170 DEFine PROCedure DEMO
180   PAPER 0: CLS
190   PICTURE
200   PAPER 4
210   AT 0,0: PRINT 'SCREEN 1'
220   SCOPY
230   SCR1
240   CLS
250   SCR0
260   SCRA
270   LIST TO 260
280   AT 0,0: PRINT 'SCREEN 0'
290   PRINT#0,'USE <CTRL><F5> TO TOGGLE SCREENS'
300 END DEFine DEMO
310 :
320 DEFine PROCedure PICTURE
330   FOR M=0 TO PI STEP .25: FOR N=0
TO 105 STEP 15 : INK (RND(2,6)): CIRCLE 20
0,128,N,.5,M: END FOR N : END FOR M
340   INK 7
350 END DEFine PICTURE
360 :
370 DEFine PROCedure INIT
380   nam$='SCR2_ext'
390   dev$='flpl_'
400   LBYTES dev$ & nam$,RESPR(512)
410   PRINT'Loaded'
```


be learned from this section of code. In the QL, the SuperBASIC memory area is dynamic. It can grow or shrink and move about within memory. For this reason, the A6 register is used to point to the base address of this area. Any particular location in this area, including SuperBASIC system variables or the BASIC program, is referenced relative to A6. Each area of this memory is indexed by two pointers, for the start and the end. These "stacks" are upside down. The SuperBASIC system variables start at offset \$00. (Note: I will be using "\$" to indicate numbers in HEX.) Each procedure, function, and variable created from within SuperBASIC is indexed via a name table and a name list. Their starting addresses are found in the SuperBASIC system variables area. Their offsets are \$18 (BV.NTBAS) and \$20 (BV.NLBAS) respectively--both long words. Their ending addresses are found at offsets \$1C (BV.NTP) and \$24 (BV.NLP).

The Name Table is composed of blocks of eight bytes. This block contains information on the type, a pointer to the location in Name List, and a pointer to the value. See Table 1 for a complete breakdown of this information.

Let's now look at the *calc* routine of the code. The comments accompanying the first few lines of this routine are misleading. The result of *move.l \$1c9a6),a1* does not retrieve the actual address, only the offset from A6. By adding A6 to A1, the actual ending address of the table is found. Since the SuperBASIC variables we wish to pass to the machine code program are floating point, we are looking in the Name Table for the occurrence of "\$0202" (see Table 1). The actual names are stored in the Name List with one byte for the length of the name, followed by the ASCII of the name. Checks are made through the Name Table for floating point variables. If one is found, its entry in the Name List is calculated and a check for either *c1* or *c2* is carried out. By declaring the machine code variable *space* as a long word of 0 and by transferring the data from the Name List into the first 3 bytes of *space*, we can make a long word check against D1 and D2 (see section labeled *floatpoint*). The Name List is not arranged in a normal 68000 manner. It is customary, in 68K assembly language, to insure that all addresses be on word boundaries (i.e., even addresses). When found, the addresses of the actual floating point values are stored in their appropriate machine code spots.

Floating point variables are stored in the QL with six bytes (a 16-bit exponent with a 32-bit mantissa). Integers are stored as two's-complemented words. The QL stores strings with the first word defining the length of the string, followed by the actual string itself. If the string is an odd number of bytes long, it will be stored with a spare byte to adhere to the normal 68K convention of word boundary addresses. Array storage is rather complex. There is one long word as a relative pointer to the actual start of data. This is followed by a word for the number of dimensions. For each dimension, a pair of words is used which define the dimension along with an index multiplier for it. This preamble is followed by the actual array, using the same format as stated above for integer, floating point, or string.

set_up

The first portion of this section moves the actual floating point data from the SuperBASIC variable area into our machine code variable area. We are now ready for our first voyage into the QL ROM via Vector utilities--floating point math.

Before any calculations are carried out, a check for ample space on the maths stack should be performed. This is accomplished by the Vector utility \$11A (BV.CHRIX - reserve space on maths stack). Upon entry, D1 should contain the number of bytes needed (as a long word). When exited, the following registers are effected:

D1 corrupted	A0 preserved
D2 corrupted	A1 preserved
D3 corrupted	A2 preserved
	A3 preserved

If there is insufficient space on the stack, this Vector call will expand it. This may entail moving the stack's location. The location of the stack is found by checking the SuperBASIC variable BV.RIP, which has the offset from A6 of \$58.

bigloop

Floating point routines, within the QL ROM, are accessed by two different Vectors, RI.EXEC - \$11C for one operation and RI.EXECB - \$11E for a list of operations. Upon entry, the following registers should be set up as follows:

D0.W	operation code (RI.EXEC only)
D7.L	set to 0 to insure reliable execution
A1.L	pointer to maths stack (relative to A6)
A3.L	pointer to the list of operations (RI.EXECB only)
A4.L	pointer to base of variable area (relative to A6)

The following registers are affected by the call:

D1 preserved	A0 preserved
D2 preserved	A1 updated pointer to maths stack
D3 preserved	A2 preserved
	A3 preserved
	A4 preserved

An error report -18 in D0 will indicate an arithmetic overflow.

See Table 2 for the various math functions available. All results of the math operations will be found on the top of the stack. RI.DUP (duplicate) is the only exception, in that it will increase the stack by one item and update the stack pointer leaving two items on the stack. The first four remove the first item on the stack and replace it with the result. The next four (along with RI.POWFP) take both items on the stack and replace them with one item and thus decrease the size of the stack. The remaining functions will remove the top item on the stack and replace it with the result. To use the RI.EXECB (list of operations), A3 should point to the list of bytes (opcodes). This list must end with \$00.

All of the math operations carried out by this portion of the code have only two items on the stack, though room was reserved for 4 floating point numbers. This allows us to leave certain items on the stack and by changing the stack pointer, carry out another operation. Finally, this new result can be combined with other items left on the stack for further math operations. This saves the need of pulling items off the stack, storing and retrieving them when needed later. Scan the code between *bigloop* and *check* and see if you can trace this manipulation of the maths stack. (Refer to the first article in this series to see a BASIC version of the calculations being carried out by this portion of the code.)

The remainder of the Madelbrot Source Code should be fairly self explanatory.

SNAPSHOT SOURCE CODE

IMPORTANT NOTE: There is a major error in both the source code and the BASIC loader (Listing 4, TDM Nov/Dec '87) for the Snapshot machine code routine. A "typo" reversed two numbers in the source code. In the source code, lines labeled *snapshot* and *paste* should read 131086 not 131068. In the BASIC Listing (see lines 1000 and 1020) "8828,1,-4,16890" should read 8828,2,14,16890. My apologies to all who could not de-bug this careless error.

This is a straight-forward piece of code. It reads a group of bytes form a certain section of the screen's memory map and stores them in a variable area contained in the machine code program. My approach to accomplish this was rather amateurish, but quick and dirty. To find the actual starting point for the upper left-hand corner of the mini-window area, I POKE'd numbers into the screen's memory until I found the exact point. the screen's memory starts at \$20000 or 131072d and is a total of 32K long. The actual screen grid is 128 bytes wide and 256 bytes high. The mini-window is 24 bytes wide and 36 bytes high. The window starts 14 bytes from the start of the screen and is 24 bytes wide. By adding 80 to the last address of the window's scan line, we will be exactly 1 line below the start of the previous location (or a total of 128 bytes). The paste routine reverses this process by moving the copy of the mini-window area back to the screen.

start

This machine code module contains two separate routines. One, *start*, plots the mandelbrot map from already compiled data. The other one, *plot*, draws the map while it is being calculated. The first section of code (*start*, *m_loop* and *n_loop*) run through the already calculated data, setting the proper ink color and plotting each point to the screen. Let's examine the various subroutines used by both routines.

convert

This subroutine is a maths operation executed by calling the RI.EXEC Vector previously discussed. Before we can plot a point to the screen, the x and y coordinates must be in floating point forms.

ink

The color attributes for any window can be set by calling one of three Trap #3 routines. They are:

```
SD.SETPA --- D0=$27 --- paper color
SD.SETST --- D0=$28 --- strip color
SD.SETIN --- D0=$29 --- ink color
```

Upon entry, the following registers need to be set accordingly:

```
D1.B color
D3.W timeout (-1)
A0.L channel ID
```

Upon returning, the following registers are affected:

```
D1 preserved A0 preserved
D2 preserved A1 corrupted
D3 preserved A2 preserved
```

Errors: -1 not complete or -6 invalid channel ID

Channel ID's in machine code are not quite the same as Channel #'s in SuperBASIC. The Channel Table contains pointers to channel definition blocks within the common heap (or \$FF000000 if the channel is closed). The channel ID consists of two words. The low word is a reference to its location in the Channel Table and the high word is the tag number. Every time a channel is opened, its tag number will be one greater than the previously opened channel. When the QL is fired up, 3 default channels are open. \$00000000 is SuperBASIC channel #0 (the lower window), \$00010001 is SuperBASIC channel #1 (the print window), \$00020002 is SuperBASIC channel #2 (the list window). No matter what the SuperBASIC channel # is for the next channel opened (i.e., #32), it will almost certainly have the channel ID of \$00030003. The Mandelbrot program uses the default window #2 to display the mandelbrot map, making calculations of the channel ID a snap.

This section of code uses the color data POKED into memory by the SuperBASIC program (lines 2830 and 4250). The distance point from the mandelbrot set (1 to 255) is used as an index pointer to the appropriate color in this table.

plot

Graphic routines from within machine code are also accessed through Trap #3 functions:

```
SD.POINT --- D0=$30 --- plot a point
SD.LINE --- D0=$31 --- draw a line
SD.ARC --- D0=$32 --- draw an arc
SD.ELIPS --- D0=$33 --- draw a circle or ellipse
SD.SCALE --- D0=$34 --- define scale and origin
SD.GCUR --- D0=$36 --- define text cursor position
```

Upon entry, the following registers must be prepared:

```
D3.W timeout (-1)
A0.L channel ID
A1.L maths stack pointer
```

Upon exit, the following registers are affected:

```
D1 corrupted A0 preserved
D2 preserved A1 corrupted
```

Each of the functions require that certain parameters (floating point form) be placed on a maths stack pointed to by A1. This stack is also upside down. To insure successful operations of the functions, there should be 240 bytes free on the stack. See Table 3 for the parameters which must be on the stack (relative to A1) for each of the graphic routines.

start2

Unlike the routine at *start*, this routine only plots one point at a time, updating the machine code variables for the x and y coordinates before returning to BASIC. It also uses the same subroutines detailed above.

Some of the variables used by this code may have been POKED into their location from SuperBASIC (array, m_point, n_point and color). This is another round-about method of passing parameters from SuperBASIC to machine code.

I hope this article will be a start for the aspiring 68000 machine codists. There is a great potential lurking in the heart and soul of the QL, and most of it is easily accessible via machine code. I feel that 68K machine code is much more flexible and dynamic than Z80. (Now, now, if any of you Z80 fans have gotten this far, don't count me as an ex-Z80 buff. One will still find me hacking away at the ole Silver Avenger--TS2068!!) With the availability of a large number of Traps and Vectors, much of the chore of coding in assembly language has been removed. Once again, I would like to apologize to any who may have lost a few nights sleep due to the error in the Snapshot code.

Due to the length of the source code listing of Michael Carver's Mandelbrot machine code subroutine, this listing will be included next issue, when this series concludes.

_ editor

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TABLE 1 -- Variable types

word	defines the type of the name
\$0001	undefined string variable
\$0002	undefined floating point number
\$0003	undefined integer
\$0101	string expression
\$0102	floating point expression
\$0103	integer expression
\$0201	string variable
\$0202	floating point number
\$0203	integer
\$0300	substring (used internally only)
\$0301	string array
\$0302	floating point array
\$0303	integer array
\$0400	SuperBASIC procedure
\$0501	SuperBASIC string function
\$0502	SuperBASIC floating point function
\$0503	SuperBASIC integer function
\$0602	REPEAT loop name
\$0702	FOR loop counter (floating point)
\$0800	machine code procedure
\$0900	machine code function
word	pointer to entry in name list (or -1 if expression)
long	pointer to value (For variables this is an offset into the variable area, or if undefined, a negative number). For SuperBASIC procedures and functions, the high word is the line number of the DEF statement. For machine code functions and definitions, the long word is the absolute address of the routine.

TABLE 2 -- Floating Point functions

OPCODE	NAME	FUNCTION
\$02	RI.NINT	INT floating point into word integer
\$04	RI.INT	truncate floating point into word integer
\$06	RI.NLINT	INT floating point form into long integer
\$08	RI.LINT	convert integer into floating point
\$0A	RI.ADD	add TOS to NOS
\$0C	RI.SUB	subtract TOS from NOS
\$0E	RI.MULT	multiply TOS by NOS
\$10	RI.DIV	divide TOS into NOS
\$12	RI.ABS	take absolute value
\$14	RI.NEG	negate
\$16	RI.DUP	duplicate

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\$22	RI.ACOS	arccosine
\$24	RI.ATAN	arctangent
\$26	RI.ACOT	arcotangent
\$28	RI.SQRT	square root
\$2A	RI.LN	natural logs
\$2C	RI.LOG10	base 10 logs
\$2E	RI.EXP	exponential
\$30	RI.POWFP	take NOS ^ TOS

TABLE 3 -- Graphic function parameters

SD.POINT	\$00(A1)	y co-ord
	\$06(A1)	x co-ord
SD.LINE	\$00(A1)	y co-ord of end of line
	\$06(A1)	x co-ord of end of line
	\$0C(A1)	y co-ord of start of line
	\$12(A1)	x co-ord of start of line
SD.ARC	\$00(A1)	angle of the arc
	\$06(A1)	y co-ord of end of arc
	\$0C(A1)	x co-ord of end of arc
	\$12(A1)	y co-ord of start of arc
	\$18(A1)	x co-ord of start of arc
SD.ELIPSE	\$00(A1)	angle of rotation
	\$06(A1)	radius
	\$0C(A1)	eccentricity (1 if a circle)
	\$12(A1)	y co-ord of center
	\$18(A1)	x co-ord of center
SD.SCALE	\$00(A1)	x position of graphics origin
	\$06(A1)	y position of graphics origin
	\$0C(A1)	scale factor
SD.GCUR	\$00(A1)	graphics x co-ord
	\$06(A1)	graphics y co-ord
	\$0C(A1)	horiz. pixel offset of cursor
	\$12(A1)	vert. pixel offset of cursor

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Time Designs Tests

TAX-I-QL/87, PACIOLI and THE SPY

by Mike de Sosa

Sounds like a spy thriller, but the title really refers to an income tax preparation program (in the nick of time), a personal or small-business double-entry accounting system, and a revolutionary multi-taskable, multi-file, universal full-screen editor--all for the Sinclair QL.

EMSOFT'S TAX-I-QL/87 * * * * 1/2

TAX-I-QL/87 is a rather complex IRS Form 1040 template designed to simplify tax preparation by individuals or tax-form preparers. It replaces TAX-I-QL which had to be rewritten from scratch. It is used with either QLSS version 2.1 or ABACUS version 2.3 and a QL with at least 256K RAM. Few instructions are on the template, and most instructions must be read from IRS forms, but this should remove a little drudgery from the process, satisfy your soul, and leave you a good record with which to impress your IRS tax auditor.

The disk version can print to IRS forms but the Microdrive version will not.

Since you probably won't read this before 30 March, I have tried to arrange an expeditious way to order the software. TAX-I-QL/87 is deductible at \$24.95. Send your check to EMSOFT, P.O. Box 8763, Boston, MA 02114-8763. Specify the Microdrive or 5 1/4" disk version, and, if the latter, whether double- or quad-density. EMSOFT will expedite shipment. No telephone orders.

A.R.K. Distributions THE SPY * * * * *

A.R.K.'s THE SPY is from Richard Howe and those wonderful folks who gave us ARCHIVIST. THE SPY is billed as a multi-file, multitaskable, universal full-screen editor. Not a word processor, the program "is designed primarily for programmers who want an editor which EXECs quickly, multi-tasks, and takes as little space as possible [in RAM] while providing all the fundamental editing facilities at the highest speed."

THE SPY lives up to this billing and more. A.R.K., for Applied Research Kernel, Distribution is in the business of designing and retailing business software, and their latest product is another good piece of work. 500K of assembler source language have been compiled onto about 200 Microdrive sectors. The people at A.R.K. believe that in the future most small computer systems will be emulated faster on Transputer* based home micros, and, if so, computer owners may be freed from the whims and follies of computer companies.

What can THE SPY do? It can load and stack as many files (programs) as your QL RAM permits, allocate working space to each, and transfer blocks of code (from assembler language to SuperBASIC) locally within files or globally between files. Files can be of any type from binary to text. It commands functions using a single keypress or combination keypress, that is, CTRL B to drop the BLOCK menu or CTRL Z to zap the current file from the stack. Other commands are via the function keys. Extremely rapid operation is possible, shifting between screens of code and moving or correcting blocks of code semi-automatically. THE SPY can, for example, load itself, customize itself, and then replace itself--something like a Phoenix.

THE SPY is said to be compatible with QRAM, KEYDEFINE, and probably with other master multitasking programs. (The software arrived too late to test its operation with other such programs and its price was not mentioned, but Mark at SHARP's should have the "straight skinny" on price and compatibility by the time you read this.)

* Transputer. A firmware/hardware addition for microcomputers that will vastly increase their speed of operation and versatility so that computers like the QL might become virtually obsolescence proof. Leon Heller, editor of QUANTA, has been working on this revolutionary development for some time.

ZEATALINE's PACIOLI * * * * 1/2

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NEXT TIME: Full information on lots of exotic new software that is supposed to be on the way.

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by Mike de Sosa

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to give up on the Sinclair QL!

by Mike de Sosa

About four years ago I wrote an article for Reader's Digest (never published) about the new Sinclair QL microcomputer. I entitled the article "The First Lightweight, Low-cost Supermicrocomputer," and promised that the QL would soon revolutionize the computer world, including the training of computer users, financing, and logistics. And the QL promised to do just that, but a few things went wrong: early models of the QL and early versions of its bundled software were just not ready for release, resulting in some bad reviews; Sir Clive's marketing strategy left many things to be desired; the U.S. distributor, though personally helpful to me, was poorly organized and refused to advertise--the statement was made, "We don't need the U.S. market"; the Reagan administration held up FCC clearance for seven months--crucial at the time; computer sales went flat; Sir Clive almost went broke because of his electric tricycle and had to liquidate his QL brainchild; etc.

The Sinclair QL and its bundled software, is now "fully developed" through the efforts of Psion Ltd. and third-party firmware designers, notably Tony Tebby, and its price has dropped from \$500 to under \$100.

The QL remains the first lightweight, low-cost, supermicrocomputer. Many computer experts--regular users of Apple, IBM, Texas Instrument, and other PCs--have visited me and marvelled at what an intelligently augmented QL can do. (They even like the keyboard and Microdrives--unique to Sinclair--which many have previously knocked.) When I tell them what the computer and its allied software, firmware, and hardware cost, their jaws really drop! For many of the same reasons that the QL was to have revolutionized the computer world in 1984, it remains an extremely versatile, almost obsolescence-proof computer (remember the term transputer--a new device which will, among many other things, permit the emulation [and input/output to] any type of computer, permitting the true universalization of computers--it's coming soon for the QL.)

What I'm trying to say is that the QL is an excellent machine that, when properly upgraded, will allow you to join the computer revolution and remain "state of the

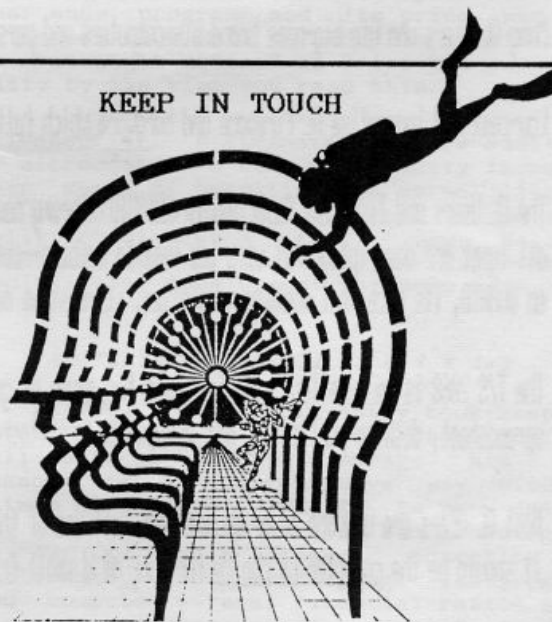
art" for the foreseeable future--and this at the very lowest cost!

Many other reasons for sticking with or upgrading to the QL are listed on the facing page, and I could go on listing them all day, mainly in connection with the many outstanding classic and new software programs now available. Did you hear that Psion Ltd's QL CHESS, running on the QL, won the World Microcomputer Chess Championship for the third time?

LOW-COST JS ROM NOW AVAILABLE

One problem with U.S. QL's is that they are furnished with JSU ROM chips rather than JS ROM chips. The former cause certain graphic distortions/relocations with some software, for example GRAPHIQL+, VROOM!, PROJECT PLANNER, DECISION MAKER, etc., thus limiting their use. Replacement JS ROM chips are now available for about \$25, and for about \$35 you can have the JS ROM plus built-in TOOLKIT II, or ICE, or Qflash RAMDISK & TOOLKIT (no, you must furnish these chips) on EPROM. For another \$10, RMG Enterprises, tel. (503) 765-2455, will even install it in your QL or a new QL, but I understand that this is a snap, requiring less than ten minutes work and no soldering. Have it put in a new QL, and buy yourself a spare QL--with JS ROM--today, the price may never be lower. Check with your favorite QL distributor for exact prices, etc.

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Like its predecessor, PD2 is simple to understand and easy to use. New features include the ability to store more fonts in memory, to store as many as nine (small) pages, to import QUILL doc files into multiple automatic or manually defined columns, new column justification options, word or character microspacing by pixel, new text and hires fonts, multi-pass printing and multiple copy options, improved text typing, and many others. CUT & PASTE operations are very fast and versatile. PD2 is available from SHARP's for under \$60.

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NEXT TIME: "Upgrading Your QL," more HOT TIPS, and more exotic wares for your QL.

DESIGNING WINDOWS

a QL program by P. Bingham

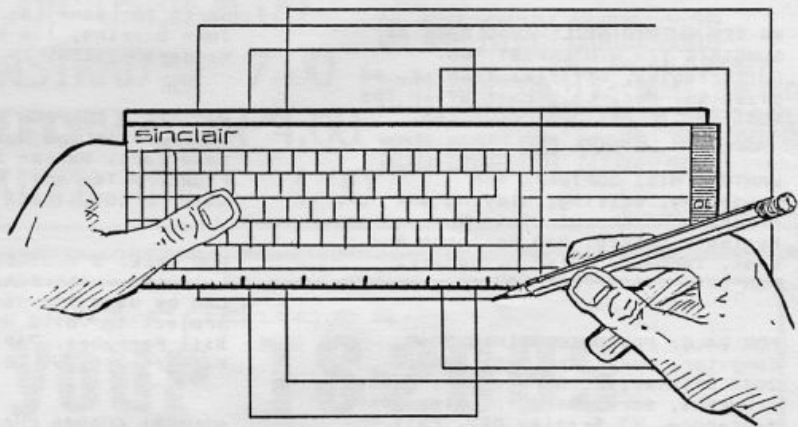
No QL graphics discussion would be complete without mention of the QL's marvelous windowing abilities. With the power allowed by virtue of Super-BASIC, the QL can handle many windows, treating each almost as separate screens. With all the window-specific commands available to the programmer, he (or she) can have control only dreamed of in other Sinclair machines.

But during programming, the actual DESIGNING of a window usually goes something like this: 1) type in WINDOW command with the four parameters set; 2) realize it isn't long enough on the screen; 3) type in another WINDOW command; 4) now it is way too long; 5) type in another WINDOW command with an in-between parameter...now what was the original value? 6) start throwing things.

A couple of years ago, I ran across a little program written by James Lucy in the British publication, *QL WORLD*. *QL WORLD* is great for QL lovers and is still worth the rather steep "poor-exchange-rate-induced" price of four bucks an issue from the few U.S. dealers who stock it. James Lucy's program was a quick little window editor for monitor owners. I have modified it quite a bit from the original (Listing 1).

The program is simple. Just type it in as is and run it. It will draw the outlines of a window. Then by using the arrow keys, this window frame can be moved around the screen. (If you bump into the screen edge it won't go any further.) By holding the CONTROL key down, the arrow keys will cause the box to shrink or swell to the desired size. The program moves the frame in steps of seven, but for fine tuning, just hit F1 and you may proceed a pixel at a time. To set it back to seven just hit F3. When you have what you want, hit the TABULATE key and the exact WINDOW parameters will be printed for you in the center of the screen. You may keep drawing various sized window frames over each other, or just hit ESC and the screen will clear ready to go again. The program alters each subsequent frame color so you can distinguish each more easily. Once in a while, two overlapping lines cancel each other. Not to worry, just hit an arrow key or TABULATE.

Well, fire up those QLs and start some fancy window programming again now that you have no excuses! This program will help with header blocks and thin shadow line parameters as well, so go do something to make that black and white MACINTOSH screen next door turn green with envy and your cousin's BIG BLUE turn even bluer.



LISTING 1

```

10 REMARK DESIGNING WINDOWS
20 :
30 MODE 512:WINDOW 512,256,0,0:PAPER 4:OVER-1:CLS:i=3:o=7
40 REPEAT new_window
50 x=440:y=210:p=30:q=20:windows
60 REPEAT outline
70 z=CODE(INKEY$(-1))
80 windows
90 SElect ON z
100 =240:o=7
110 =232:o=1
120 =208:q=q-o:IF q<0:q=0
130 =216:q=q+o:IF q>y>256:q=q-o
140 =192:p=p-o:IF p<0:p=0
150 =200:p=p+o:IF p>x>512:p=p-o
160 =218:q=q+o:y=y-o:IF y<2:q=q-o:y=y+o
170 =210:q=q-o:y=y+o:IF q<0:q=q+o:y=y-o
180 =202:p=p+o:x=x-o:IF x<2:p=p-o:x=x+o
190 =194:p=p-o:x=x+o:IF p<0:p=p+o:x=x-o
200 =27:RUN
210 =9:windows
220 WINDOW 95,10,200,125:INK 7:CLS:PRINT x!y!p!q!
230 WINDOW 512,256,0,0:o=7:i=i+2:IF i=9:i=3
240 NEXT new_window
250 END SElect
260 windows
270 END REPEAT outline
280 DEfine PROCedure windows
290 BLOCK x,1,p,q,i:BLOCK x,1,p,q+y-1,i
300 BLOCK 1,y-2,p,q+1,i:BLOCK 1,y-2,p+x-1,q+1,i
310 END DEfine windows

```

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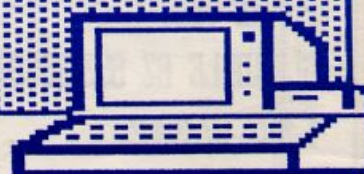
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