NO. 43
JUNE 1986

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THE #1 MAGAZINE FOR ATARI® COMPUTER OWNERS

ANALOG COMPUTING™

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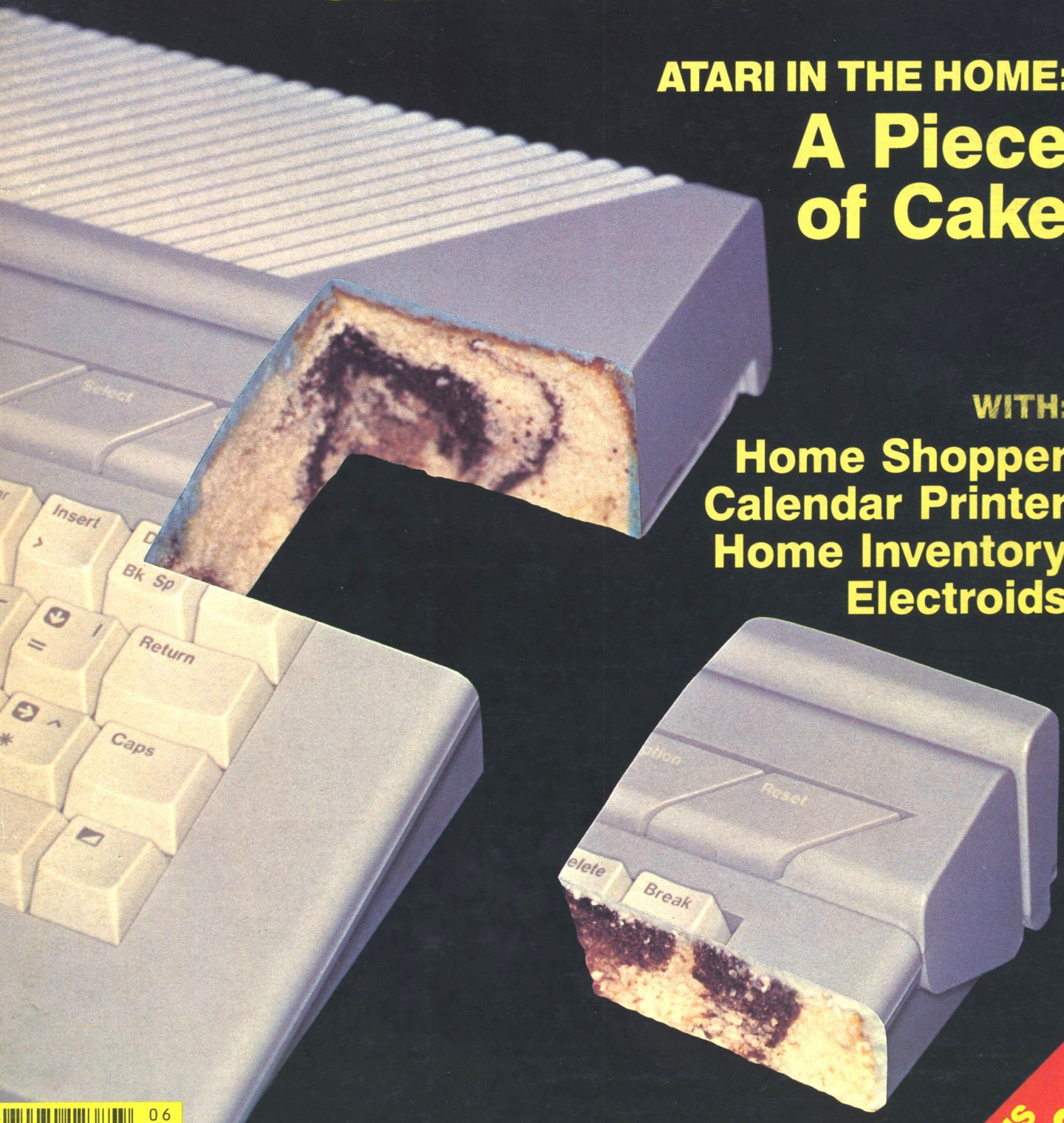

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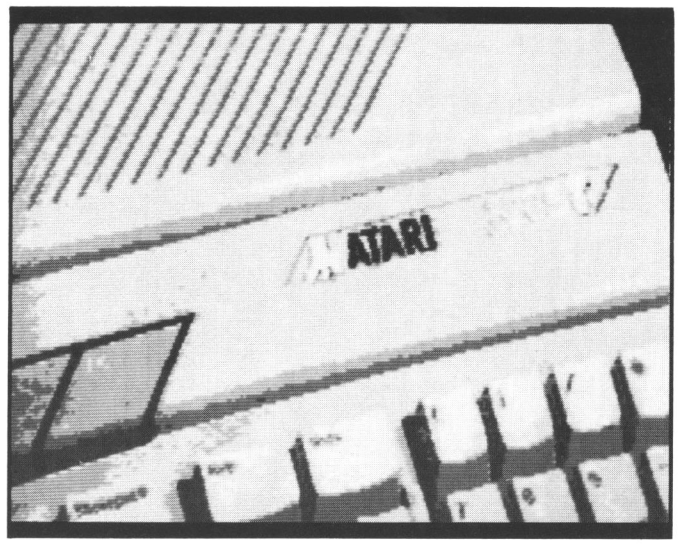

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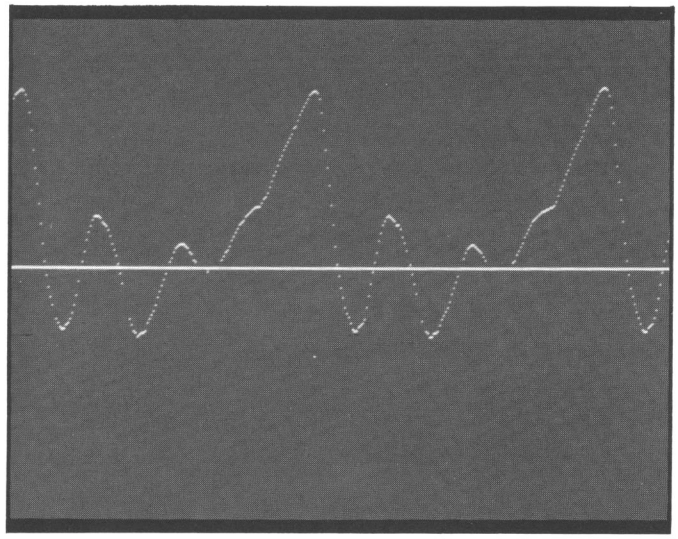

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NO. 43 JUNE 1986

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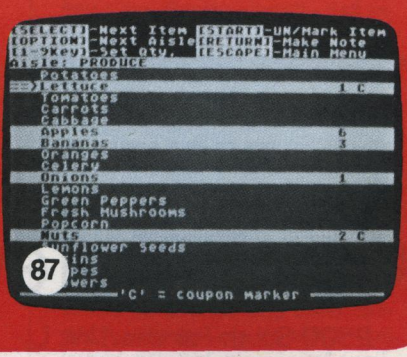
ANALOG COMPUTING™

FEATURES

FEATURES *continued*

REVIEWS

COLUMNS



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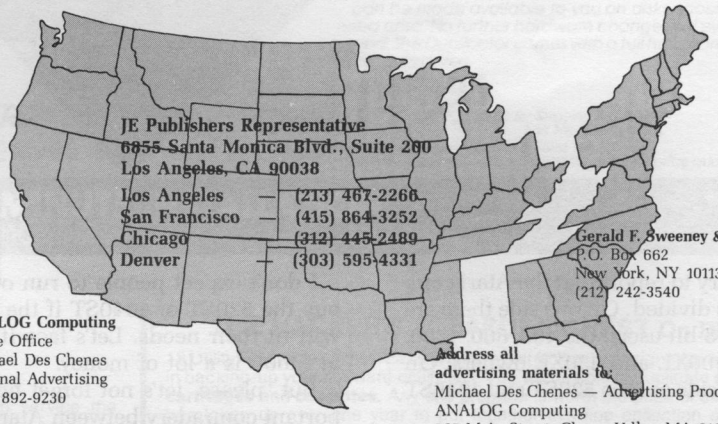

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EDITORIAL

I'm sorry to report that the Atari community is divided. On one side there are the Atari 8-bit users: the 400, 800, 1200, 600XL, 800XL and 130XE owners. On the other side are the 520ST and 1040ST owners.

The 8-bit users tend to feel threatened by the 16-bit users. And the 16-bit owners can, at times, act a little stuffy toward the older Atari owners. . .when, in fact, most of *them* started with one of the original Atari computers.

The response we've gotten from both sides indicates that 8-bit owners are the more fanatical of the two groups. I get the impression they consider themselves as "the underdogs." Instead of accepting STs as simply newer models to fill the higher-end gap Atari desperately needed to close, they see the ST as "the competitor"—a possible threat to the future of the 8-bit Atari.

What's wrong with one company selling two completely different machines? Where is it written that software companies can only write for one or the other? And who says only one will survive the next ten years?

I'm very disappointed at the attitudes on *both* sides. According to our sources, the 130XE *and* the 520ST have been selling quite well over the past months, and both still appear to be strong sellers.

I don't expect people to run out and buy the 520ST or 1040ST if the 130XE will fit their needs. Let's face it, $800 to $1000 is a lot of money.

But, please, let's not forget how important comradery between Atari owners has been in the past. That comradery, with the help of user groups, was part of the reason that Atari held its position as a major force during the computer shakeout. Let's not alienate each other.

On a similar subject, our editorials in issues 40 and 41 stated that our new **ST-Log** section would not take away from the number pages we devote to the 8-bit machines each month. We will insert additional pages for **ST-Log**.

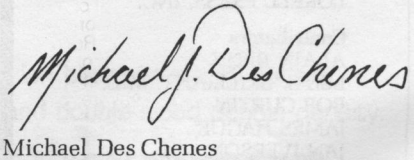
Even so, we received a great deal of mail from readers complaining about less coverage devoted to the older computers. I hope this will be the last time that we'll have to touch on the subject of "**ANALOG Computing** versus **ST-Log**."

I think that readers who are worried should sit down and count the pages dedicated to 8-bit Ataris. Maybe then they'll believe us.

As mentioned earlier, most ST owners were Atari 8-bit users. . .and some still are. We at **ANALOG Computing** feel it would be unfair to make them purchase two publications at this time. Perhaps, in the not-so-near future, there'll be a need for such a separation.

ST owners should realize that first-time computer buyers deserve an opportunity to consider the 130XE, if that's what would fit their needs. On the other hand, 8-bit owners should see that buyers need choices, too—and need information after they've brought the new machine home. It's only fair that we cover the new Atari line as thoroughly as we cover the 8-bits.

I hope all Atari owners can see the disadvantages of an unfriendly separation between 8- and 16-bit users. One large, united group can accomplish far more than can two small rivals.



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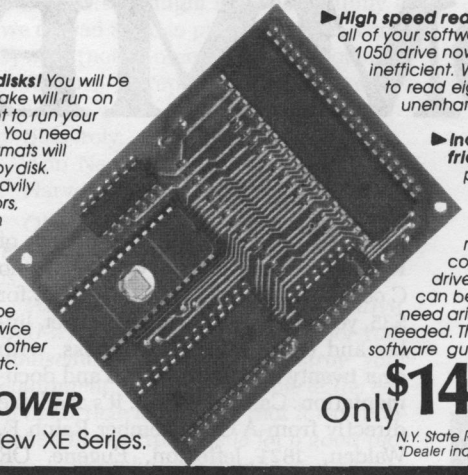

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CIRCLE #103 ON READER SERVICE CARD

READER COMMENT

ANALOG's tops.

I am writing in praise of the way you answered my hopes for help in obtaining documentation on a Bit-3 full view 80-column board for my Atari 800. Having bought it second-hand without documentation, I wrote *Microbits* twice to request a copy, with no reply on either inquiry. I tried locating a phone number to no avail. I had also tried two different Atari user groups for information.

Two days after I wrote requesting information, you answered my request. I received the information two days thereafter. Two other magazine publishers have yet to respond in any form.

This is the second time the **ANALOG Computing** staff has amazed me. First, two years ago, by publishing my **Proset** program (issue 21) and now by responding so rapidly—and with your *only* copy of the documentation I required. You have once again won my hearty thanks and another renewal.

ANALOG Computing is *tops* in my book, recommended to all my Atari-owning friends. I only hope that others do not spoil your way of helping. Please keep up the excellent work.

Thank you again.
Richard J. Browne
Canton Center, CT

"Editorial" comments.

Please keep that editorial page—it's the first thing I always read (and *not* because it's first in physical location). Hearing from you makes **ANALOG Computing** much more personal.

Congratulations on adding Clayton Walnum to your staff. Boy, can he write well (lots, too)! I'm personally looking forward to the next part of **C-manship**. Thanks to the clarity of his articles, I finally understand those C listings.

By the way, Bob Curtin's review of **Kyan Pascal** would have you believe no C compiler exists for 8-bitters. Well, for $35, you can get the best C compiler, linker and text editor on two disks, with over twenty sample programs and documentation. Called DVC/65, it's available directly from A.C.E. member Ralph E. Walden, 1821 Jefferson, Eugene, OR 97402. It supports 130XE and is the one I'm going to try on my 800XL before I take the 520ST plunge.

I'm afraid I have to disagree with Mr. Eisenberg's comments (issue 40's **Reader Comment**) on external interfacing of computers. . . People who buy computers are high-tech toy buyers (like me) or have used a word processor, spreadsheet or database elsewhere. I had *no* practical application for my first 400—but was it fun!

My wife thinks a practical application for my computer would be a mechanical hand to come out and slap me when I think about adding more peripherals.

Sincerely,
Everett P. Rantanen
Milwaukee, WI

800 monitor jack pinouts.

I'm the owner of an Atari 800 and have decided to take the advice given by Arthur Leyenberger in his **Stocking Stuffers** article (issue 37). I'm going to get a Commodore 1702 monitor.

But here's the problem: I don't know what pins are what on the 800 monitor jack. I've searched all my magazines and the manual, and can only find out about the audio. Can you help? What are the pinouts for the monitor jack?

Leighton W. Vary, Jr.
Phoenix, AZ

Figure 1 shows the pinouts for your computer. Figure 2 illustrates the assembly of the necessary cables. —*Ed.*

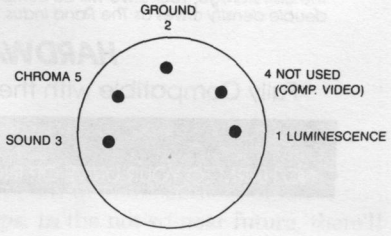


Figure 1.

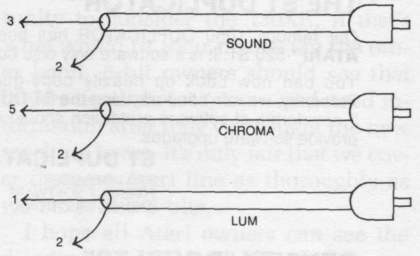


Figure 2. — Phono jacks.

A user on End User.

After reading issue 39 of **ANALOG Computing** (February 1986), I felt the impetus required to write a letter to one of the anti-Atari publications that seems to disgrace magazine racks in increasing numbers lately.

Unfortunately, it was comments in the **End User** section that prompted me. Your magazine is a fine and desperately needed resource for Atari owners. I've become dependent on the reviews, tutorials and features offered monthly. I can't understand how a well-selling line of 8-bit products could be deemed "dead."

Such talk is damaging to both Atari

and the user. With 800XL and 130XE sales going strong, my imagination would require substantial expansion to believe such reports.

Barry Williams
Enterprise, AL

It doesn't take a lot of imagination to realize that 1985 saw fewer new software releases than 1984. And 1984 saw fewer than 1983. If you follow this simple linear trend, 1986 should see even fewer.

Why? According to the major software publishers, who look at sales of Apple, Commodore and Atari software, Atari sales account for much less than other brands. In a competitive industry, successful products are those in demand.

Much as you or I or ***ANALOG Computing*** *would like 8-bit computers to last forever, time does march on. Eventually, they will probably be replaced. It's sad that, although 8-bit Ataris are still very capable, they're seen by the industry and the general public as outdated technology.*

However, you can bet your joystick that ***ANALOG Computing*** *will continue to support all Atari computers. We'd be foolish not to continue to help the* ***End User*** *get the most out of his or her individual Atari adventure. —Ed.*

Weighty considerations.

In the past, I have been extremely satisfied with program quality in **ANALOG Computing**. You have provided me with much information and kept me "up to date" in the Atari world.

Now, I've received issue 41 (April 1986) and could not believe my eyes. Curt Cox's **Paperweight** program literally kicks 8-bit Atarians in the pants. Mr. Cox must have no respect for fellow 8-bit owners. For him to write a "self destruct" program is simply *uncalled for!*

What's more, I (and many others) own a modem and call many BBSs. Once a "smart" person uploads this horrid program, *hundreds* of unknowing users are subject to "killing their system."

I cannot believe that **ANALOG Computing** would publish such a program. Cox's writing it astonishes me even more.

I truly *love* my Atari 800 and feel that it has given me more than its money's worth. I demand an apology for this horrible program's publication. I truly hope that **ANALOG Computing** will continue its 8-bit support.

Matt Birkner
Peabody, MA

I have been a subscriber to **ANALOG Computing** for a long time and I've never seen such a disgusting article as the one "entitled" **Paperweight** that appeared in issue 41! Now we know how you really feel about the loyal 8-bit users who've supported your magazine all these years.

The article might have been funny if we all had $800 to plunk down on a new system (not to mention all the software we'd have to replace), but most of us don't.

Sincerely,
Ann Nace
Narvon, PA

Obviously, quite a few readers took ***Paperweight*** *seriously. All we can say is "don't!"*

Paperweight *was an imaginative, well-written program, included for your amusement. It does not destroy your equipment. We printed a note at the end of the article to indicate that it was published in our April issue for a good reason —to make you laugh.*

We tested it ourselves (on a machine deemed expendable—we knew less than you did) and found it very convincing. When the program's through, turn your computer OFF and then ON again. SYSTEM RESET doesn't work.

Trust us; we would never print something that truly had ***Paperweight****'s effect. We do apologize for any misinterpretations, but we think our readers should realize we're as attached to our Ataris as they are to theirs.*

Those who think ***Paperweight*** *was our way of exterminating 8-bit equipment merely show that the 8- versus 16-bit controversy has gone far enough. Whatever model you have,* ***ANALOG Computing*** *wants you to get the most you can from it, for as long as you can.*

So, if you can catch the trash man, get your computer back; it's still completely operable. —Ed.

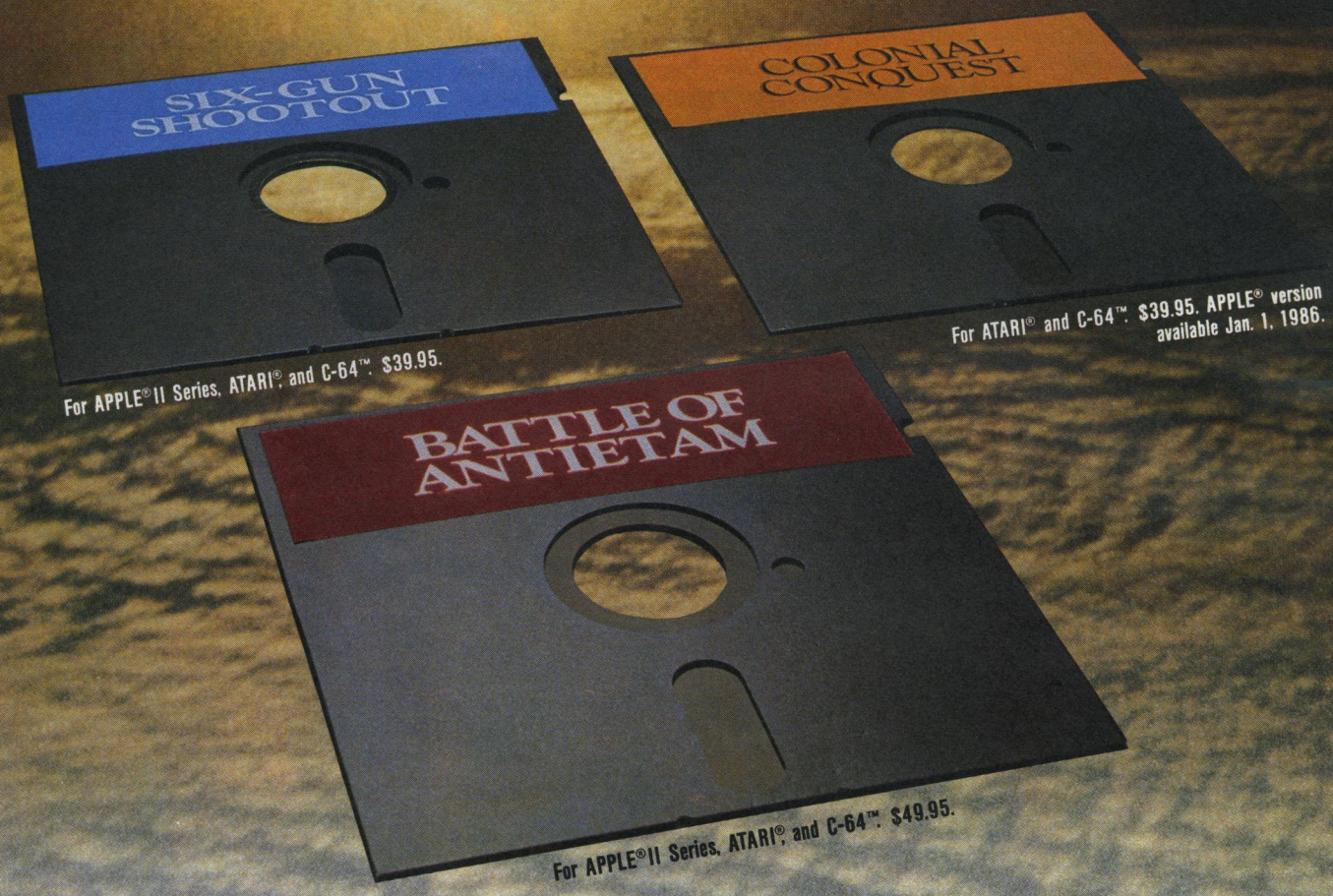
The other side of the coin.

As a new computer user, I greatly appreciate your decision to cover the new ST line.

I readily admit that I was not one of those brave pioneers in the personal computer revolution. I did not go out and purchase an 8-bit Atari, Commodore, or Apple in those days of yesteryear.

The 520ST is my first computer—and I still have lots to learn. I am very glad that an excellent magazine like **ANA-**

SSI Time Machines



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If there are no convenient stores near you, VISA & M/C holders can order our time machines directly by calling **800-443-0100, ext. 335 (toll free)**.

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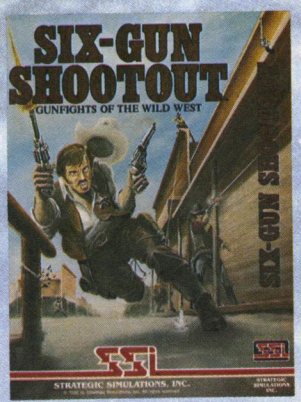
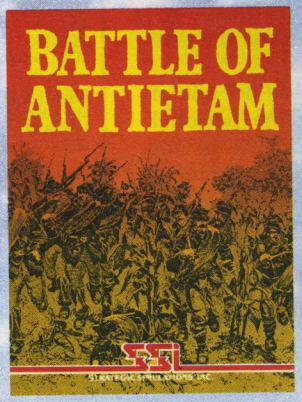
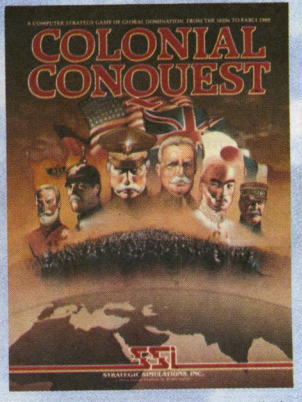
To order by mail, send your check to: STRATEGIC SIMULATIONS, INC., 1046 N. Rengstorff Ave., Mountain View, CA 94043. (California residents, add 7% sales tax.) All our games carry a "14-day satisfaction or your money back" guarantee.

WRITE FOR A FREE COLOR CATALOG OF ALL OUR GAMES.







STRATEGIC SIMULATIONS, INC.

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CIRCLE #106 ON READER SERVICE CARD

LOG Computing is helping to fill the information gap for those of us who are new owners of this rapidly-evolving technology.

I have absolutely nothing against the other computers, but I happen to own the ST, as a result of being impressed by the remarkable price/power ratio. The wait was worth it to me, given my very modest financial status as compared to the big institutions which—up until now—have had a virtual monopoly on this level of computer technology.

Thanks for helping to keep me informed on what's available for the ST. You could hardly be expected to ignore the ST, though. I salute your decision to add pages and to continue to include coverage of products for the ST as well as for all Atari computerware.

Sincerely,
Sam Wells
Los Alamitos, CA

I've been subscribing to **ANALOG Computing** since 1981 and own every issue back to your premier issue. In my opinion, it's the best magazine going for your Atari needs. Now, it's the best for your ST needs, too!

My family has three computers. We bought an 800 back in 1980 and added two disk drives, color monitor and printer. My husband bought me a 520ST for Christmas, with color monitor and two double-sided drives.

He (poor soul) has a 512 Macintosh, external drive and Imagewriter. (A lot of friendly rivalry goes on here.) We recently bought a 1200-baud modem that works for all three computers.

I'm *really* pleased with the current new format. A lot of people would probably just as soon have you split off the **ST-Log** section into its own separate magazine. I'm happy they're together, because we have both an 8- and a 16-bit Atari.

We certainly haven't put "Old Faithful" out to pasture just because we got something newer and more powerful. My 800 is still used at least two hours a day. It's not unusual for all three to be going at once.

Very sincerely yours,
Kathy Scoville
Henrietta, NY 14467

Bravo! We couldn't have said it better. New and old can live together, in peace.
—Ed.

Send your letters to:

Reader Comment
P.O. Box 23
Worcester, MA 01603

WHAT IS CHECKSUM DATA?

Program listings in **ANALOG Computing** before this issue were followed by a table of numbers appearing as DATA statements, called "CHECKSUM DATA." These numbers were to be used in conjunction with **D:CHECK** and **C:CHECK** (which appeared in **ANALOG Computing** issue 16 and the **ANALOG Compendium**) or with **Unicheck** (from issue 24, updated in issues 31 and 39).

D:CHECK and **C:CHECK** (written by Istvan Mohos and Tom Hudson) and **Unicheck** (by Tom Hudson) were designed to find and correct typing errors when readers entered programs from the magazine. For those readers who would like copies of these articles, you may send for back issue 16, 24, 31 or 39 ($4.00 each) or the **ANALOG Compendium** ($14.95 plus $2.00 shipping and handling) from:

ANALOG Computing
P.O. Box 625
Holmes, PA 19045

NEW PRODUCTS

MONDAY MORNING MANAGER

This 1986 version of **Monday Morning Manager** includes 64 major league playoff teams, from 1905 through 1985. In the new **MMM**, any major league team may play against any other, and each of the more than 1500 players will perform as they did for the real thing.

The results of each play, in every game, are based on actual statistics. Accuracy is claimed to be within 1% in over 4000 test games.

Monday Morning Manager lists for $39.95 for the Atari 8-bit line, and costs $50.00 for the 520ST. TK Computer Products, P.O. Box 9617, Downers Grove, IL 60515 — (800) 422-4912.

CIRCLE #162 ON READER SERVICE CARD

FIX YOUR ATARI!

Sams Computerfacts are a new series of service booklets for personal computers. Included in the line are fix-it manuals for the Atari 400, 800 and 800XL. Coming soon: the same kind of books for the 810 disk drive, 1025 printer, 130XE and the 520ST.

In each version of **Computerfacts**, you'll find standard-notation schematics created with Computer Aided Design (CAD), preliminary service checks, troubleshooting tips, replacement parts lists, semiconductor cross-references and reproductions of actual waveform photos. Sams also publishes the **Photofacts** series, covering over 400 books on a wide range of electronic products.

For more information, contact Howard W. Sams & Co., 4300 W. 62nd Street, Indianapolis, IN 46268 — (317) 298-5400.

CIRCLE #163 ON READER SERVICE CARD

WELCOME TO THE CITY OF FOOBLITZKY

Infocom's new multi-player strategy game is described as part Clue and part Mastermind. In the city of **Fooblitzky**, you're a dog, wandering the crowded streets and busy shops, trying to deduce and obtain the four objects necessary to win. This will depend on how well you use funds, keep records and outwit your opponents.

The animated graphics are a first for Infocom. The typical Infocom packaging has four workboards, two sets of rules and four markers. The 48K game uses joystick or keyboard.

Fooblitzky retails for $39.95, from Infocom, Inc., 125 CambridgePark Drive, Cambridge, MA 02140 — (617) 492-6000.

CIRCLE #164 ON READER SERVICE CARD

OTHER NEWS

Atari Fun and Games is a book for anyone who's in the market for some new and different games.

More than twenty games run on all the 8-bits, and include a wide range of logic, action and graphic entertainment. Documentation covers machine language calls, use of PEEKs and POKEs, and much more.

Fun and Games has 294 pages and 57 illustrations. It sells for $10.95 (in paperback), $16.95 (hardbound), or $24.95 (for book and disk). Contact: TAB Books, Inc., Blue Ridge Summit, PA 17214 — (717) 794-2191.

CIRCLE #165 ON READER SERVICE CARD

■ ■ ■

Okidata is offering a **$15 cash rebate** with the purchase of their **Okimate 10** color printer. This offer runs through June 20, 1986.

Okimate 10 has a suggested retail price of $208. Contact: Okidata, 532 Fellowship Road, Mount Laurel, NJ 08054 — (609) 235-2600.

CIRCLE #166 ON READER SERVICE CARD

■ ■ ■

The latest offerings from Digital Devices are their **A16** and **A64 U-Print**s. These products allow standard Centronics-type printers to be connected to the Atari.

The **A16** and **A64** include a 16K or 64K buffer, respectively. These new units also feature a RESET button, for clearing out memory, and an extra Atari I/O port.

The **A16** retails for $99.95, and the **A64** for $119.95. For information: Digital Devices Corporation, 430 Tenth Street, Suite N205, Atlanta, GA 30318 — (404) 872-4430.

CIRCLE #167 ON READER SERVICE CARD

OUR APOLOGIES

*Last month (issue 42), **ANALOG Computing** published a description of the **Super 3D Plotter II** in our **ST News** section of the **ST-Log** (issue 2) magazine.*

It should be noted that this program is for 8-bit machines, not the ST. Our apologies to our readers and to Elfin Magic.

Home Inventory

Keep track of *everything!*

by Jan Iverson

Atari uses memory location 764 to hold the last keystroke pressed. If we peek at that location, we can perform a variety of functions within a program.

Holding down the CTRL key and the arrow keys causes the cursor to move in various directions on the screen. But we can peek at location 764 and, by knowing the decimal equivalent of the arrow keys, we can move the cursor (or another item we select) to any location on-screen. I've chosen not to have the CTRL key pressed at the same time. This frees up your left hand and allows some freedom, since you don't have to remember to press the CTRL key.

The following program uses memory location 764 to test for the arrow keys pressed.

I use **Home Inventory** for various applications. I have one disk with nothing but computer-related items. Another contains my record collection, and a third disk contains the household inventory. On this disk, I have one line entered for the total computer-related items and another for my record collection.

The program can be streamlined to suit your own needs. Through careful reprogramming, you may adapt this for any application.

Lines 80 and 4870 contain the dimension of the total length of the three fields (51x200) for the sort step. If you add any fields, you must change this dimension length, also. Be aware that there's a memory limitation for sorting.

There's an excellent utility program, **Multicolor Screen Generator**, by Richard J. Kalagher in issue 12 (July-August 1983) of **ANALOG Computing**. I used this to develop the custom screen for **Home Inventory**. Each time you boot the program up, there'll be a short delay while the screen is poked into page 6. There will be no delay thereafter for the other options selected, as long as you don't exit the program.

The colored boxes at the bottom of the screen will change with each option. The memory locations for the colors are in 1712 through 1733. By poking the corresponding colors (*4* for grey, *144* for blue, *80* for lavender and *64* for red) and putting time delays in between, the colors seem to flow downward.

Entering and using the program.

Type in Listing 1 and save a backup copy for safety.

The main menu has four options: add, change, print and sort. Use the arrow keys (without pressing CTRL) to select the option. (You'll notice that you may press ESC to exit the program.)

Due to the need to protect the integrity of the data file, the steps must be followed in each of the options. In most cases, you can exit by pressing ESC, or by using the arrow keys, paging over to the menu option and pressing START.

You'll be sent back to the main menu. From there, you may go to another option. This will insure that the file has been updated and closed properly.

Adding entries.

The screen has an edit mask to limit the amount

of characters for each line. The description is limited to twenty characters; the date is set up to input the year first, the month and the day last. This is to allow proper sorting.

When the date is printed out, though, it will be displayed as month, day and year. The date is limited to six numbers, (i.e., *840901*) and to numeric input only (no slashes or dashes—the print routines will put these items in). The ID is limited to fifteen characters, and the amount is limited to ten. The program will not allow you to enter more than the limit.

Home Inventory's program forces you to enter some data on each line. If you press RETURN without entering data, the buzzer will sound, the screen will change to red, and you'll be returned to the same line.

After you enter the cost and press RETURN, you'll be given the opportunity to "continue," "change" or "end."

If you press START while the inverse video is on the word *CONTINUE*, the screen will clear and you'll be allowed to type in more additions. If you use the arrow key to page over to the "change" selection and press START, you'll be given the chance to change any of the items, as explained in the "Changing Entries" section below.

If you want to end the "adding" section, page over to the "end" statement and press START. The entries will be updated on the disk, and you'll be sent back to the main menu.

Changing entries.

Here's where the arrow keys come in handy. Enter the complete description, or, if you want to step through the file, enter an * and press RETURN.

You may call up another entry by pressing SELECT. Use the right and left arrow keys to select change, delete or menu, then press START. When a change is made, you're allowed to page up and down the screen by using the arrow keys. When the item is chosen, press START and make the change.

You may make as many changes as you wish. If you wish to select another item from your file, press SELECT and you'll be allowed to change, delete or go to the menu for that item, also.

Make as many of these changes as you need. If you select delete and wish to continue on, press SELECT, and that item will be deleted—but the next item on the file will be shown on-screen (if you selected the * option). Using this method, you can step through the complete file. Press ESC when finished in the change section.

Printing the entries.

This option allows either a screen print or a hard copy. Use the arrow keys to make the selection. The screen size is limited, so the ID number will not be printed. The hard copy will print the entire record. This copy will have a heading and page numbering, and it will divide into pages at the end. A total dollar amount will also print.

Sorting the records.

If this item is selected from the main menu, the screen will change and the number of records read will be displayed. You'll be given the opportunity to select which field to sort on. Use the arrow keys to page to the selection, then press START.

The sort will begin and will give you an updated count of the number of members in the array while sorting. The total will equal the number of records read. This will verify that no records have been dropped.

I have a number of purchased database programs, but I've found **Home Inventory** a much quicker and handier way to store my inventory.

Jan Iverson is an applications programmer with Chevron Corp. He's been working with computers for eighteen years and is program chairman for his local user's group (DACE).

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor*, page 21.

Listing 1.
BASIC listing.

```
RN 10 REM    HOME INVENTORY
QA 20 REM  by Jan Iverson 1984
BA 30 REM
VQ 32 K0=0:K1=1:K2=2:K3=3:K4=4:K5=5:K6=6:
   K7=7:K8=8:K9=9:K10=10:K12=12:K13=13:K1
   4=14:K15=15:K16=16:K17=17:K18=18
KD 34 K19=19:K20=20:K21=21:K22=22:K23=23:
   K28=28:K29=29:K30=30:K31=31:K32=32:K33
   =33:K155=155:K195=195:K255=255
OS 36 K709=709:K710=710:K752=752:K764=764
   :K53279=53279:K53774=53774:K64=64
LA 40 DIM DESC$(K20),DATE$(K6),COST(K10),
   FILE1$(K15),FILE2$(K15),COST$(K10),AMT
   $(K10)
OC 50 DIM DE5$(K20),DT$(K6),IDENT$(K15),C
   ST$(K10),CH$(K1),PAD$(51)
ZU 60 PAD$="ZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZZ
   ZZZZZZZZZZZ9999999999"
FR 70 DIM D$(K20),FOUND$(K1),ID$(K15),A$(
   K1)
AE 80 DIM ALL$(10200)
SP 90 DIM HOLD$(51),REC$(51)
AO 130 OPEN #K4,K4,K0,"K:"
RW 140 FILE1$="D1:INV.DAT":FILE2$="D1:INV
   .TMP"
SD 150 POKE K710,K0:POKE K752,K1:GOSUB 57
   10
```

```
FW 160 GRAPHICS K17:POKE 756,226:POKE 708
   ,K0:POKE K16,K64:POKE K53774,K64
UX 170 LNO=K0:PGNO=K1:PGRE=60:CH$="N"
XQ 180 M1=K0:M2=K0:X1=K0
RY 190 X=K2:Y=K3:TOT=K0:AA=K0:FOUND$="N":
   AGAIN=K0:D$(1,1)="♥"
TM 200 POSITION K3,K1:? #K6;"home invento
   ry"
LC 210 POSITION K3,K2:? #K6;"──────────
   ──"
QA 220 POSITION K8,K6:? #K6;"ADD"
OO 230 POSITION K8,K9:? #K6;"CHANGE"
LN 240 POSITION K8,K12:? #K6;"PRINT"
CZ 250 POSITION K8,K15:? #K6;"SORT"
JR 260 POSITION K2,K18:? #K6;"use ↑ ↓ key
   s  to     select  option"
XJ 270 POSITION K2,K20:? #K6;"PRESS start
    WHEN          READY"
GJ 280 POSITION K2,K22:? #K6;"press esc t
   o end"
PU 290 POSITION K6,K6:? #K6;"■"
JT 300 POKE K764,K155
MV 310 IF PEEK(K764)=K14 THEN POSITION K6
   ,K6:? #K6;" ":GOTO 520
QX 320 IF PEEK(K764)=K15 THEN 360
FP 330 IF PEEK(K53279)=K6 THEN 600
HN 340 IF PEEK(K764)=K28 THEN 4570
MX 350 GOTO 310
KV 360 POKE K764,K255
NU 370 POSITION K6,K6:? #K6;" "
RV 380 POSITION K6,K9:? #K6;"■"
QH 390 IF PEEK(K764)=K15 THEN 440
AS 400 IF PEEK(K764)=K14 THEN POSITION K6
   ,K9:? #K6;" ":GOTO 290
RO 410 IF PEEK(K53279)=K6 THEN 1450
HK 420 IF PEEK(K764)=K28 THEN 4570
QE 430 GOTO 390
KS 440 POKE K764,K255
PT 450 POSITION K6,K9:? #K6;" "
TX 460 POSITION K6,K12:? #K6;"■"
PA 470 IF PEEK(K764)=K15 THEN 520
AP 480 IF PEEK(K764)=K14 THEN POSITION K6
   ,K12:? #K6;" ":GOTO 360
5G 490 IF PEEK(K53279)=K6 THEN 1270
HH 500 IF PEEK(K764)=K28 THEN 4570
PP 510 GOTO 470
KP 520 POKE K764,K255
MY 530 POSITION K6,K12:? #K6;" "
VZ 540 POSITION K6,K15:? #K6;"■"
CX 550 IF PEEK(K764)=K14 THEN POSITION K6
   ,K15:? #K6;" ":GOTO 440
KU 560 IF PEEK(K764)=K15 THEN POSITION K6
   ,K15:? #K6;" ":GOTO 290
BF 570 IF PEEK(K53279)=K6 THEN 4860
HX 580 IF PEEK(K764)=K28 THEN 4570
OX 590 GOTO 530
VO 600 GRAPHICS K0:POKE K710,K4:POKE K709
   ,K255:POKE K16,K64:POKE K53774,K64:POK
   E K752,K1
JV 610 POSITION K13,K19:? "Reading File"
YH 620 GOSUB 3680
NO 630 GOSUB 5710:GOSUB 5690:GOSUB 2840:G
   OSUB 3380:GOSUB 3360:GOSUB 3440
JW 640 GOSUB 3840:GOSUB 3560:GOSUB 3490
LT 650 POSITION K2,K6:? "Description:"
NY 660 X=K15:Y=K6:GOSUB 2850
QR 670 IF LEN(DES$)<K20 THEN DES$(LEN(DES
   $)+K1)=" ":GOTO 670
BJ 680 IF DES$="                    " THE
   N GOSUB 2730:GOTO 650
ZM 690 DESC$=DES$:DES$(K20)="♥":DES$(K2)=
   DES$:DES$=" "
IV 700 POSITION K2,K6:? "Description:":PO
   SITION K2,K9:? "Date(YYMMDD):"
5H 710 X=K16:Y=K9:GOSUB 2970
TD 720 IF LEN(DT$)<K6 THEN DT$(LEN(DT$)+K
   1)=" ":GOTO 720
RQ 730 IF DT$="      " THEN GOSUB 2730:GO
   TO 700
IZ 740 DATE$=DT$:DT$(K6)="♥":DT$(K2)=DT$:
   DT$=" "
JR 750 POSITION K2,K9:? "Date(YYMMDD):":P
   OSITION K2,K12:? "Id Number:"
KZ 760 X=K13:Y=K12:GOSUB 3090
JP 770 IF LEN(IDENT$)<K15 THEN IDENT$(LEN
   (IDENT$)+K1)=" ":GOTO 770
FC 780 IF IDENT$="               " THEN G
   OSUB 2730:GOTO 750
OX 790 ID$=IDENT$:IDENT$(K15)="♥":IDENT$(
   K2)=IDENT$:IDENT$=" "
OT 800 POSITION K2,K12:? "Id Number:":POS
   ITION K2,K15:? "Cost $"
FM 810 X=K10:Y=K15:GOSUB 3210
ZI 820 IF LEN(CST$)<K10 THEN CST$(LEN(CST
   $)+K1)=" ":GOTO 820
EH 830 IF CST$="          " THEN GOSUB 27
   30:GOTO 800
UO 840 COST$=CST$:COST=VAL(COST$):CST$(K1
   0)="♥":CST$(K2)=CST$:CST$=" "
IG 850 POSITION K2,K15:? "Cost $"
QX 860 GOSUB 3560:POSITION K6,K19:? "Use
   ";CHR$(27);"← ";CHR$(27);"→ keys, pres
   s <START>"
OY 870 POSITION K4,K21:? "┐       ┌":POSIT
   ION K17,K21:? "──────"
JV 880 POSITION K4,K22:? "CONTINUE     CH
   ANGE        END"
KQ 890 POKE K764,K155
ST 900 POSITION K4,K21:? "┐       ┌"
YT 910 POSITION K17,K22:? "CHANGE"
PT 920 POSITION K4,K22:? "CONTINUE"
SI 930 IF PEEK(K764)=K7 THEN 970
CE 940 IF PEEK(K764)=K6 THEN POSITION K4,
   K21:? "──────":POSITION K4,K22:? "CO
   NTINUE":GOTO 1050
CR 950 IF PEEK(K53279)=K6 THEN POKE K764,
   K155:GOTO 1130
QJ 960 GOTO 930
KN 970 POKE K764,K155
FV 980 POSITION K4,K21:? "──────":POSIT
   ION K17,K21:? "┐     ┌"
ZF 990 POSITION K4,K22:? "CONTINUE"
EH 1000 POSITION K17,K22:? "CHANGE"
AI 1010 IF PEEK(K764)=K6 THEN POSITION K1
   7,K21:? "──────":GOTO 890
BA 1020 IF PEEK(K764)=K7 THEN 1050
QA 1030 IF PEEK(K53279)=K6 THEN GOSUB 276
   0:GOSUB 3560:GOSUB 3600:GOTO 2070
NN 1040 GOTO 1010
ZJ 1050 POKE K764,K155
KG 1060 POSITION K17,K21:? "──────":POSIT
   ION K32,K21:? "┐ ┌"
VG 1070 POSITION K17,K22:? "CHANGE"
5L 1080 POSITION K32,K22:? "END"
KC 1090 IF PEEK(K764)=K6 THEN POSITION K3
   2,K22:? "END":POSITION K32,K21:? "──"
   :GOTO 970
NF 1100 IF PEEK(K764)=K7 THEN POSITION K3
   2,K22:? "END":POSITION K32,K21:? "──"
   :GOTO 890
MZ 1110 IF PEEK(K53279)=K6 THEN GOSUB 122
   0:GOSUB 3800:GOTO 1160
RJ 1120 GOTO 1090
AF 1130 GOSUB 3800:GOSUB 3840:GOTO 640
FI 1140 IF PEEK(K764)=K28 THEN GOSUB 3800
   :GOTO 1160
PE 1150 GOTO 1130
UH 1160 DESC$="ENDOFFILE                ":DATE
   $="XXXXXX":ID$="XXXXXXXXXXXXXXX":COST=
   0
UV 1170 PRINT #K2;DESC$:PRINT #K2;DATE$:P
   RINT #K2;ID$:PRINT #K2;COST
TN 1180 CLOSE #K1:CLOSE #K2
BA 1190 XIO 33,#K1,K0,K0,FILE1$
KQ 1200 XIO 32,#K1,K0,K0,"D1:INV.TMP,INV.
   DAT"
PT 1210 GOTO 160
EV 1220 GRAPHICS K17
QP 1230 D$(1,1)=" "
ZY 1240 POSITION K2,K10:? #K6;"WRITING FI
   LE..."
J5 1250 POSITION K2,K12:? #K6;"please wai
   t■■■■■"
AV 1260 RETURN
AF 1270 GRAPHICS K0:POKE K710,K4:POKE K75
   2,K1:POKE K709,K255:POKE K16,K64:POKE
```

```
   K53774,K64
BL 1280 GOSUB 4230
AY 1290 CLOSE #K1
CI 1300 TRAP 32767:TRAP 4580
AE 1310 OPEN #K1,K4,K0,FILE1$
KI 1320 INPUT #K1,DESC$,DATE$,ID$,COST
ED 1330 IF DATE$="XXXXXX" THEN 1400
UK 1340 GOSUB 4110:GOSUB 3870
TC 1350 POSITION K0,Y
ST 1360 ? DESC$;" ";DATE$(K3,K4);"/";DATE
   $(K5,K6);"/";DATE$(K1,K2);" ";COST$
VV 1370 Y=Y+K1:TOT=TOT+COST
UL 1380 IF Y=K18 THEN GOSUB 4140
QF 1390 GOTO 1320
BL 1400 Y=Y+K2:COST=TOT:GOSUB 3870
GH 1410 POSITION K23,Y:? "TOTAL: ";COST$
UG 1420 POSITION K5,K22:? "Press (ESC) to
    return to MENU"
IK 1430 IF PEEK(K764)=K28 THEN 160
QR 1440 GOTO 1430
PI 1450 GRAPHICS K0:POKE K710,K4:POKE K70
   9,K255:POKE K16,K64:POKE K53774,K64:PO
   KE K752,K1:GOSUB 5710:GOSUB 5690
GP 1460 KX=144:GOSUB 2770
QK 1470 GOSUB 3340:GOSUB 3440
RR 1480 GOSUB 3380:GOSUB 3520
QH 1490 POSITION K2,K6:? "Description:"
WF 1500 POSITION K15,K6:? "_____
   _____"
WC 1510 X=K15:Y=K6:GOSUB 2850
JK 1520 IF LEN(DES$)<K20 THEN DES$(LEN(DE
   S$)+K1)=" ":GOTO 1520
DZ 1530 D$=DES$:DES$(K20)="♥":DES$(K2)=DE
   S$:DES$=" "
TA 1540 POKE 54286,64:GOSUB 1860:POKE 542
   86,192:GOSUB 3560:GOSUB 4030
PD 1550 POSITION K2,K6:? "Description:"
ZW 1560 POKE K764,K155
WU 1570 POSITION K4,K21:? "┐     ┌":POSITI
   ON K17,K21:? "└─────┘"
KL 1580 POSITION K17,K22:? "DELETE"
MX 1590 POSITION K4,K22:? "CHANGE"
KZ 1600 POKE K53279,K10
JF 1610 IF PEEK(K764)=K7 THEN 1660
HK 1620 IF PEEK(K764)=K6 THEN POSITION K4
   ,K21:? "└─────┘":POSITION K4,K22:? "CHA
   NGE":GOTO 1750
DC 1630 IF PEEK(K53279)=K6 THEN POKE K764
   ,K155:KX=4:GOSUB 2830:GOSUB 2770:KX=21
   0:GOSUB 2770:GOSUB 3380:GOTO 1820
LU 1640 IF PEEK(K53279)=K5 THEN POKE K764
   ,K155:POKE 54286,K64:GOSUB 3810:POKE 5
   4286,K64:GOSUB 1880:POKE 54286,192
QJ 1650 GOTO 1600
ZY 1660 POKE K764,K155
YB 1670 POSITION K17,K21:? "┐     ┌":POSIT
   ION K4,K21:? "└─────┘"
GO 1680 POSITION K4,K22:? "CHANGE"
UM 1690 POSITION K17,K22:? "DELETE"
HG 1700 IF PEEK(K764)=K6 THEN 1560
JG 1710 IF PEEK(K764)=K7 THEN 1750
KI 1720 IF PEEK(K53279)=K5 THEN POKE K764
   ,K155:POKE 54286,K64:GOSUB 1880:POKE 5
   4286,192:GOTO 1560
BE 1730 IF PEEK(K53279)=K6 THEN FOUND$="Y
   ":GOSUB 1220:GOTO 1880
QU 1740 GOTO 1700
XM 1750 POKE K764,K155:POSITION K32,K21:?
    "┐   ┌":POSITION K17,K21:? "└─────┘"
KJ 1760 POSITION K17,K22:? "DELETE"
HE 1770 POSITION K32,K22:? "MENU"
FZ 1780 IF PEEK(K764)=K6 THEN POSITION K3
   2,K22:? "MENU":POSITION K32,K21:? "└──
   ─":GOTO 1660
DP 1790 IF PEEK(K764)=K7 THEN POSITION K3
   2,K22:? "MENU":POSITION K32,K21:? "└──
   ─":GOTO 1560
PN 1800 IF PEEK(K53279)=K6 THEN FOUND$="Y
   ":GOSUB 1220:GOTO 1920
UN 1810 GOTO 1780
GL 1820 GOSUB 3560:FOUND$="Y"
OM 1830 IF D$(1,1)="*" THEN GOSUB 3640
NJ 1840 IF D$(1,1)<>"*" THEN GOSUB 3600
KD 1850 CH$="Y":GOTO 2070
TV 1860 CLOSE #K1:CLOSE #K2
NA 1870 OPEN #K1,K4,K0,FILE1$:OPEN #K2,K8
   ,K0,FILE2$
LK 1880 INPUT #K1,DESC$,DATE$,ID$,COST
CX 1890 IF DATE$="XXXXXX" THEN 2010
DH 1900 IF D$(1,1)="*" THEN GOSUB 1950:FO
   UND$="Y":RETURN
ZU 1910 IF D$=DESC$ THEN AA=AA+K1:GOTO 19
   40
UW 1920 PRINT #K2;DESC$:PRINT #K2;DATE$:P
   RINT #K2;ID$:PRINT #K2;COST
VH 1930 GOTO 1880
HF 1940 IF AA>K1 THEN 1920
GI 1950 GOSUB 3870
NA 1960 POSITION K15,K6:? "
     ":POSITION K15,K6:? DESC$
WP 1970 POSITION K16,K9:? DATE$
UT 1980 POSITION K13,K12:? ID$
VS 1990 POSITION K9,K15:? COST$
AA 2000 RETURN
FY 2010 DESC$="ENDOFFILE          ":DATE$
   ="XXXXXX":ID$="XXXXXXXXXXXXXXX":COST=0
   :GOSUB 4080
UF 2020 PRINT #K2;DESC$:PRINT #K2;DATE$:P
   RINT #K2;ID$:PRINT #K2;COST
SX 2030 CLOSE #K1:CLOSE #K2
AK 2040 XIO 33,#K1,K0,K0,FILE1$
LC 2050 XIO 32,#K1,K0,K0,"D1:INV.TMP,INV.
   DAT"
QF 2060 GOTO 160
YS 2070 POKE K764,K155:POKE K53279,K10
PX 2080 POSITION K2,K6:? "Description:"
UW 2090 POSITION K2,K9:? "Date(YYMMDD):"
XI 2100 IF PEEK(K764)=K28 THEN POSITION K
   2,K6:? "Description:":GOTO 2700
KL 2110 IF PEEK(K53279)=K6 THEN 2160
RI 2120 IF PEEK(K53279)=K5 AND D$(1,1)="*
   " THEN GOSUB 2840:GOSUB 2750:GOSUB 356
   0:GOSUB 4030:GOTO 1560
KV 2130 IF PEEK(K764)=K15 THEN 2220
BN 2140 IF PEEK(K764)=K14 THEN POSITION K
   2,K6:? "Description:":GOTO 2550
OD 2150 GOTO 2100
WQ 2160 POSITION K15,K6:? "_____
   _____"
WN 2170 X=K15:Y=K6:GOSUB 2850
QP 2180 IF LEN(DES$)<K20 THEN DES$(LEN(DE
   S$)+K1)=" ":GOTO 2180
SR 2190 IF DES$="                    " TH
   EN GOSUB 2730:GOTO 2170
FH 2200 DESC$=DES$:DES$(K20)="♥":DES$(K2)
   =DES$:DES$=" "
NT 2210 GOTO 2100
YH 2220 POKE K764,K155:POKE K53279,K10
OS 2230 POSITION K2,K6:? "Description:"
QL 2240 POSITION K2,K9:? "Date(YYMMDD):"
EO 2250 POSITION K2,K15:? "Cost $"
VZ 2260 POSITION K2,K12:? "Id Number:"
MR 2270 IF PEEK(K764)=K28 THEN POSITION K
   2,K9:? "Date(YYMMDD):":GOTO 2700
KA 2280 IF PEEK(K53279)=K6 THEN 2330
SF 2290 IF PEEK(K53279)=K5 AND D$(1,1)="*
   " THEN GOSUB 2840:GOSUB 2750:GOSUB 356
   0:GOSUB 4030:GOTO 1560
NL 2300 IF PEEK(K764)=K14 THEN 2070
UG 2310 IF PEEK(K764)=K15 THEN 2390
RX 2320 GOTO 2270
MV 2330 POSITION K16,K9:? "______"
BH 2340 X=K16:Y=K9:GOSUB 2970
IM 2350 IF LEN(DT$)<K6 THEN DT$(LEN(DT$)+
   K1)=" ":GOTO 2350
SZ 2360 IF DT$="      " THEN GOSUB 2730:G
   OTO 2340
BF 2370 DATE$=DT$:DT$(K6)="♥":DT$(K2)=DT$
   :DT$=" "
SP 2380 GOTO 2270
ZE 2390 POKE K764,K155:POKE K53279,K10
UD 2400 POSITION K2,K9:? "Date(YYMMDD):"
RW 2410 POSITION K2,K12:? "Id Number:"
EJ 2420 POSITION K2,K15:? "Cost $"
KF 2430 IF PEEK(K764)=K14 THEN 2220
```

```
SF 2440 IF PEEK(K764)=K15 THEN 2550
ME 2450 IF PEEK(K764)=K28 THEN POSITION K
   2,K12:? "Id Number:":GOTO 2700
SN 2460 IF PEEK(K53279)=K6 THEN 2490
SD 2470 IF PEEK(K53279)=K5 AND D$(1,1)="*
   " THEN GOSUB 2840:GOSUB 2750:GOSUB 356
   0:GOSUB 4030:GOTO 1560
RP 2480 GOTO 2430
XG 2490 POSITION K12,K12:? "_____________
   __"
UO 2500 X=K13:Y=K12:GOSUB 3090
BK 2510 IF LEN(IDENT$)<K15 THEN IDENT$(LE
   N(IDENT$)+K1)=" ":GOTO 2510
HI 2520 IF IDENT$="                " THEN
   GOSUB 2730:GOTO 2500
TA 2530 ID$=IDENT$:IDENT$(K15)="♥":IDENT$
   (K2)=IDENT$:IDENT$=" "
RF 2540 GOTO 2430
YW 2550 POKE K764,K155:POKE K53279,K10
WF 2560 POSITION K2,K12:? "Id Number:"
LI 2570 POSITION K2,K15:? "Cost $"
QN 2580 IF PEEK(K764)=K28 THEN POSITION K
   2,K15:? "Cost $":GOTO 2700
PE 2590 IF PEEK(K53279)=K6 THEN 2640
RM 2600 IF PEEK(K53279)=K5 AND D$(1,1)="*
   " THEN GOSUB 2840:GOSUB 2750:GOSUB 356
   0:GOSUB 4030:GOTO 1560
TQ 2610 IF PEEK(K764)=K14 THEN 2390
MV 2620 IF PEEK(K764)=K15 THEN POSITION K
   2,K15:? "Cost $":GOTO 2070
UD 2630 GOTO 2580
ZE 2640 POSITION K10,K15:? "__________"
PV 2650 X=K10:Y=K15:GOSUB 3210
OI 2660 IF LEN(C$T$)<K10 THEN C$T$(LEN(C$
   T$)+K1)=" ":GOTO 2660
DK 2670 IF C$T$="          " THEN GOSUB 2
   730:GOTO 2650
VL 2680 COST$=C$T$:COST=VAL(COST$):C$T$(K
   10)="♥":C$T$(K2)=C$T$:C$T$=" "
UV 2690 GOTO 2580
NW 2700 IF CH$="Y" THEN GOSUB 1220:GOTO 1
   920
DR 2710 GOSUB 2840
TG 2720 GOTO 860
ZI 2730 POKE 712,64:? "[R]":FOR I=K1 TO 100
   :NEXT I
GW 2740 POKE 712,K0:RETURN
GR 2750 GOSUB 3440:POKE 54286,64:GOSUB 38
   10:POKE 54286,64:GOSUB 1880:POKE 54286
   ,192:RETURN
CC 2760 KX=4:GOSUB 2830:GOSUB 2770:KX=210
   :GOSUB 2770:GOTO 3380
HS 2770 FOR I=1728 TO 1732:POKE I,KX:FOR
   DELAY=1 TO 3:NEXT DELAY:NEXT I:RETURN
FB 2830 FOR I=K17 TO K21:POSITION K0,I:?
   "
      ":NEXT I:RETURN
DS 2840 KX=4:GOSUB 2830:GOSUB 2770:KX=144
   :GOSUB 2830:GOSUB 2770:GOTO 3380
HC 2850 POSITION X,Y:? "_"
GD 2860 FOR I=K1 TO K21
XC 2870 IF I<K1 THEN I=I+K1:POSITION X,Y:
   ? " ":X=X+K1
WQ 2880 GET #K4,DE5C
DV 2890 IF DE5C=K28 OR DE5C=K29 OR DE5C=K
   30 OR DE5C=K31 THEN 2880
PG 2900 IF DE5C=K155 THEN 2960
MU 2910 IF I=K21 THEN I=I-K1:POSITION X,Y
   :? " ":X=X-K1:GOTO 2880
VX 2920 IF DE5C=126 THEN X=X-K1:POSITION
   X,Y:? "_":POSITION X,Y:? "_":POSITION
   X+K1,Y:? "_":I=I-K1
LJ 2923 IF I<K1 THEN 2870
YD 2925 IF DE5C=126 THEN DE5$(I)=" ":GOTO
    2870
LJ 2930 POSITION X,Y:? CHR$(DE5C)
DZ 2940 IF I<>K20 THEN POSITION X+K1,Y:?
   "_"
AD 2950 DE5$(I)=CHR$(DE5C):X=X+K1:NEXT I
BK 2960 RETURN
HK 2970 POSITION X,Y:? "_"
YK 2980 FOR I=K1 TO K7
XK 2990 IF I<K1 THEN I=I+K1:POSITION X,Y:
```

Home Inventory *continued*

```
    ? " ":X=X+K1
MX 3000 GET #K4,DT
SR 3010 IF DT=K28 OR DT=K29 OR DT=K30 OR
    DT=K31 THEN 3000
MP 3020 IF DT=K155 THEN 3080
WM 3030 IF I=K7 THEN I=I-K1:POSITION X,Y:
    ? " ":X=X-K1:GOTO 3000
RF 3040 IF DT=126 THEN X=X-K1:POSITION X,
    Y:? "_":POSITION X,Y:? "_":POSITION X+
    K1,Y:? "_":I=I-K1
NE 3042 IF I<K1 THEN 2990
UD 3043 IF DT=126 THEN DT$(I)=" ":GOTO 29
    90
CO 3045 IF DT<48 OR DT>57 THEN 3080
PG 3050 POSITION X,Y:? CHR$(DT)
RC 3060 IF I<>K6 THEN POSITION X+K1,Y:? "
    _"
LL 3070 DT$(I)=CHR$(DT):X=X+K1:NEXT I
AZ 3080 RETURN
GZ 3090 POSITION X,Y:? "_"
IB 3100 FOR I=K1 TO K16
VX 3110 IF I<K1 THEN I=I+K1:POSITION X,Y:
    ? " ":X=X+K1
GR 3120 GET #K4,ID
HZ 3130 IF ID=K28 OR ID=K29 OR ID=K30 OR
    ID=K31 THEN 3120
R5 3140 IF ID=K155 THEN RETURN
NF 3150 IF I=K16 THEN I=I-K1:POSITION X,Y
    :? " ":X=X-K1:GOTO 3120
NC 3160 IF ID=126 THEN X=X-K1:POSITION X,
    Y:? "_":POSITION X,Y:? "_":POSITION X+
    K1,Y:? "_":I=I-K1
BT 3163 IF I<K1 THEN 3110
WC 3165 IF ID=126 THEN IDENT$(I)=" ":GOTO
     3110
DY 3170 POSITION X,Y:? CHR$(ID)
GB 3180 IF I<>K15 THEN POSITION X+K1,Y:?
    "_"
OB 3190 IDENT$(I)=CHR$(ID):X=X+K1:NEXT I
AF 3200 RETURN
GF 3210 POSITION X,Y:? "_"
AV 3220 FOR I=K1 TO ii
WF 3230 IF I<K1 THEN I=I+K1:POSITION X,Y:
    ? " ":X=X+K1
MC 3240 GET #K4,CST
UQ 3250 IF CST=K28 OR CST=K29 OR CST=K30
    OR CST=K31 THEN 3240
XA 3260 IF CST=K155 THEN RETURN
WW 3270 IF I=11 THEN I=I-K1:POSITION X,Y:
    ? " ":X=X-K1:GOTO 3240
YQ 3280 IF CST=126 THEN X=X-K1:POSITION X
    ,Y:? "_":POSITION X,Y:? "_":POSITION X
    +K1,Y:? "_":I=I-K1
EL 3283 IF I<K1 THEN 3230
HL 3285 IF CST=126 THEN CST$(I)=" ":GOTO
    3230
AX 3290 IF CST=47 OR CST<46 OR CST>57 THE
    N 3240
AX 3300 POSITION X,Y:? CHR$(CST)
CS 3310 IF I<>K10 THEN POSITION X+K1,Y:?
    "_"
XM 3320 CST$(I)=CHR$(CST):X=X+K1:NEXT I
AQ 3330 RETURN
UU 3340 POKE 708,196:POSITION K5,K2:? "
                    CHANGE"
AW 3350 RETURN
GD 3360 POKE 708,196:POSITION K5,K2:? "
                       ADD"
BC 3370 RETURN
YD 3380 POSITION K0,K17:? "┌──────────────
    ──────────────────────────────┐"
FJ 3390 POSITION K0,K18:? "│
                                 │"
FE 3400 POSITION K0,K19:? "│
                                 │"
ZC 3410 POSITION K0,K20:? "│
                                 │"
XJ 3420 POSITION K0,K21:? "└──────────────
    ──────────────────────────────┘"
A5 3430 RETURN
PA 3440 POSITION K2,K6:? "Description:"
UT 3450 POSITION K2,K9:? "Date(YYMMDD):"
WE 3460 POSITION K2,K12:? "Id Number:"
```

```
EZ 3470 POSITION K2,K15:? "Cost $"
BH 3480 RETURN
GH 3490 POSITION K4,K18:? "Enter data - P
   ress (RETURN)"
CR 3500 POSITION K4,K20:? "Press (START)
   to continue"
AO 3510 RETURN
AM 3520 POSITION K3,K18:? "Enter Descript
   ion - press (RETURN)"
QQ 3530 POSITION K19,K19:? "Or"
GR 3540 POSITION K3,K20:? "Use an '*' to
   step thru the file"
BA 3550 RETURN
ZY 3560 POSITION K1,K18:? "
                          "
AV 3570 POSITION K1,K19:? "
                          "
UT 3580 POSITION K1,K20:? "
                          "
BM 3590 RETURN
DS 3600 POSITION K6,K18:? "Use ";CHR$(27)
   ;"↑ ";CHR$(27);"↓ keys - press (START)
   "
LM 3610 POSITION K6,K19:? "Press (RETURN)
    after entry"
GO 3620 POSITION K6,K20:? "When finished
   press (ESC)"
AW 3630 RETURN
XN 3640 POSITION K1,K18:? "Use ";CHR$(27)
   ;"↑ ";CHR$(27);"↓ keys - press (START)
   .  Press"
JK 3650 POSITION K1,K19:? "(RETURN) after
    entry. For more entries"
PE 3660 POSITION K1,K20:? "press (SELECT)
   . To end press (ESC)"
BI 3670 RETURN
TZ 3680 CLOSE #K1:CLOSE #K2
TQ 3690 TRAP 3720:OPEN #K1,K4,K6,FILE1$:T
   RAP 32767
EJ 3700 OPEN #K2,K8,K0,FILE2$
UJ 3710 GOTO 3760
AT 3720 CLOSE #K1:OPEN #K1,K8,K0,FILE1$
KL 3730 DESC$="ENDOFFILE              ":DATE
   $="XXXXXX":ID$="XXXXXXXXXXXXXXX":COST=
   K0
PG 3740 PRINT #K1;DESC$:PRINT #K1;DATE$:P
   RINT #K1;ID$:PRINT #K1;COST
IZ 3750 CLOSE #K1:GOTO 3680
LE 3760 INPUT #K1,DESC$,DATE$,ID$,COST
RY 3770 IF DATE$="XXXXXX" THEN RETURN
VM 3780 PRINT #K2;DESC$:PRINT #K2;DATE$:P
   RINT #K2;ID$:PRINT #K2;COST
VH 3790 GOTO 3760
RM 3800 POKE 54286,64
UT 3810 PRINT #K2;DESC$:PRINT #K2;DATE$:P
   RINT #K2;ID$:PRINT #K2;COST
CL 3820 POKE 54286,192
BA 3830 RETURN
XB 3840 POSITION K15,K6:? "_____________
   _______":POSITION K16,K9:? "_____"
HJ 3850 POSITION K13,K12:? "_____________
   __":POSITION K10,K15:? "_________"
BJ 3860 RETURN
LZ 3870 SIGN=SGN(COST):COST=ABS(COST)
TP 3880 COST=INT((COST+5.0E-03)*100)/100
EN 3890 AMT$=STR$(COST)
SA 3900 DLEN=LEN(STR$(INT(COST)))
LH 3910 CLEN=LEN(AMT$)-DLEN
VO 3920 IF CLEN=K0 THEN AMT$(LEN(AMT$)+K1
   )=".00"
SV 3930 IF CLEN=K2 THEN AMT$(LEN(AMT$)+K1
   )="0"
RA 3940 J=K0:COST$="           "
TK 3950 FOR I=K10 TO 11-LEN(AMT$) STEP -K
   1
DC 3960 COST$(I,I)=AMT$(LEN(AMT$)-J)
HV 3970 J=J+K1:NEXT I
US 3980 IF SIGN<K0 THEN COST$(I,I)="-"
BU 3990 RETURN
MZ 4000 POSITION K4,K22:? "CHANGE       D
   ELETE          MENU"
RF 4010 POSITION K6,K19:? "Use ";CHR$(27)
   ;"← ";CHR$(27);"→ keys, press (START)"
```

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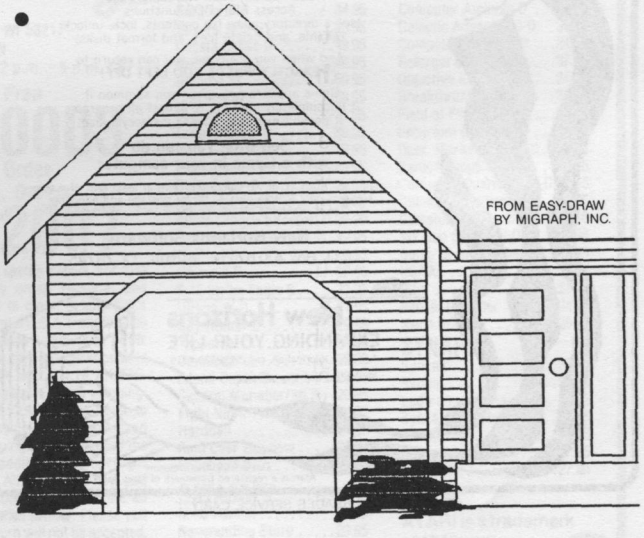
Home Inventory *continued*

```
AI 4020 RETURN
NI 4030 POSITION K4,K22:? "CHANGE          D
   ELETE          MENU"
PO 4040 POSITION K4,K18:? "Use ";CHR$(27)
   ;"€ ";CHR$(27);"→ keys, press <START>"
QN 4050 POSITION K19,K19:? "Or"
MN 4060 POSITION K4,K20:? "Press <SELECT>
    for another item"
AX 4070 RETURN
SJ 4080 POKE 54296,64
QS 4090 IF FOUND$="N" THEN POSITION K6,K2
   2:? "ITEM NOT FOUND - TRY FROM MENU"
AE 4100 RETURN
MY 4110 POSITION K0,K0:? "     DESCRIPTIO
   N       DATE       COST     "
FW 4120 POSITION K0,K1:? "
                            "
AN 4130 RETURN
KF 4140 POSITION K3,K20:? "Press <START>
   to continue printing"
UD 4150 POSITION K3,K22:? "Press <ESC> to
    return to <MENU>"
RC 4160 IF PEEK(K53279)=K6 THEN 4190
IT 4170 IF PEEK(K764)=K28 THEN 160
SK 4180 GOTO 4160
ZP 4190 Y=K3
ZN 4200 GRAPHICS K0:POKE K710,K4:POKE K75
   2,K1:POKE K709,K255:POKE K16,K64:POKE
   K53774,K64
PE 4210 GOTO 4110
ZQ 4230 GOSUB 5710:GOSUB 5690
DE 4240 KX=80:GOSUB 2770:GOSUB 3380
EO 4250 POKE 708,196:POSITION K5,K2:? "
                        PRINT"
EQ 4260 POSITION K10,K21:? "┐      ┌"
CH 4270 POSITION K10,K22:? "SCREEN"
KX 4280 POSITION K20,K22:? "PRINTER"
BF 4290 POSITION K2,K19:? "Use ";CHR$(27)
   ;"€ ";CHR$(27);"→ keys - then press <S
   ELECT>"
ZD 4300 POKE K764,K155
JY 4310 POSITION K20,K21:? "──────":POSI
   TION K10,K21:? "┐      ┌"
UP 4320 POSITION K10,K22:? "SCREEN":POSIT
   ION K20,K22:? "PRINTER"
CA 4330 IF PEEK(K764)=K6 OR PEEK(K764)=K7
    THEN 4360
EE 4340 IF PEEK(K53279)=K5 THEN GOSUB 420
   0:RETURN
RQ 4350 GOTO 4330
ZV 4360 POKE K764,K155
FX 4370 POSITION K10,K21:? "──────":POSIT
   ION K20,K21:? "┐      ┌"
ZT 4380 POSITION K10,K22:? "SCREEN":POSIT
   ION K20,K22:? "PRINTER"
RW 4390 IF PEEK(K764)=K6 OR PEEK(K764)=K7
    THEN 4300
SV 4400 IF PEEK(K53279)<>K5 THEN 4390
CT 4420 TRAP 32767:TRAP 4580
RO 4430 POKE 54286,64
JC 4440 CLOSE #K1:CLOSE #K3:OPEN #K1,K4,K
   0,FILE1$:OPEN #K3,K4,K0,"P:":IF PEEK(K
   195)=138 THEN 4420
CU 4450 GOSUB 4710
KZ 4460 INPUT #K1,DESC$,DATE$,ID$,COST
OB 4470 IF DATE$="XXXXXX" THEN 4540
GK 4480 GOSUB 3870
FT 4490 PRINT #K3;"    ";DESC$,DATE$(K3,K
   4);"/";DATE$(K5,K6);"/";DATE$(K1,K2),I
   D$,COST$
LZ 4500 LNO=LNO+K1
XQ 4510 IF LNO=55 THEN GOSUB 4750
KR 4520 TOT=TOT+COST
TN 4530 GOTO 4460
NI 4540 COST=TOT:GOSUB 3870:PRINT #K3
YM 4550 PRINT #K3,,,,,;"     TOTAL";COST$
AD 4560 GOSUB 4810:POP :GOTO 160
VK 4660 GOTO 4580
DD 4670 POSITION K5,K22:? "NO DATA TO BE
   READ - ADD DATA"
WH 4680 FOR DELAY=K1 TO 300:NEXT DELAY
BP 4690 POKE K195,K0
QD 4700 GOTO 160
GM 4710 PRINT #K3,,," INVENTORY REPORT",,
   "       PAGE ";PGNO:PRINT #K3
FD 4720 PRINT #K3,"DESCRIPTION","  DATE",
   "    ID NUMBER","      COST"
UA 4730 PRINT #K3:RETURN
QG 4750 FOR J=K1 TO K7:PRINT #K3:NEXT J
WX 4780 LNO=K0:PGNO=PGNO+K1
TG 4790 GOTO 4710
QW 4810 PGRE=PGRE-LNO
CB 4820 FOR J=K1 TO PGRE
EF 4830 PRINT #K3:NEXT J:RETURN
XO 4860 REM ** BEGIN SORT ROUTINE **
FP 4870 ALL$=" ":ALL$(10200)="♥":ALL$(K2)
   =ALL$
UC 4880 GRAPHICS K0:POKE K710,K4:POKE K70
   9,K255:POKE K16,K64:POKE K53774,K64:PO
   KE K752,K1:X=K0:I=K0
IC 4890 POSITION K13,K19:? "Reading File"
ZB 4900 FILE1$="D:INV.DAT":FILE2$="D:INV.
   TMP":CLOSE #K1:CLOSE #K2:OPEN #K1,K4,K
   0,FILE1$:OPEN #K2,K8,K0,FILE2$
KU 4910 INPUT #K1,DESC$,DATE$,ID$,COST
EL 4920 IF DATE$="XXXXXX" THEN 5000
LO 4930 COST$=STR$(COST)
CM 4940 IF LEN(COST$)<K10 THEN COST$(LEN(
   COST$)+K1)=" ":GOTO 4940
VS 4950 REC$(K1,K20)=DESC$:REC$(K21,26)=D
   ATE$:REC$(27,41)=ID$:REC$(42,51)=COST$
QJ 4960 I=I+K1
XE 4970 X1=X1+K1
XJ 4980 ALL$(I*51-50,I*51)=REC$
UI 4990 GOTO 4910
NR 5000 PRINT "5":GOSUB 5710:GOSUB 5690
DO 5010 KX=64:GOSUB 2770:GOSUB 3380
```

```
ZC 5020 POKE 708,196:POSITION K5,K2:? "
                        SORT"
LP 5030 I=I+K1:ALL$(I*51-50,I*51)=PAD$
RK 5040 Y=K2:POSITION K12,K8:? "Record Co
   unt: ";X1
TJ 5050 GOTO 5360
KQ 5060 POSITION K4,K10:? "Begin Sort"
CI 5070 FOR I=K1 TO X1
FY 5080 POSITION K22,K10:? "Working: ";I
WX 5090 FOR J=Y TO X1
UM 5100 IF ALL$(J*51-M1,J*51)<ALL$(I*51-M
   1,I*51) THEN GOSUB 5310
AW 5110 NEXT J:Y=Y+K1:NEXT I
FE 5140 POSITION K12,K12:? "Sort Complete
   d"
HH 5150 FOR SRT=K1 TO 50:NEXT SRT:GOSUB 1
   220
CH 5160 FOR I=K1 TO X1
OL 5170 REC$=ALL$(I*51-50,I*51)
UJ 5180 DESC$=REC$(K1,K20)
FZ 5190 DATE$=REC$(K21,26)
CI 5200 ID$=REC$(27,41)
FS 5210 COST$=REC$(42,51)
DM 5220 COST=VAL(COST$)
UP 5230 PRINT #K2;DESC$:PRINT #K2;DATE$:P
   RINT #K2;ID$:PRINT #K2;COST
FJ 5240 NEXT I
LO 5250 DESC$="ENDOFFILE           ":LET D
   ATE$="XXXXXX":LET ID$="XXXXXXXXXXXXXXX
   ":LET COST=K0
WY 5260 PRINT #K2;DESC$:PRINT #K2;DATE$:P
   RINT #2;ID$:PRINT #K2;COST
TQ 5270 CLOSE #K1:CLOSE #K2
BD 5280 XIO 33,#K1,K0,K0,FILE1$
YC 5290 XIO 32,#K1,K0,K0,"D:INV.TMP,INV.D
   AT"
PW 5300 GOTO 160
DE 5310 HOLD$=ALL$(I*51-50,I*51)
XF 5320 ALL$(I*51-50,I*51)=ALL$(J*51-50,J
   *51)
DW 5330 ALL$(J*51-50,J*51)=HOLD$
DN 5340 HOLD$=ALL$(I*51-50,I*51)
AY 5350 RETURN
EE 5360 GOSUB 3380
RF 5370 POSITION K8,K15:? "Which Field to
    sort on?"
CX 5380 POSITION K3,K21:? "┌──────────┐"
OC 5390 POSITION K3,K22:? "DESCRIPTION  D
   ATE  ID NUMBER  COST"
ZB 5400 POSITION K4,K19:? "Use ";CHR$(27)
   ;"← ";CHR$(27);"→ keys then press <STA
   RT>"
FH 5410 POKE K764,K0:POKE K53279,K10
CH 5420 POSITION K3,K21:? "┌──────────┐"
ZY 5430 POSITION K3,K22:? "DESCRIPTION"
LU 5440 IF PEEK(K764)=K6 THEN POSITION K3
   ,K22:? "DESCRIPTION":POSITION K3,K21:?
    "──────────":GOTO 5620
CA 5450 IF PEEK(K764)=K7 THEN POSITION K3
   ,K22:? "DESCRIPTION":POSITION K3,K21:?
    "──────────":GOTO 5480
RF 5460 IF PEEK(K53279)=K6 THEN M1=50:GOT
   O 5060
TJ 5470 GOTO 5440
CC 5480 POKE K764,K0
KO 5490 POSITION K16,K21:? "┌──┐"
JF 5500 POSITION K16,K22:? "DATE"
LB 5510 IF PEEK(K764)=K6 THEN POSITION K1
   6,K22:? "DATE":POSITION K16,K21:? "──
   ──":GOTO 5410
CR 5520 IF PEEK(K764)=K7 THEN POSITION K1
   6,K22:? "DATE":POSITION K16,K21:? "──
   ──":GOTO 5550
SV 5530 IF PEEK(K53279)=K6 THEN M1=30:M2=
   K6:GOTO 5060
SB 5540 GOTO 5510
BV 5550 POKE K764,K0
AW 5560 POSITION K22,K21:? "┌────────┐"
II 5570 POSITION K22,K22:? "ID NUMBER"
VG 5580 IF PEEK(K764)=K6 THEN POSITION K2
   2,K22:? "ID NUMBER":POSITION K22,K21:?
    "──────────":GOTO 5480
HE 5590 IF PEEK(K764)=K7 THEN POSITION K2
   2,K22:? "ID NUMBER":POSITION K22,K21:?
    "──────────":GOTO 5620
SC 5600 IF PEEK(K53279)=K6 THEN M1=24:GOT
   O 5060
VH 5610 GOTO 5580
BO 5620 POKE K764,K0
JH 5630 POSITION K33,K21:? "┌──┐"
MF 5640 POSITION K33,K22:? "COST"
YE 5650 IF PEEK(K764)=K6 THEN POSITION K3
   3,K22:? "COST":POSITION K33,K21:? "──
   ──":GOTO 5550
IK 5660 IF PEEK(K764)=K7 THEN POSITION K3
   3,K22:? "COST":POSITION K33,K21:? "──
   ──":GOTO 5410
FE 5670 IF PEEK(K53279)=K6 THEN M1=K9:GOT
   O 5060
VB 5680 GOTO 5650
BH 5690 POSITION K3,K1:? "home inventory"
AR 5700 RETURN
ZY 5710 INIT=INIT+K1
PD 5720 IF INIT>K1 THEN 5820
VA 5730 ? CHR$(125):POSITION K6,K10:? "IN
   ITIALIZING...PLEASE WAIT":FOR I=K1 TO
   100:NEXT I
PD 5740 X5=PEEK(559):POKE 559,0
UL 5750 RESTORE 5980:FOR N=K0 TO 99:READ
   X:POKE 1664+N,X:NEXT N
VE 5760 COLTAB=1712:LUMTAB=COLTAB+24
JN 5770 REM START COUNTER AND RESET EVERY
    VBI
PI 5780 X=USR(1693)
AA 5790 REM TELL ANTIC WHERE DLI CODE IS
SF 5800 POKE 512,128:POKE 513,K6
NL 5820 REM NOW SET INTERRUPT BITS
JY 5830 DSTART=PEEK(560)+256*PEEK(561)
FE 5840 FOR N=DSTART+K6 TO DSTART+K28
PF 5850 POKE N,130:NEXT N
WT 5870 REM SET DLI BIT ON FIRST LINE
DK 5880 POKE DSTART+K3,194
ED 5890 REM ENABLE DLI
OE 5900 POKE 54286,192:PRINT "R"
GM 5920 REM HANDLE LINE 0 AS BACKGROUND
MF 5930 POKE K710,PEEK(COLTAB)
DX 5940 POKE K709,PEEK(LUMTAB)
BR 5950 POKE 39974,6:POKE 39976,6
WL 5960 POKE 559,X5:RETURN
BQ 5980 DATA 72,138,72,174,156,6,189,176
AO 5990 DATA 6,141,10,212,141,24,208,189
IC 6000 DATA 200,6,141,23,208,238,156,6
WQ 6010 DATA 104,170,104,64,12,104,169,7
YU 6015 DATA 160,168,162,6,32,92,228,96
LV 6020 DATA 169,1,141,156,6,76,98,228
QP 6030 DATA 4,4,4,4,4,4,4,4,4,4,4,4
GW 6040 DATA 4,4,4,4,4,4,4,4,4,4,0,0
LO 6050 DATA 14,14,14,14,14,14,14,14,14,14
LR 6060 DATA 14,14,14,14,14,14,14,14,14,14
ZQ 6070 DATA 14,14,14,14,14,14,0,0,0,0
```



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BASIC Editor

A new checker for BASIC listings

by Clayton Walnum

The **BASIC Editor** is a utility to help you enter BASIC program listings published in **ANALOG Computing**. To simplify identification of errors, each program line is evaluated immediately after it's typed, eliminating the need for cumbersome checksum listings. When you've finished entering a program using **BASIC Editor**, you can be certain it contains no typos.

Typing in the Editor.

Listing 1 is the **BASIC Editor**. Type it in, then check your work with **Unicheck** (from issue 24, or the updated version in issues 31 and 39). When you are certain the program has been properly typed, save a copy to disk or cassette.

Using the Editor.

Take a look at one of the BASIC program listings in this issue (*not* the one for this program). Notice that each program line is preceded by a two-letter code. This code is the checksum for that line; it's not a part of the program.

To enter a program listing from the magazine, run the **BASIC Editor** program. Your screen will be divided into two "windows." The upper window is where checksum codes and program lines are entered. The lower window will display each line as it's being processed, as well as present you with various prompts and messages.

When the program's waiting for input, the cursor will appear next to the code prompt. Type the code that precedes the line you're working on and press RETURN. The cursor will then position itself at the left margin. Enter the program line and press RETURN.

After you've completed your entry, the **Editor** will process the line. If the line was typed properly, it'll be placed into the computer's memory. If you made an error in either the code or the line, you'll hear a buzzer and the screen will turn red. Check your work in the lower window. When you identify your mistake, re-enter both the code and the line.

Leaving the Editor.

You may leave the **Editor** at any time, by entering (at the code prompt) either *Q* for quit or *B* for BASIC. If you type *Q*, the **Editor** will ask if you wish to save to disk or cassette. Follow the prompts to save your work.

If you type *B*, the **Editor** will immediately return you to BASIC. Enter *LIST* to review your work. Note that Line 0 and Lines 32602 through 32694 are the **Editor** program. Your lines fall between.

To return to the **Editor**, type *RUN*.

The B command can be handy if you should accidentally press the CLEAR key, or in some other way change the screen display. Just return to BASIC and rerun the program.

Large listings.

If the program you're entering is particularly long,

you may need to take a break. When you want to stop, type Q for the code entry, then follow the instructions for saving your work. When you're ready to begin again, load the **BASIC Editor**, then retrieve your work with the command *ENTER "D:FILENAME.EXT"* where *FILENAME.EXT* is the filename you saved the file under.

If you're using a cassette system, you should substitute *ENTER "C:"* for the above command.

If you've forgotten where you left off, list the program to the screen. The last line you typed will be immediately before Line 32602.

Another problem inherent in the typing of especially large programs is that there may not be enough room in memory for both the **Editor** and the program you're typing. In this case, you should type the listing in two parts, saving each under a different filename, then combine them into a single program as instructed below.

Ready to go.

When you've finished typing a listing, save it with the Q command, then, when the **Editor** has returned you to BASIC, type *NEW* and press RETURN. You may then load the finished program with the ENTER command and run it. If you'd like the program to load faster, resave it with the SAVE command.

Because of the program size, you may have been forced to type it in two portions. Before you can run it, the two files must be combined. To do this, clear memory with the NEW command, then ENTER both segments into memory and resave the combined result.

Murphy's Law.

Anyone who's been associated with computing knows that there's no industry where Murphy is more prevalent. You may find that, after typing a program, it still won't run. There are two likely causes for this.

First, it may be that you aren't following the program's instructions properly. Always read the article accompanying a program before attempting to run it. Failure to do so may present you with upsetting results.

Finally, although you can trust **BASIC Editor** to catch your typos, it can't tell you if you've skipped some lines entirely. If your program won't run, make sure you typed all of it. Missing program lines are guaranteed trouble.

One last word. Some people find it an unnecessary and nasty chore to type REM lines. I don't condone the omission of these lines, since they may be referenced within the program (a bad practice, but not unheard of). If you want to take chances, **BASIC Editor** is willing to comply.

Listing 1.
BASIC listing.

```
0 GOTO 32602
32602 DIM L$(114),C1$(2),C2$(2),B$(38)
,A$(1)
32604 B$(1)=" ":B$(38)=" ":B$(2)=B$
32606 RETRN=155:BACKSP=126:ESCAPE=27
32608 GRAPHICS 0:POKE 766,0:POKE 752,0
:POKE 82,1:DL=PEEK(560)+256*PEEK(561)+
4
32610 POKE DL-1,70:POKE DL+2,6:POKE DL
+3,112:POKE DL+4,112:POKE DL+13,112:PO
KE DL+14,112:POKE DL+23,112
32612 POKE DL+24,65:POKE DL+25,PEEK(56
0):POKE DL+26,PEEK(561):POKE 559,0
32614 POSITION 20,0:? "analog basic ed
itor":POSITION 0,1:? "                TYP
ING WINDOW                ":? "CODE:"
32616 POSITION 0,9:? "                MESS
AGE WINDOW                ":POSITION 1,1
6:? "Last line entered:";LL
32617 POSITION 27,16:? "LAST CODE:";C1
$
32618 POKE 559,34:POSITION 6,3:? " ";C
HR$(30);:L$="":L1=2:GOSUB 32648:C1$=L$
32620 IF C1$="Q" THEN 32674
32621 IF C1$="B" THEN GRAPHICS 0:END
32622 POSITION 1,5:? " ";CHR$(30);:L1=
114:GOSUB 32648:F=0:CHKSUM=0:POKE 766,
1
32624 POKE 752,1:FOR X=11 TO 13:POSITI
ON 1,X:? B$:NEXT X:POSITION 1,11
32625 FOR X=LEN(L$) TO 1 STEP -1:IF L$
(X,X)=" " THEN NEXT X
32626 POP :L$=L$(1,X)
32627 FOR X=1 TO LEN(L$):F=F+1:CHKSUM=
CHKSUM+F*ASC(L$(X))
32628 IF X=39 THEN POSITION 1,12
32630 IF X=77 THEN POSITION 1,13
32632 ? L$(X,X);:NEXT X
32634 CHK=CHKSUM-(INT(CHKSUM/676)*676)
:HI=INT(CHK/26):LO=CHK-(HI*26):C2$(1)=
CHR$(HI+65):C2$(2)=CHR$(LO+65)
32636 POKE 766,0:IF C1$<>C2$ THEN 3264
2
32638 GRAPHICS 0:POKE 559,0:POKE 766,1
:POSITION 1,3:? L$:POSITION 1,8:? "CON
T":POSITION 1,0:POKE 842,13:STOP
32640 POKE 842,12:LL=VAL(L$):GOTO 3260
8
32642 POKE 710,50:SOUND 0,75,12,8:FOR
X=1 TO 40:NEXT X:SOUND 0,0,0,0
32644 POSITION 6,3:? "  ":L$=""
32646 FOR X=5 TO 7:POSITION 1,X:? B$:N
EXT X:POKE 752,0:POSITION 37,16:? C1$:
GOTO 32618
32648 L=0
32650 GOSUB 32690:IF (A=RETRN OR A=BAC
KSP) AND L=0 THEN 32650
32652 IF A=RETRN THEN RETURN
32654 IF A=BACKSP THEN 32666
32656 IF A=ESCAPE THEN ? CHR$(A);:GOTO
 32650
32658 L=L+1:IF L>L1 THEN RETURN
32660 IF L>38 AND L<76 THEN POSITION L
-INT(L/38)*38,6
32662 IF L>76 AND L<114 THEN POSITION
L-INT(L/38)*38,7
32664 L$(L,L)=CHR$(A):? CHR$(A);:GOTO
32650
```

```
32666 L=L-1:IF L=37 THEN POSITION 38,5
:? " ";CHR$(30);:GOTO 32672
32668 IF L=75 THEN POSITION 38,6:? " "
;CHR$(30);:GOTO 32672
32670 ? CHR$(BACKSP);:IF L=0 THEN L$="
":GOTO 32650
32672 L$=L$(1,LEN(L$)-1):GOTO 32650
32674 POSITION 5,12:? "CASSETTE OR DIS
K";:INPUT L$:IF L$<>"C" AND L$<>"D" TH
EN 32674
32676 IF L$="D" THEN 32684
32678 POSITION 1,12:? "Ready cassette
and press RETURN":GOSUB 32690
32680 LIST "C:",1,32600:GOTO 32688
32684 POSITION 0,12:? "FILENAME (D:FIL
ENAME.EXT)    ";CHR$(30);CHR$(30);CHR$(
30);:INPUT L$
32685 TRAP 32686:OPEN #1,4,0,L$:CLOSE
#1:GOTO 32692
32686 LIST L$,1,32600
32688 GRAPHICS 0:END
32690 OPEN #1,4,0,"K:":GET #1,A:CLOSE
#1:RETURN
32692 ? "FILE ALREADY EXISTS!";? "ERA
SE IT";:INPUT A$:TRAP 32692:IF A$="Y"
THEN 32686
32694 FOR X=12 TO 15:POSITION 0,X:? B$
:NEXT X:GOTO 32684
```

●

CHECKSUM DATA.

(see beginning of article)

```
0 DATA 631,516,471,883,337,442,749,774
,786,259,213,171,723,448,136,7539
32625 DATA 226,666,338,98,79,900,32,53
6,199,881,116,937,853,303,924,7088
32652 DATA 905,856,492,114,614,686,323
,698,1,39,72,489,146,339,234,6008
32684 DATA 964,121,560,976,936,38,191,
3786
```

●

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GRIFFIN'S LAIR

Educational Programs Review

by Braden E. Griffin, M.D.

A very learned man was heard to say that we learn little from our successes; the only things in life that teach us anything are affliction and suffering. Pretty heady stuff. That being the case, those who suffer through these reviews must consider me some sort of guru.

This month I will review two programs based on classics—one, a classic concept; the other, a classic story. Each has initiated considerable cerebration in young and old, along with countless hours of joy. No suffering here—so who's griping?

Both offerings this time are for the ST. Fear not that I've jumped on the ST bandwagon, ignoring the old guard. Nay, nay. However, the appearance of quasi-educational software for the ST (after months of waiting) has me a little excited. **Griffin's Lair** will continue to review programs for the *entire* Atari series; it's remaining in the normal pages of **ANALOG Computing**

WORD FOR WORD
BAY VIEW SOFTWARE
177 Webster Street, Suite A-295
Monterey, CA 93940
520ST $39.95

Word for Word is described as a computer crossword game. As I began reading the instructions (remember, I'm one of those compulsive types)... Anyway, as I began reading the instructions, a familiar chord rang through. This was a version of computer Scrabble™. Of course, the authors can't *say* it's just like Scrabble, probably because of copyright laws, etc. Consequently, a seemingly inordinate amount of space explaining the basic rules of the game is necessary.

All the well-known aspects of Scrabble are included. Differing point values for the letters, double and triple letter scores, double word scores, exchange of letters, and challenging words are all part of this game. The mouse is used to travel about the playing screen, and words are entered via the keyboard. The appropriate input is quick and simple, and design of the various screens facilitates play.

The main playing screen has the game board on the left and the playing area on the right. A player's six letters are displayed at the top of the playing area. Option boxes immediately below allow one to "hide" letters from opponents, as well as shuffle the order of the letters.

One may also rearrange individual letters by dragging them on top of one another and inserting them where desired, by clicking the mouse. This is very helpful, as we all remember from playing the original board game.

Beneath the option boxes is the space where a word to be entered is typed in. Then the direction (horizontal or vertical) is selected. Finally, a pointer is moved onto the game board and placed in the square where the word is to start.

After a word is entered on the game board screen, it may be challenged. Once challenged, it must be looked up in one's own reference source. If it is a real word, the appropriate button is clicked, and the challenger loses his next turn. If it's not found to be a real word, then the player receives a score of 0.

At the end of the game, unused letters count against each player. If all of a player's letters are used, then the source is increased by the value of the opponent's unplayed letters. Sounds just like the real thing.

The game is designed to be played against one, two, or three other players. Any or all of these may be a computer opponent. There's always *someone* to play against.

Let me warn you though, the computer is tough. I don't know how large its vocabulary is, but the systematic way the computer sorts through a quite extensive list of words to select the one with the highest point value makes for a worthy opponent.

If there were no more to the game than this, it would have been just fine, but there *is* a lot more. Several pull-down menus are available throughout, to fur-

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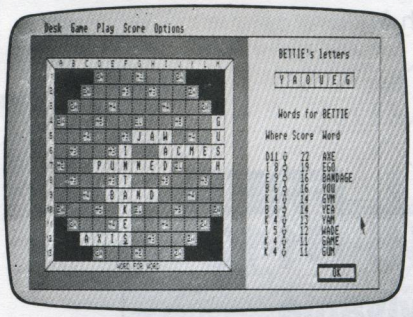
ther enhance playing. These include a desk menu, which makes available any desk accessory listed for use with one's computer.

The game menu allows one to restart a game, choose a new game, or make a new game (more on this later). The play menu gives one the options of passing a turn, exchanging letters, or selecting a very helpful "assist" mode.



Word for Word.

Using the assist command, the computer examines one's letters and shows the words they're able to form. These words are listed in the playing area, with the highest point value word at the top. We're also shown the coordinates where the first letter of the word must be played to receive the indicated score. The score menu shows each player's score and the number of letters remaining in that player's rack.

The options menu contains several commands. One of these enables a player to hide or show the letter values on the letter rack and the game board. Another will display the process the computer goes through as it forms its words. The skill level of the computer can be selected from beginner, intermediate or advanced. The time limit the computer has to complete its turn can also be selected under the options menu.

Had enough? No? Want to design your own game board and save it on disk? You can do it. Black out squares which won't be playable; put in double word, triple letter, etc. scores wherever you want. Change the value of individual letters, or increase the absolute number of individual letters. All of this can be done with relative ease.

A very thorough game manual accompanies this program, and the whole game design is extremely user-friendly. The simplicity of Scrabble with computer enhancements makes this a winner. Here's a game which always provides you with a readily available (and quite competitive) opponent. Bay View Software has not only recreated a classic board game for the computer; they've made it better.

WINNIE THE POOH
IN THE HUNDRED ACRE WOOD
SIERRA ON-LINE, INC.
P.O. Box 485
Coarsegold, CA 93614
520ST $24.95

When I received this program from the staff at **ANALOG Computing**, I was concerned . . . Making a computer adventure game based on the legendary Pooh and his friends might, in some fashion, tarnish the reputation of this classic children's story.

I know that Sierra's a quality company and has always done things with class, but I was still worried. Well, A.A. Milne can rest in peace. This adventure, designed for children ages seven and up, is simply superb.

I've discussed the educational benefits of adventure games in this column before. They provide an excellent means to enhance skills in reading comprehension, problem solving, logic and mapping strategies. **Pooh** includes these educational building blocks in an entertaining and enjoyable environment.

A blustery wind has come along and mixed up everything in the forest. The player must locate displaced objects and return them to their rightful owners.

There are ten objects which belong to a particular character or in a specific place. Each time the game is played, a different group of objects must be found, so no two games are alike.

Using the mouse or the keyboard, the player travels through the Hundred Acre Wood and interacts with characters by selecting one of the displayed options. One may decide to *look behind the chest, climb the tree, talk with Kanga*, or leave that spot and go in a specific direction.

All of the possible options are displayed, and the child doesn't have to type in commands—or figure out just the right way to communicate with the computer, as is the case with more adult adventure games.

The options aren't always terribly purposeful; some allow conversations with the various inhabitants, but aren't critical in achieving the final goal. For example, talking with Eeyore will merely bring forth the expected self-deprecating ravings we all know and love so well. Each character is similarly developed, as one might expect in a book.

Being able to carry only a single object at a time forces the child to remember where other found objects are located and to seek out specific characters. As the game continues, a few obstacles may stand in the way of easily accomplishing one's goal.

If too much time is taken redistributing lost items, the blustery wind will return and mix everything up again. Occasionally, a mist will come in and cover everything with a thick blanket of fog. When this happens, the player must keep on walking until the fog lifts, finding himself in quite a different locale.

All of the most-loved characters are included. Of course, Pooh Bear is the star. We also find Kanga, Roo, Piglet, Eeyore, Rabbit, Owl and Christopher Robin.

Oh yes, we musn't forget Tigger, my personal favorite. That lovable, bouncy tiger does cause some problems. He may appear anywhere and, when he does, he bounces the player to another part of the forest, causing him to drop the object being carried. He just loves to bounce —after all, that's what Tiggers do best!

Winnie the Pooh
in the Hundred Acre Wood.

Owl can be a big help. If an object is found, and one doesn't know to whom it belongs, take it to Owl. He'll help discover its owner.

All the special places of the Hundred Acre Wood are incorporated in the adventure. These include the Heffalump trap, Where the Woozle Wasn't, Roo's sandy pit, etc.

The graphics are excellent, doing justice to the original drawings by H. Shepard. The game manual is quite clear and contains a description of the characters and places, a glossary of terms and additional learning activities. A game save feature is also available.

Once all the items have been found

and returned, a party is held in the player's honor, at an unknown site. When one finds the party, a sing-along of the familiar "Winnie the Pooh" soon takes place. The musical accompaniment is as superb as everything else.

This is a fun adventure and would win the Oscar for Best Adaptation if it were a movie. I was so affected by the mood created that I dug out the Pooh books and began rereading them.

I soon found I'd been joined by my two, quite grown-up, teenagers. It wasn't long before I was reading Pooh aloud to the two of them, stirring the most pleasant memories. And I thought to myself, "Silly old Bear!"

Dr. Griffin, as Chief of Newborn Medicine at a perinatal center, spends most of his time in the newborn intensive care ward. Off-hours, he's been using an Atari 800 for four years. In keeping with his gentle profession of nurturing preemies, Dr. Griffin's number one game is ***Crush, Crumble, Chomp****.*

ATTENTION PROGRAMMERS!

ANALOG Computing is interested in programs, articles, tutorials and hardware/software review submissions dealing with the whole line of Atari personal computers, including the new ST models. If you feel that you can write as well as you can program, then submit those articles and reviews that have been floating around in your head, awaiting publication. This is your opportunity to share your knowledge with the growing family of Atari computer owners.

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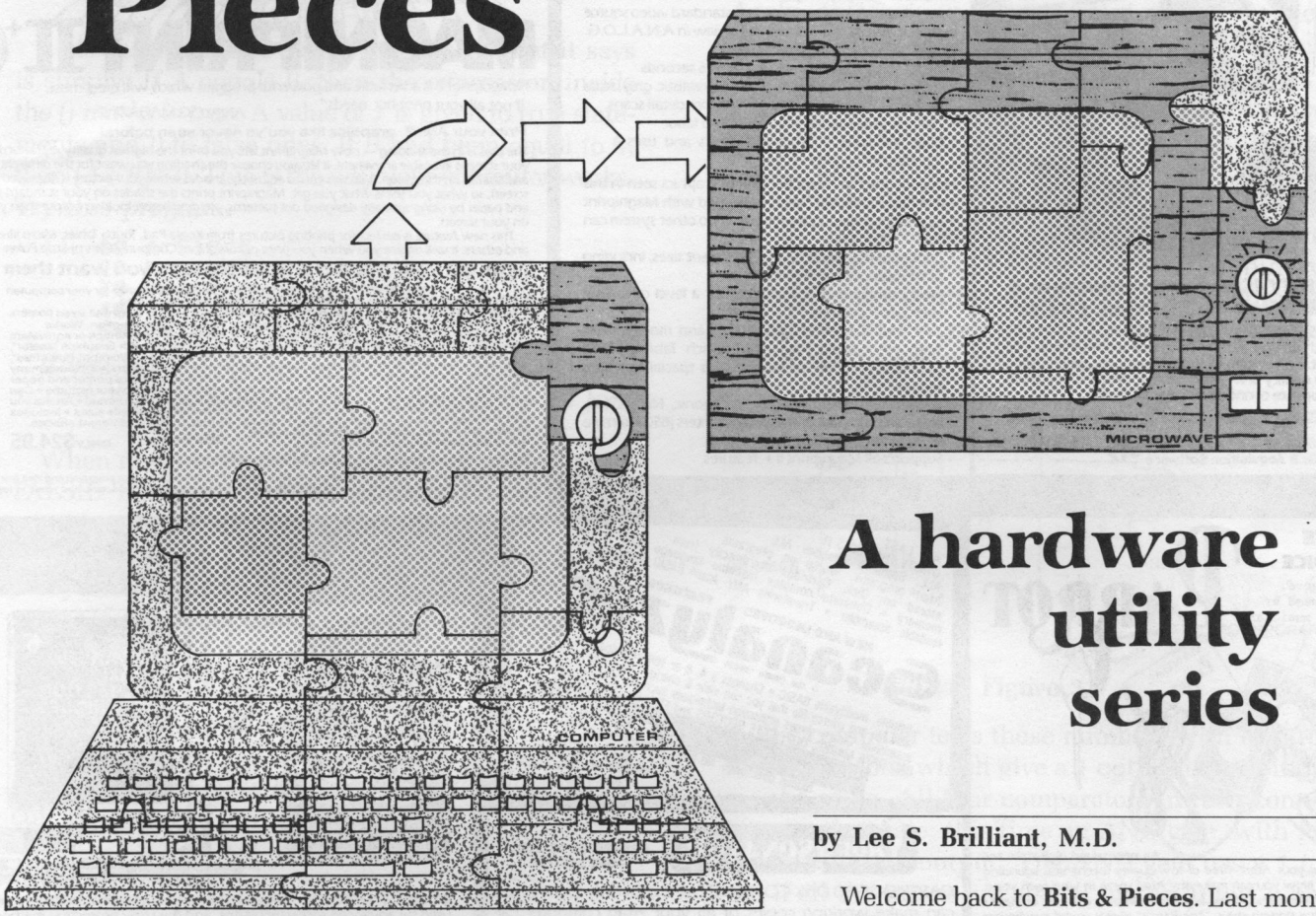
Bits & Pieces



A hardware utility series

by Lee S. Brilliant, M.D.

Welcome back to **Bits & Pieces**. Last month we discussed, on a rather deep level, how the main processor of the Atari works. If you understood that, then you understand how all computers work—right up to the biggies at the Pentagon. The only difference is in how big they are.

The first computer was an abacus, created by the Chinese centuries ago. But the first electronic computers were developed during WWII. Until then, calculations for cannon trajectories had been done by trial and error, by hand, or with the help of some device (like a slide rule). As aircraft became faster, the need to calculate trajectories faster increased.

The first computers were analog devices: a set of potentiometers (like the volume control on your radio) were tied together electrically and had calibrated scales. The desired data were "fed" to the "computer" by turning the dials to the right numbers. The voltage outputs were read by a voltmeter and a "result" obtained. They were inaccurate but fast—and good enough for government work.

After the war, vacuum tubes were used to build computers. The first real digital computer occupied the entire basement of a university building and used as much power as a city block. Yet that computer, ENIAC, could barely do more than a pocket calculator. But, for lots of long calculations, it was faster and more accurate than a team of scientists working from a set of logarithm tables.

The real basis for today's computers is an obscure branch of algebra developed by George Boole more than

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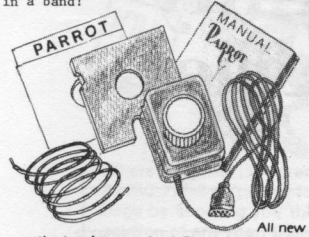

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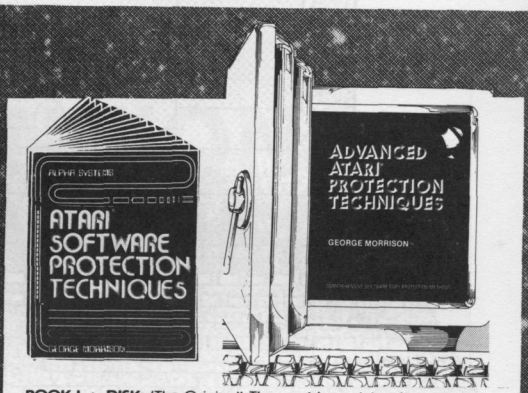

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one hundred years ago. Called Boolean algebra, this form of mathematics is mostly symbolic, but transforms mathematical expressions into either true or false statements. Consider the following:

```
A=5
B=5
(A=B)=1
```

This may look like funny math, but what it says is simply: *If A equals B, then the expression inside the () marks is true.* A value of *1* is given to true statements and *0* to false ones. If *B* had been equal to *4*, then *(A = B) = 0*. This is the way your computer works. Try this program.

```
10 A=5:B=5
20 C=(A=B)
30 PRINT C
40 IF C THEN PRINT "TRUE":END
50 PRINT "FALSE"
```

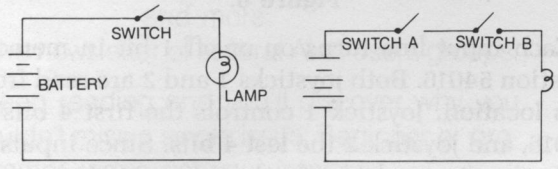
If you run this program, the screen will show a *1*, then the word TRUE. Now change Line 10 to:

```
10 A=4:B=5
```

When run this time, *C = 0* and the computer prints FALSE. The complete expression *IF C = 1 THEN* is not necessary, because the computer assumes either *C = 0* or *C < > 0*. The beauty of this system is that everything is binary, either true *(1)* or false *(0)*. This makes if perfect for computers—which have only two fingers.

Nitty Gritty.

Let's look at some simple electric circuits. In Circuit A of Figure 1, the light bulb only lights if the switch is closed. Now look at the modification in Circuit B.



Circuit A. **Circuit B.**

Figure 1.

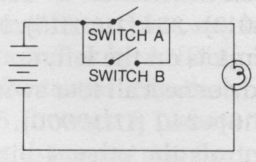


Figure 2.

Here, the light bulb lights only if *both* switches are closed. We equate the closed switch with the value *1* and an open switch with *0*. We can now say, *If A = 1 AND B = 1 THEN BULB ON*. This looks remarkably like computer logic and, in fact, it is. Now look at Figure 2.

Here, when either switch is closed, the bulb lights. In other words, *IF A = 1 OR B = 1 THEN BULB ON*. Again, this is how the computer makes decisions, based on true or false statements. As in the previous example, *(A = B)* would be evaluated as *IF A = B THEN PRINT "TRUE"*. There's nothing magical about this type of decision making. We can substitute transistors and other parts for the switches and light bulbs, to build "logic gates."

The last question we ask is: how does the computer know whether *A = B* or not? Well, in binary, *5* is *0101*, and *4* is *0100*. If each bit of each number is compared to its counterpart in the other number, you'll see that a match doesn't occur.

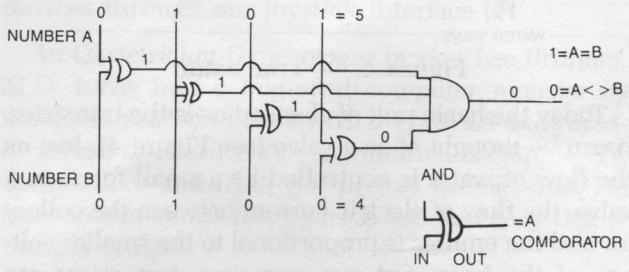


Figure 3.

The computer tests these numbers with electronic comparisons which give a *1* output if both inputs are the same. All four comparators in turn connect into another gate: this time an AND gate, with four inputs and one output. The AND gate has a *1* output if all the inputs are also *1*; that is, Input 1 AND Input 2 AND Input 3 AND Input 4 equal *1*.

If you know a little machine language, you can see this is how the CMP command works. It has either a *1* or *0* result, which is stored in the Z (zero) register. Based on whether or not this flag is set, the branch commands BNE (Z cleared) or BEQ (Z set) are executed. These functions are built into the main processor and are set up by machine language commands stored in RAM.

More history.

In the fifties, scientists at Bell Telephone laboratories developed a new device which would work like a vacuum tube but was solid, not hollow. From this, we get the term *solid state*. The device was the transistor. Soon, computers were built using these much smaller and more energy-efficient devices. Many years later, several transistors were manufactured on

a single base, creating an entire amplifier in a single part.

Not long afterwards, integrated circuits (ICs) were built, with many more parts combined on a single chip of silicon. Finally, large scale integration provided entire computers, TVs and radios on single chips. Before ICs, such logic units were made up of individual transistors on circuit boards. An 8-bit AND/OR/EOR logic board alone would have been about the size of a 600XL computer, but now all this logic is included in the 6502 central processor chip as a small part of your computer!

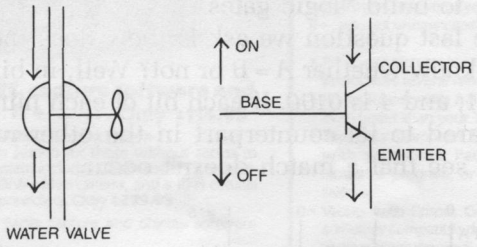
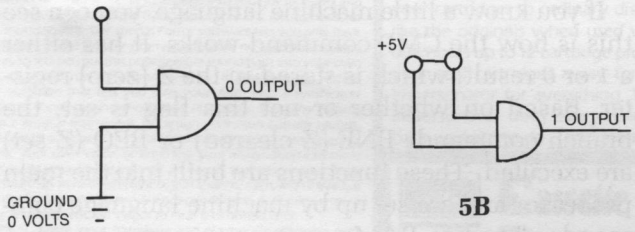


Figure 4. — Transistor.

Today the basic unit of electronics is the transistor. It can be thought of as a valve (see Figure 4). Just as the flow of water is controlled by a small force on a valve, the flow of electric current between the collector and the emitter is proportional to the smaller voltage of the base. For our purposes, two states are considered: full on and full off. Therefore, we either bias the transistor to the collector or the emitter voltage.

The standard is +5 volts output in a logic 1 state, and ground (or 0 volts) in logic 0. The actual construction is complicated, but we don't need to know too much about actual gate construction. We do need to know some standards by which these circuits work.



5A 5B

Figure 5. — AND Gate.

In schematics, gates are represented by special symbols, instead of showing individual parts. All logic gate inputs are considered to be at logic 1, unless they're specifically set to logic 0. Look at Figure 5. This shows an AND gate.

Figure 5A shows one input at *0* and the other at *1*, so the output is *0*, because input 1 AND input 2 are not both logic 1. Figure 5B shows both inputs at logic 1, so the output is *1*. But, if neither input had been connected to either 0 or 1, the output of the AND gate is still *1*, because *inputs are always internally pulled up to +5 volts unless specifically set to 0.* When the output of a gate is at logic 0, it represents almost a short circuit to ground.

Breadboards.

Okay, it's time to get off of all this theoretical junk and do something useful. For many of the experiments, you'll need a general purpose connection with your Atari called a "breadboard." The first thing we'll do is use the joystick ports as input devices and build a general purpose interface.

You all know how to move monsters around the screen with a joystick, but how is this actually accomplished, and how can it be adapted to fit your own needs? The joystick is nothing more than four switches: left, right, up and down. When you push the stick up, it closes the up switch. These four switches hook between pins 1 and ground for up, 2 and ground for down, 3 and ground for left, and 4 and ground for right (see Figure 6).

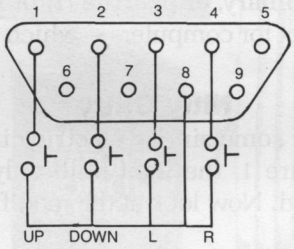


Figure 6.

Each input line turns on or off 1 bit in memory location 54016. Both joysticks 1 and 2 are read from this location. Joystick 1 controls the first 4 bits of 54016, and joystick 2 the last 4 bits. Since inputs to logic circuits are always *1* unless connected to ground (logic 0), then PEEK(54016) should be *255* (*11111111* in binary) when no joystick is present.

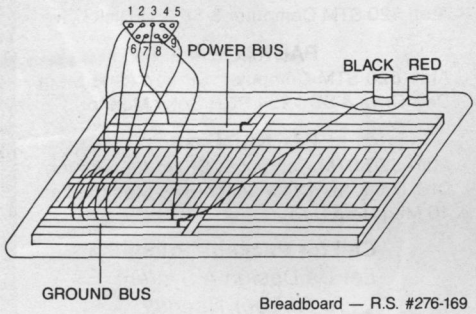
If we place pin 1 of plug #1 at logic 0 by shorting it to ground, then the first bit in 54016 is turned to *0*, and PEEK(54016)=*254* (*11111110*). Note the inverse relationship: pin 1 is on the left, and bit 0 is on the right. If we could connect all four switches to ground, then PEEK(54016)=*240* (*11110000*).

Joystick 2 controls the other 4 bits, and, if these are also grounded, then PEEK(54016)=*0* (*00000000*). The computer reads this byte between each picture on the screen and transfers the value in the lower nibble to location 632, and the upper nibble to 633 as

a 4-bit number. You can also access these locations with the BASIC STICK(0) and STICK(1) commands.

It's time now to build our interface. The parts needed are listed in the parts list. The solderless breadboard has a right and left half, and at the top and bottom of each half are two rows of connections, the upper pair for +5 volts and the lower pair for ground.

The two upper rows should be connected together and a wire run from there to one of the red binding posts. The bottom two connect together, then to the black post. The remaining central sections are organized into vertical rows.



PARTS LIST

Breadboard — R.S. #276-169
DB-9 female plugs — R.S. #276-1538
(or 2 joystick cables #276-1978; cut off male end)
Multi conductor cable — R.S. #278-772
Hook-up wire — R.S. #278-1306

Figure 7.

Make your joystick cables by running a piece of 9 conductor cable from the joystick plugs to the board. You'll need to strip and put solder on the bare ends, so that they'll push into the holes on the breadboard. If you've done this correctly, it should look like Figure 7. Insert plug 1 into joystick port 1.

Type in the following program and RUN it.

```
10 PRINT PEEK(54016):GOTO 10
```

The screen will print a long line of *255*s. One at a time, insert wires into the breadboard to jump from joystick plug pins 1 through 4 to ground. As you do this, the value displayed will decrease by the value of the bit set to logic 0. That is, if you short the first pin to ground, *254* will be displayed (255-1).

If pin 4 is shorted to ground, it will display *247* (pin 4 corresponds to the *8*s column and 255 – 8 = 247). If you program in machine, any bit can be tested with a BIT command or by ANDing it with the value of the bit to be tested. Similarly, plug into port 2 and test bits 5 through 8 (values 16 to 128).

There's nothing to prevent you from using any kind of open/close switch instead of the jumper wire on the breadboard. For example, you could substitute a magnetic switch to a window or door sensor, a doorbell button, a switch attached to the track of your garage door to sense if it's open, the relay connections of a photoelectric door alarm, or a swimming pool level sensor.

Any switch device can be plugged in here as long as it doesn't have any power attached. A simple furnace thermostat can even let your computer know it's getting too hot!

Let your imagination go wild. Solder a few feet of wire to each of four push buttons and press their leads into the breadboard instead of the jumper wires. Listing 1 uses these pushbuttons on the first four lines. It detects the closure of each switch, senses which was first and, finally, records the time to response in sixtieths of a second. This could be the basis of a quiz game: flash a question on-screen, and the first person to respond wins that round.

Start using your computer to sense the real world. Next month, we'll explore ways to control outside devices through our joystick interface.

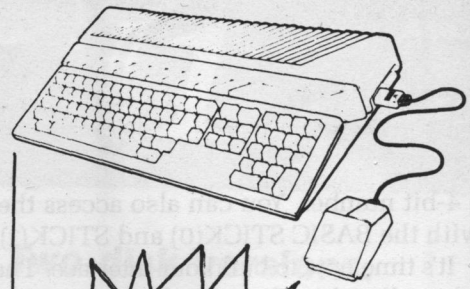
An Obstetrician-Gynecologist by day, Lee Brilliant, M.D. turns into a bug-eyed computer monster by night. He started in 1983 with a TI 99/4A and rapidly moved to Atari. He's programmed on Apple, TI, Commodore and IBM, but prefers his old 800. He loves to tear computers apart to see how they tick—using a scalpel!

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor*, page 21.

Listing 1.
BASIC listing.

```
NI 10 CONSOL=53279:POSITION 10,10:? "PRES
   S START"
OU 20 IF PEEK(CONSOL)<>6 THEN 20
GU 100 ? CHR$(125);"TIMING":POKE 19,0:POK
   E 20,0
OW 110 IF PEEK(54016)=255 THEN 110
RI 120 HOLD=PEEK(54016)-240:TIME=(PEEK(20
   )+256*PEEK(19))/60:COUNT=8:?
JV 130 FOR PLAYER=4 TO 1 STEP -1:IF COUNT
   <=HOLD THEN HOLD=HOLD-COUNT:COUNT=COUN
   T/2:GOTO 150
LF 140 ? "PLAYER#";PLAYER;"  TIME:";TIME;
   " SECONDS":COUNT=COUNT/2
RW 150 NEXT PLAYER
```

COMPUTER CREATIONS



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Electroids

by James Hague

For years, I've been seeing clone after clone of climbing and shooting arcade-style games that show very little originality. After learning assembly language, I believed I could do better. Not realizing the enormity of the task before me, I set out to accomplish what only wizards like Tom Hudson could ever achieve.

After months of errors, bad sectors and everything else my Atari could throw at me my perseverance has been rewarded. The going was rough, but I'm proud to finally present **Electroids**—an original, 100% machine-language arcade game for one player.

Typing it in.

Listing 1 is the BASIC data used to create both disk and cassette versions of **Electroids**. Those readers who are interested in how the game works may obtain the assembly listing on either the magazine disk version or the **ANALOG Computing** TCS.

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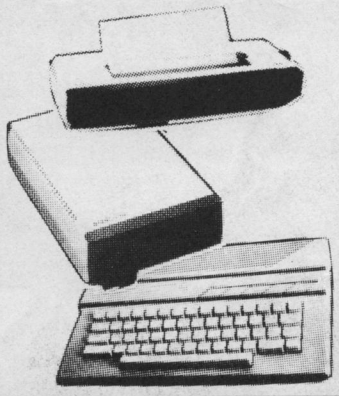

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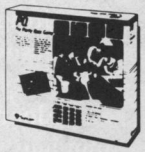

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Electroids *continued*

Disk users should refer to the **M/L Editor** article on page 81 for typing instructions.

If you have a cassette system, type in Listing 1, then add the lines shown in Listing 2. Type RUN and press RETURN. The program will begin checking the data statements, printing the line numbers as it goes. It will alert you to any problems. Fix any incorrect lines and rerun the program until all errors are eliminated.

When all your data lines are correct, the computer will beep twice and prompt you to *READY CASSETTE AND PRESS RETURN*. Now, insert a blank cassette in your recorder, press the RECORD and PLAY buttons simultaneously, and hit RETURN. The message *WRITING FILE* will appear, and the program will create a machine language boot tape version of **Electroids**, printing each data line number as it goes. When the *READY* prompt appears, the game is recorded and ready to play. CSAVE the BASIC program on a separate tape before continuing.

To play the game, rewind the tape created with the BASIC program to the beginning. Turn the computer off and remove all cartridges. Press the PLAY button on your recorder and turn on your computer, while holding down the START key. If you have an XL or XE series computer, you must hold the START and OPTION keys when you turn on the power. The computer will beep once. Hit RETURN, and **Electroids** will load and run automatically.

The game.

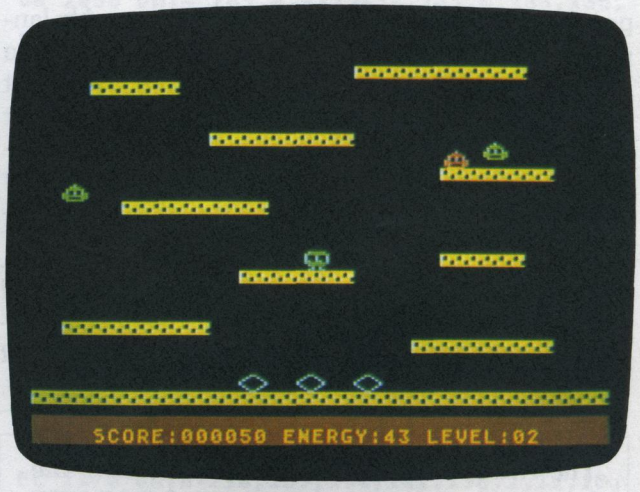
Electroids is a joystick-controlled game for one player. You must protect special "power jewels" from a group of attackers known as **Electroids**. These creatures fall from the top of the screen, attempting to come in contact with one of the pulsating green jewels at the bottom.

If an **Electroid** hits one of the many floating yellow platforms, it will move along the surface until it can again continue down. If it does manage to touch one of the power jewels, a short circuit will occur—and you'll lose five units of energy. On the brighter side, the **Electroid** which did the damage will be eliminated. You begin the game with fifty units of energy; it's over when all are lost.

You control a small green creature which defies biological classification. It's known as simply the "Green Thing." Its job is to prevent **Electroids** from short-circuiting those power jewels located in the lower portion of the screen.

The Green Thing is moved left and right along the yellow platforms by pushing the joystick in that direction. If it moves off one side of the screen, it will reappear on the other, and vice versa. If the Green Thing moves off one of the platforms, it will fall, but no harm will come to it (in fact, that's the only way to move down).

In order to move upward, press and hold the trigger. The Green Thing will jump until the trigger's release, then it will fall until it hits a platform. It's important to note that Green Things can be moved left and right while falling and jumping. The Green Thing is quite a versatile little creature, isn't it?



Now on to the important part. In order to stop an **Electroid**, you must touch it while it's green—when it's falling. This will cause the **Electroid** to bounce backwards toward the top of the screen until it hits a ledge, when it will again begin the suicidal descent.

This trick will give you anywhere from 5 to 75 points, depending on the level. If you touch an **Electroid** while he is red (on platforms), energy will be quickly drained from your supply. When I say "quickly," I mean *quickly*, so watch out!

The only part of the game that seems to confuse beginners is how to complete a level. A level is complete when a certain number of **Electroids** have been eliminated.

They can be eliminated in any of three ways: (1) when bounced off the top of the screen, (2) when exiting from the screen through the lower left- or right-hand corners of the screen, or (3) when hitting a jewel.

When a specific number of them have been destroyed, the computer will print *LEVEL COMPLETE* and automatically advance to the next level. After each level, you'll get some bonus energy (you'll need it). There are a total of twelve levels in the game, some of which contain glowing red electrodes. These will drain energy on contact, so be careful!

Electroids *continued*

Electroids is a game which requires much practice to master. It may take a few games to become proficient at controlling the Green Thing, but it's not *that* hard. In the early boards, it's a good idea to just move around at the top of the screen. In later levels, of course, that becomes impossible.

A final note.

Many people have the potential to program some great arcade games, but are convinced it's for experts only. I'll admit it's no piece of cake, but it isn't impossible, either. **Electroids** was my first assembly language game and it turned out quite well. Maybe Kyle Peacock could do better, but I'm satisfied with what I've accomplished. I encourage others to convert their brainstorms into assembly language mnemonics, because—with a little effort—you never know *what* could happen. You just might be the next Tom Hudson.

James Hague is a senior at Berkner High School in Richardson, Texas. Although this is the first assembly language program he's written, it's not his first published—his ***Bonk*** *program appeared in issue 35.*

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor*, page 21.

The code is simply a double check for Listing 1; it's of more use with Listing 2.

Listing 1.
BASIC listing.

```
FS 1000 DATA 255,255,0,52,13,61,32,101,22
   8,162,0,189,0,224,157,0,4867
JT 1010 DATA 32,189,255,224,157,255,32,23
   2,208,241,169,32,141,244,2,189,2304
NO 1020 DATA 39,52,157,0,32,232,224,48,20
   8,245,76,104,52,0,0,0,2220
SD 1030 DATA 0,0,0,0,0,24,36,66,129,129,6
   6,36,24,255,187,187,5242
HH 1040 DATA 238,238,255,0,0,124,56,124,5
   6,124,56,124,56,0,24,24,9967
IT 1050 DATA 24,24,60,126,255,0,0,0,255,2
   55,255,255,255,72,169,0,649
RY 1060 DATA 141,10,212,141,19,208,141,20
   ,208,141,21,208,104,64,32,245,7568
QA 1070 DATA 54,169,0,133,138,32,93,55,32
   ,75,60,173,10,210,141,22,3278
PI 1080 DATA 208,173,31,208,201,6,240,5,1
   73,132,2,208,238,169,80,133,9503
XP 1090 DATA 134,169,0,133,133,133,132,13
   3,138,133,128,133,129,133,130,141,8866
XM 1100 DATA 30,208,133,185,133,186,133,1
   87,32,93,55,160,132,132,139,169,8989
OU 1110 DATA 115,133,140,141,0,208,162,0,
   189,146,54,153,0,36,149,172,5939
UX 1120 DATA 200,232,224,12,208,242,162,5
   5,160,120,169,7,32,92,228,169,8981
VY 1130 DATA 0,133,131,133,136,133,137,13
   3,138,133,166,133,135,133,185,133,336
DK 1140 DATA 186,133,187,141,30,208,133,1
   89,133,188,198,139,248,165,133,24,1394
XA 1150 DATA 105,1,133,133,216,166,132,22
   4,12,240,62,232,134,132,189,204,2643
ZC 1160 DATA 60,133,165,189,217,60,133,16
   8,169,20,133,170,189,230,60,133,386
XA 1170 DATA 184,189,243,60,133,131,76,51
   ,53,112,112,112,70,0,34,6,781
GH 1180 DATA 6,6,6,6,6,6,6,6,6,6,6,6,6,6,
   6,6,1996
CQ 1190 DATA 6,6,6,6,6,130,65,19,53,169,1
   9,141,48,2,169,53,770
GL 1200 DATA 141,49,2,169,87,141,0,2,169,
   52,141,1,2,169,192,141,4550
FD 1210 DATA 14,212,169,26,141,196,2,169,
   202,141,197,2,169,36,141,198,8909
NW 1220 DATA 2,169,56,141,199,2,162,0,138
   ,157,0,34,157,249,34,232,7402
AD 1230 DATA 224,250,208,245,162,0,189,15
   0,53,133,190,232,189,150,53,133,1052
ZR 1240 DATA 191,232,189,150,53,133,142,2
   32,189,150,53,160,0,145,190,200,759
PY 1250 DATA 196,142,208,249,232,224,44,2
   08,221,76,248,53,51,34,6,2,5200
BX 1260 DATA 62,34,3,2,126,34,5,2,174,34,
   4,2,203,34,5,2,7488
TG 1270 DATA 18,35,3,2,31,35,4,2,85,35,5,
   2,117,35,5,2,5096
QO 1280 DATA 164,35,20,2,184,35,20,133,15
   3,155,151,147,97,159,101,145,7590
ZO 1290 DATA 161,146,160,152,154,133,0,0,
   0,0,51,35,47,50,37,26,7662
UZ 1300 DATA 0,0,0,0,0,0,0,37,46,37,50,39
   ,57,26,0,0,4503
NW 1310 DATA 0,44,37,54,37,44,26,0,0,0,0,
   0,0,0,169,0,4891
RV 1320 DATA 133,142,166,142,189,194,53,1
   70,169,65,157,0,35,230,142,165,8986
LX 1330 DATA 142,197,184,208,237,162,39,1
   89,208,53,157,204,35,202,16,247,1244
RA 1340 DATA 32,106,58,32,113,58,32,92,58
   ,169,32,141,7,212,169,2,3641
VW 1350 DATA 141,29,208,169,62,141,47,2,3
   2,245,54,169,200,141,192,2,7196
WN 1360 DATA 162,2,32,8,55,202,16,250,169
   ,0,133,187,133,185,133,186,9771
VD 1370 DATA 141,30,208,32,44,55,169,1,13
   3,138,162,8,189,236,54,157,7602
RO 1380 DATA 225,34,202,16,247,160,120,32
   ,15,59,162,8,169,0,157,225,6389
UD 1390 DATA 34,202,16,250,32,34,60,32,68
   ,57,32,120,58,32,149,58,1255
FL 1400 DATA 173,31,208,201,6,208,3,76,13
   5,52,165,165,208,3,76,38,4994
PT 1410 DATA 59,165,134,208,226,76,170,59
   ,124,254,146,146,218,254,124,40,2185
OO 1420 DATA 40,40,108,108,0,124,254,146,
   146,218,254,124,40,40,108,108,8190
JF 1430 DATA 0,0,124,254,146,146,218,254,
   124,40,108,108,0,124,254,146,9864
WK 1440 DATA 146,218,254,124,40,40,108,10
   8,0,16,56,124,84,214,254,198,8670
DJ 1450 DATA 124,0,24,36,66,129,129,66,36
   ,24,0,24,36,66,66,36,8135
IN 1460 DATA 24,0,0,0,24,36,36,24,0,0,0,2
   4,36,66,66,36,5510
CE 1470 DATA 24,0,103,101,116,64,114,101,
   97,100,121,169,0,170,157,0,4744
MP 1480 DATA 36,157,0,37,157,0,38,157,0,3
   9,232,208,241,96,173,10,6955
CE 1490 DATA 210,41,127,24,105,65,149,144
   ,157,1,208,173,10,210,41,15,5081
VC 1500 DATA 149,147,169,216,157,193,2,16
   9,1,149,162,149,153,169,0,149,8431
BZ 1510 DATA 150,96,164,147,162,0,189,194
   ,54,153,0,37,200,232,224,10,8445
NN 1520 DATA 208,244,164,148,162,0,189,19
   4,54,153,0,38,200,232,224,10,8825
NS 1530 DATA 208,244,164,149,162,0,189,19
   4,54,153,0,39,200,232,224,10,8851
GT 1540 DATA 208,244,96,169,0,141,0,210,1
   41,2,210,141,4,210,141,6,6220
VE 1550 DATA 210,141,1,210,141,3,210,141,
```

```
   5,210,141,7,210,96,165,138,8743
MQ 1560 DATA 208,3,76,244,56,169,0,133,77
   ,230,137,166,137,224,3,208,118
BV 1570 DATA 20,162,0,134,137,32,194,58,1
   74,199,2,202,224,48,208,2,7887
PN 1580 DATA 162,60,142,199,2,162,0,189,5
   ,208,41,2,240,27,169,0,4211
PC 1590 DATA 157,1,208,149,150,149,144,16
   5,135,248,24,105,5,216,133,135,9404
FS 1600 DATA 169,138,141,1,210,169,50,133
   ,185,232,224,3,208,217,162,2,639
RD 1610 DATA 189,13,208,41,1,240,34,181,1
   53,201,255,240,28,181,162,208,3472
NP 1620 DATA 16,248,165,135,24,105,1,133,
   135,216,169,1,133,186,76,243,9595
EL 1630 DATA 55,169,1,149,159,169,16,133,
   187,202,16,212,173,4,208,41,8111
VD 1640 DATA 8,240,13,248,165,135,24,105,
   1,216,133,135,169,1,133,186,8236
SG 1650 DATA 166,185,240,32,202,240,14,13
   4,185,142,0,210,173,10,210,141,54
ZT 1660 DATA 197,2,76,46,56,162,0,134,185
   ,142,0,210,142,1,210,169,7916
NW 1670 DATA 202,141,197,2,165,186,240,23
   ,169,200,141,3,210,173,10,210,328
AB 1680 DATA 41,3,24,105,43,141,2,210,169
   ,0,133,186,76,79,56,141,5380
FX 1690 DATA 3,210,141,2,210,165,187,240,
   35,56,233,1,240,22,133,187,9678
OQ 1700 DATA 24,105,32,141,5,210,173,10,2
   10,41,15,24,105,60,141,4,2307
MD 1710 DATA 210,76,118,56,133,187,141,4,
   210,141,5,210,164,139,162,11,8015
JU 1720 DATA 169,0,153,0,36,200,202,16,24
   9,173,120,2,201,11,240,7,7064
KU 1730 DATA 201,7,240,20,76,176,56,166,1
   40,202,224,43,208,2,162,202,555
XE 1740 DATA 134,140,142,0,208,76,176,56,
   166,140,232,224,203,208,2,162,2063
GA 1750 DATA 44,134,140,142,0,208,165,166
   ,208,9,173,132,2,240,19,169,8605
UD 1760 DATA 0,133,167,32,255,56,165,166,
   208,3,76,223,56,230,139,76,9412
AJ 1770 DATA 223,56,169,1,133,167,165,139
   ,201,30,208,7,169,1,133,166,7893
DM 1780 DATA 76,199,56,198,139,32,223,58,
   164,139,162,0,181,172,153,0,7830
CK 1790 DATA 36,200,232,224,12,208,245,76
   ,247,56,32,93,55,169,0,141,7037
WS 1800 DATA 30,208,76,98,228,162,0,173,4
   ,208,41,1,208,5,169,1,4266
LQ 1810 DATA 133,166,96,165,140,201,137,1
   44,20,189,57,57,197,139,208,5,8328
TP 1820 DATA 169,0,133,166,96,232,224,5,2
   08,239,76,8,57,189,62,57,6955
DK 1830 DATA 197,139,208,3,76,26,57,232,2
   24,6,208,241,76,8,57,37,5535
QD 1840 DATA 85,125,165,189,45,69,101,133
   ,157,189,162,0,181,162,208,8,8790
TW 1850 DATA 169,54,157,193,2,76,87,57,16
   9,216,157,193,2,232,224,3,9307
OO 1860 DATA 208,234,165,169,240,3,198,16
   9,96,165,168,133,169,165,171,240,4533
ZV 1870 DATA 3,198,171,96,165,170,133,171
   ,162,0,181,162,208,3,76,154,9053
YX 1880 DATA 57,32,4,58,181,162,208,74,17
   3,10,210,41,1,240,11,169,6871
LS 1890 DATA 0,149,153,169,1,149,150,76,2
   04,57,149,153,169,255,149,150,2163
FX 1900 DATA 32,4,58,181,162,240,43,173,1
   0,210,41,3,240,249,201,1,9087
XD 1910 DATA 240,13,201,2,240,20,169,1,14
   9,153,149,150,76,204,57,169,9011
AY 1920 DATA 1,149,153,169,0,149,150,76,2
   04,57,169,1,149,153,169,255,877
EO 1930 DATA 149,150,232,224,3,208,163,16
   2,0,181,144,24,117,150,201,40,8629
PG 1940 DATA 208,5,169,215,76,231,57,201,
   216,208,2,169,41,149,144,157,663
EM 1950 DATA 1,208,181,147,24,117,153,201
   ,240,208,5,32,8,55,198,165,8162
VN 1960 DATA 149,147,232,224,3,208,210,76
   ,44,55,160,0,185,40,58,213,7285
FE 1970 DATA 147,208,17,181,144,217,50,58
   ,144,10,217,60,58,176,5,169,6644
XN 1980 DATA 0,149,162,96,200,192,10,208,
   227,169,1,149,162,96,47,71,7857
VY 1990 DATA 103,135,159,39,87,127,167,19
   1,57,89,65,97,49,129,153,153,7358
IJ 2000 DATA 145,41,89,137,113,137,97,185
   ,193,185,193,209,133,142,74,74,817
HH 2010 DATA 74,74,9,16,153,204,35,200,16
   5,142,41,15,9,16,153,204,5593
NE 2020 DATA 35,96,162,2,160,10,181,128,3
   2,70,58,200,202,16,247,96,8009
UX 2030 DATA 165,134,160,24,76,70,58,165,
   133,160,33,76,70,58,165,135,5994
VT 2040 DATA 208,1,96,165,134,248,56,229,
   135,216,133,134,201,128,144,4,655
OR 2050 DATA 169,0,133,134,169,0,133,135,
   76,106,58,162,2,181,159,240,9121
YV 2060 DATA 11,169,0,149,159,169,255,149
   ,153,32,170,58,202,16,238,96,10
NS 2070 DATA 165,131,248,24,101,128,133,1
   28,169,0,101,129,133,129,169,0,6815
GM 2080 DATA 101,130,133,130,216,76,92,58
   ,165,136,24,105,8,201,32,208,7099
RY 2090 DATA 2,169,0,133,136,168,162,0,18
   5,204,54,157,8,32,200,232,9231
DA 2100 DATA 224,8,208,244,96,165,166,208
   ,43,165,167,208,39,230,189,165,3808
QD 2110 DATA 189,201,7,208,31,169,0,133,1
   89,165,188,24,105,12,201,48,6810
YE 2120 DATA 208,2,169,0,133,188,168,162,
   0,185,146,54,149,172,200,232,2265
XJ 2130 DATA 224,12,208,245,96,169,0,133,
   20,132,142,165,20,197,142,240,570
XA 2140 DATA 10,173,31,208,201,6,208,243,
   76,135,52,96,32,93,55,169,6867
LH 2150 DATA 0,141,1,208,141,2,208,141,3,
   208,162,13,189,254,59,157,23
KA 2160 DATA 223,34,202,16,247,160,10,169
   ,168,141,1,210,169,105,141,0,7973
EC 2170 DATA 210,169,134,141,196,2,32,15,
   59,169,115,141,0,210,169,26,6089
DQ 2180 DATA 141,196,2,32,15,59,165,134,2
   40,70,136,208,223,32,93,55,7977
BY 2190 DATA 162,13,189,12,60,157,223,34,
   202,16,247,166,132,189,0,61,8093
AQ 2200 DATA 170,165,134,201,117,240,10,2
   48,24,105,1,216,133,134,32,106,7635
MJ 2210 DATA 58,160,8,169,40,141,1,210,14
   0,0,210,132,143,160,1,32,5801
NK 2220 DATA 15,59,164,143,136,16,241,202
   ,208,215,32,93,55,76,201,52,8612
UK 2230 DATA 169,0,133,138,141,0,208,141,
   192,2,32,93,55,169,202,141,8222
BR 2240 DATA 197,2,169,24,133,136,32,194,
   58,162,0,189,26,60,157,226,7860
UJ 2250 DATA 34,160,25,32,15,59,232,224,8
   ,208,240,160,120,32,15,59,6541
IJ 2260 DATA 169,15,133,168,133,170,133,1
   65,32,68,57,173,31,208,201,6,7563
RT 2270 DATA 208,3,76,135,52,173,132,2,20
   8,3,76,135,52,165,165,208,8637
KN 2280 DATA 231,76,104,52,108,101,118,10
   1,108,64,99,111,109,112,108,101,6217
OZ 2290 DATA 116,101,64,98,111,110,117,11
   5,64,101,110,101,114,103,121,64,5917
CZ 2300 DATA 116,104,101,64,64,101,110,10
   0,165,132,201,3,144,34,169,195,8734
SP 2310 DATA 141,11,34,141,31,34,165,132,
   201,7,144,20,169,195,141,7,6566
EO 2320 DATA 34,141,27,34,141,47,34,141,6
   7,34,141,87,34,141,107,34,3309
YV 2330 DATA 96,169,102,141,197,2,169,150
   ,141,198,2,169,200,141,199,2,9904
ZT 2340 DATA 169,101,141,48,2,169,60,141,
   49,2,96,112,112,112,112,112,5255
RB 2350 DATA 112,112,112,112,112,112,71,1
   24,60,112,6,6,112,112,6,65,2143
PV 2360 DATA 101,60,0,0,0,52,40,37,0,37,4
   4,37,35,52,50,47,7452
BC 2370 DATA 41,36,51,0,0,0,64,64,64,64,6
   4,64,72,99,73,64,725
VH 2380 DATA 81,89,88,84,64,0,0,0,0,0,128
```

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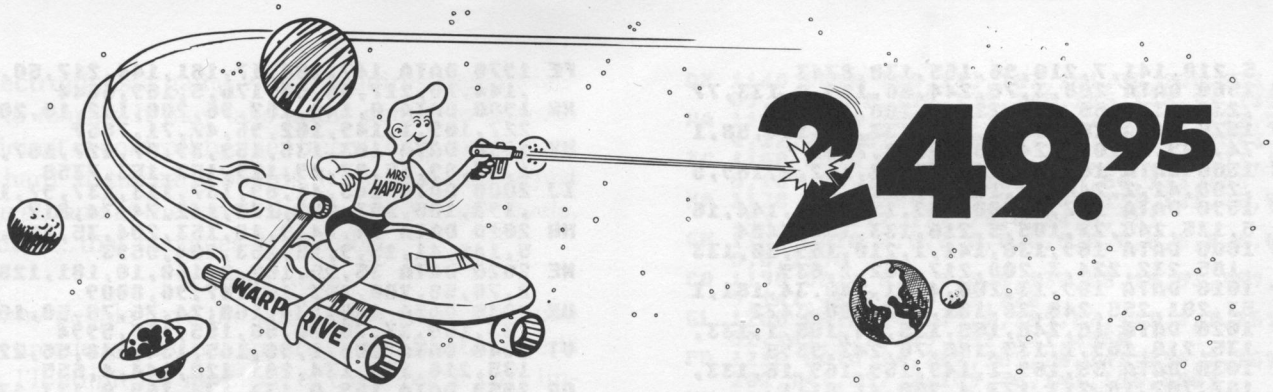

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CIRCLE #120 ON READER SERVICE CARD

```
   ,128,128,162,185,128,5258
HL 2390 DATA 170,161,173,165,179,128,168,
   161,167,181,165,128,128,128,192,192,42
   60
YX 2400 DATA 192,192,240,242,229,243,243,
   192,192,243,244,225,242,244,192,192,25
   60
XF 2410 DATA 192,192,0,5,7,9,10,11,12,12,
   12,12,12,12,12,0,4261
DW 2420 DATA 18,15,12,10,9,8,7,6,5,4,3,2,
   0,1,3,4,2999
TA 2430 DATA 5,6,7,8,9,10,11,12,14,0,5,16
   ,21,32,37,48,5195
MN 2440 DATA 53,64,69,80,96,117,0,5,5,5,7
   ,7,7,10,10,10,5167
KJ 2450 DATA 15,15,15,0,224,2,225,2,0,52,
   0,0,0,0,0,0,5783
```

Listing 2.
BASIC listing.

```
ML 10 REM *** ELECTROIDS ***
LI 20 REM CASSETTE MAKER PROGRAM
EI 40 DIM DAT(16):LINE=990:RESTORE 1000:T
   RAP 120:? "CHECKING DATA"
DO 50 LINE=LINE+10:? "LINE:";LINE:FOR X=1
    TO 16:READ DAT:IF DAT<0 OR DAT>255 TH
   EN 220
YY 60 DAT(X)=DAT:NEXT X:DATLIN=PEEK(183)+
   PEEK(184)*256:IF DATLIN<>LINE THEN ? "
   LINE ";LINE;" MISSING!":END
WP 70 TOTAL=LINE:FOR X=1 TO 16
HM 80 IF PASS=2 THEN PUT #1,DAT(X):NEXT X
   :READ CHKSUM:GOTO 50
AJ 90 TOTAL=TOTAL+DAT(X)*X:IF TOTAL>9999
   THEN TOTAL=TOTAL-10000
LR 100 NEXT X:READ CHKSUM:IF TOTAL=CHKSUM
    THEN 50
MO 110 GOTO 220
ZR 120 IF PEEK(195)<>6 THEN 220
ZT 130 IF PASS=0 THEN 200
AD 160 FOR X=1 TO 128:PUT #1,0:NEXT X:CLO
   SE #1:END
HD 200 ? "READY CASSETTE AND PRESS RETURN
   ";:OPEN #1,8,0,"C:":RESTORE 230:FOR X=
   1 TO 40:READ N:PUT #1,N:NEXT X
QS 210 ? :? "WRITING FILE":PASS=2:LINE=99
   0:RESTORE 1000:TRAP 120:GOTO 50
MI 220 ? "BAD DATA: LINE ";LINE:END
CI 230 DATA 0,19,210,51,249,51,169,0,234,
   234,234,169,60,141,2,211,169,0,141,231
   ,2,133,14,169,56,141,232,2
FN 240 DATA 133,15,169,0,133,10,169,52,13
   3,11,24,96
```

●

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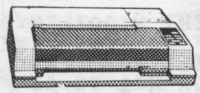

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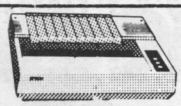

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by Matthew J.W. Ratcliff

The Computer Gourmet is the perfect addition for the computer you keep in the kitchen. You *do* keep an Atari in the kitchen, don't you? It's the answer for all of you who said, "Gee, Honey, you can even keep all your recipes on it. We really *need* this computer." Well, 14 million **Pac-Man** games later, don't you think it's about time to let the wizard of the kitchen use the Atari?

The Computer Gourmet is a machine language recipe database management program that makes cookbooks a thing of the past—once you've created all your recipe data disks. The **Gourmet** comes with a concise manual to guide you through all its features. The package includes a program disk and a database disk with ninety-two recipes to get you started. You can easily change the recipes or create your own disk. Each single-density, Atari DOS format data disk will hold about one hundred recipes.

I fired up the program and had my wife sit down in front of the monitor. She's definitely not a computer type, but, after a short keyboard tutorial, she had no trouble finding recipes.

The main—ahem—menu presents four options: (1) Add New Recipes, (2) Change/Remove Recipes, (3) Show Recipes, and (4) Change Recipe Diskette.

Every recipe data disk has two files: data and index. Pressing option 4, the program will prompt you to switch data disks. It will then read a new recipe index.

Options 1 through 3 send you to the recipe screen. The top two screen lines are used to show program prompts and the current meaning of console key functions. Below that are three lines, two fields each, which display type, category, servings, rating, cooking time and temperature.

When searching for recipes, you may specify all or part of the title, type and/or category of interest. Pressing START begins the search function.

The first recipe found to match your specifications is displayed. Below the brightly colored fields, the recipe appears on the typical blue of a graphics 0 display. If the entire text won't fit, it's easily scrolled up or down with the arrow keys.

The recipe index is kept in memory, including each entry's type and category. Recipe titles are kept in the data file. This results in fast searches if you specify type and/or category only.

If you search by title only, the program must search through every recipe on the disk sequentially, a rather slow process. If type or category is entered, the index tells the program exactly where on disk a matching recipe lies, resulting in a much faster search.

This isn't a serious limitation—you usually have a pretty good idea of what you plan to cook. For example, if you need to cook a vegetable with dinner and you have lots of potatoes, specify "dinner" and "potatoes" in the type and category fields, respectively.

You can then search through all your favorite potato dishes, to find the one that tickles your taste buds this time. If you're cooking breakfast, you could also specify "cake" in the title. The search might turn up *POTATO PANCAKES*.

If your recipe serves two and you have a small army (say, ten) to feed, just press SELECT. You may then input 10 and see the recipe's ingredients recomputed and displayed. This is a very nice feature of the **Gourmet**.

You can also print a "shopping list" or the entire text of the dish currently displayed. My wife really likes being able to get a quick printout of a recipe. There's no worry about getting a disk or cookbook messed up in the kitchen, if you use a printout. And, when a guest wants your recipe, just print it out.

The shopping list is simply a printout of the ingredient section. I would have liked to see a facility in the program for specifying a menu of recipes for a week or month at a time. These could have been summarized on the printer, to make up a complete shopping list.

The recipe itself consists of two distinct sections: ingredients and direc-

tions. Ingredients may be preceded with a quantity.

The editor for recipe entry will be very familiar to anyone used to the Atari. You edit recipe text the same way you would when entering a BASIC program.

There is a minor limitation in that the **Gourmet** doesn't "word wrap" as you type; it doesn't even "wrap." When you get to the end of a line, it just beeps at you and keeps the cursor at the last character position.

It's your responsibility to keep track of the line's end and press RETURN where necessary, as you would with a typewriter.

This is no big problem, unless you're a good touch typist who doesn't have to look at the screen. The program should at least give a beep five characters before the end of a line. Still, once you get accustomed to it, this is only a minor nuisance.

I was frustrated to find that there was no way to get a summary of all the recipes on a data disk, even though such a summary is given in the manual.

I talked to the author, who sent me a short BASIC program listing that does the job. It will print a complete recipe index for a data disk, sorted by type, category and title.

If you get the **Gourmet** without this program, call or write for the listing. I was told it will be included on **Gourmet**'s program disk in the future.

The Computer Gourmet is very well written and user friendly for the most part, but is not without limitations. Most are minor.

Disks aren't protected, and the manual encourages you to make a backup. Another nice touch is the fact that the program automatically turns off built-in BASIC on the XL/XE machines. Forget that OPTION key at power-up time.

For those of you who've acquired a numerical keypad, you'll be glad to know that the **Gourmet** supports it—another nice touch.

I can see "computer widows" everywhere swapping recipes and saying words like *database* and *disks*. My wife really likes the program because, "You can just snap in a disk and tell the computer to find your recipe. I hate getting out cookbooks and searching through them."

We highly recommend this program. But be forewarned. . .you may find yourself buying another computer, just for the kitchen.

ST-LOG™

THE ATARI ST OPERATOR'S MAGAZINE

JUNE 1986 ISSUE 3

THIS ISSUE:

VDI Sampler

ATARI® ST™

REQUIRED READING

INTERNALS
Essential guide to learning the inside information of the ST. Detailed descriptions of sound & graphics chips, internal hardware, various ports, GEM. Commented BIOS listing. An indispensible reference for your library. 450pp. $19.95

GEM Programmer's Ref.
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CIRCLE #124 ON READER SERVICE CARD

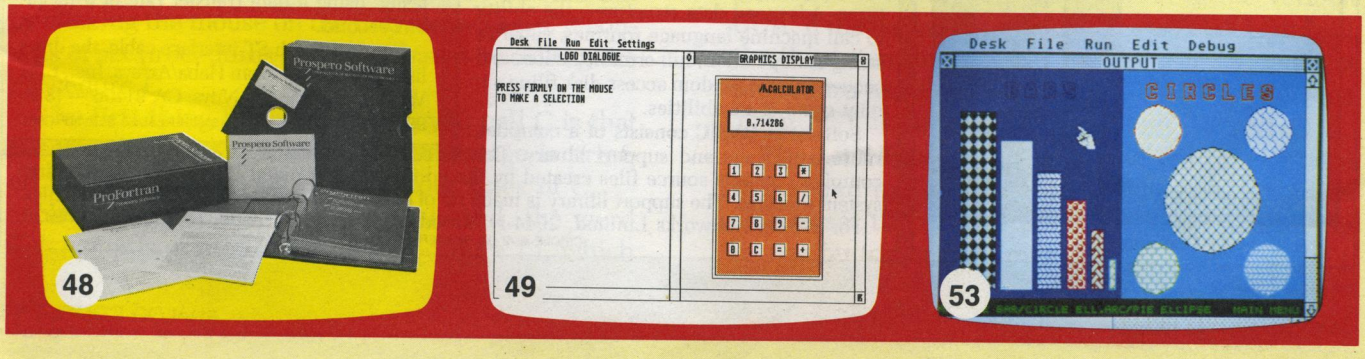
ST·LOG
THE ATARI ST OPERATOR'S MAGAZINE

ISSUE 3
JUNE 1986

FEATURES

REVIEWS

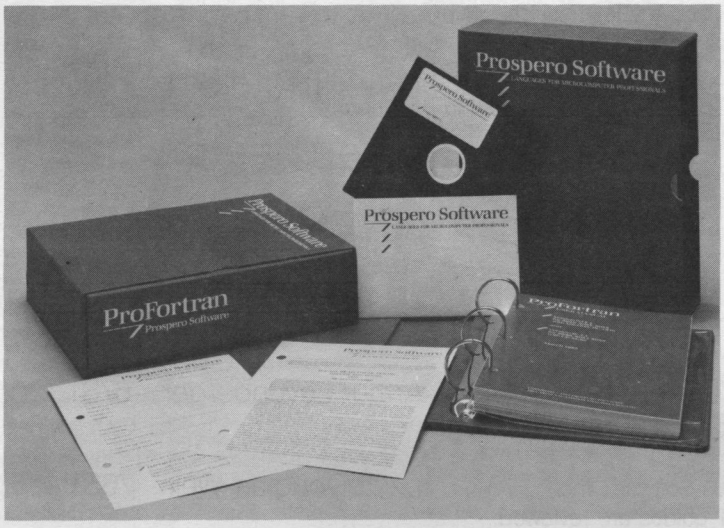
COLUMNS



ST NEWS!

PRO FORTRAN-77

Prospero has announced **Pro Fortran-77**, a compiler that enables developers to recompile existing mini and mainframe software, to run on the ST line.



The original Fortran-77 is a very popular high-level programming language, often chosen by engineers, academics and scientists for their demanding work.

Pro Fortran-77 retails for $149.99. For more information, write: Prospero Software, 190 Castelnau, London, England SW13 9DH, or call 01-741 8531.

CIRCLE #168 ON READER SERVICE CARD

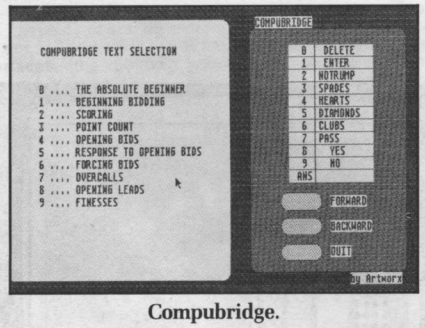
ARTWORX RELEASES FOR THE ST

Compubridge and **Bridge 4.0**, both popular programs for the 8-bit Ataris, are now available for the 16-bit machines. **Compubridge** is a basic bridge tutorial, compiled from the *Five Card Major Bridge Teacher's Manual* by Shirley Silverman. The program has ten chapters of text and has eight sections of quizzes. While you play "test" games, the computer analyzes your moves and suggests alternates.

Bridge 4.0 allows you and your computer partner to bid against two computer opponents, then play out the hand. This comprehensive bridge-playing game is similar to the newspaper column, with replay of selected hands, rotation of players' cards and a built-in referee.

Each bridge program retails for $29.95. Available from Artworx Software Company, Inc., 150 North Main Street, Fairport, NY 14450.

CIRCLE #169 ON READER SERVICE CARD



Compubridge.

SOFTWORKS BASIC

This new BASIC for STs is chock full of features. Advanced data structures, the ability to call machine language routines, superior string manipulation, full error detection, and sequential and random access disk filing are only *some* of its abilities.

Softworks BASIC consists of a compiler, runtime package and support library. The compiler converts source files created by the editor into tokenized files which the runtime system executes. The support library is made up of example programs and Atari interface files.

For $79.00, Softworks Limited, 2944 N. Broadway, Chicago, IL 60657 — (312) 975-4030.

CIRCLE #172 ON READER SERVICE CARD

OTHER NEWS

In **Championship Golf: The Great Courses of the World**, Gamestar has released **Volume 1: Pebble Beach**.

Actual topographical maps were used, to authentically recreate the course itself. All eighteen holes are placed, along with traps, roughs and trees. Even an ocean breeze is added into the play, in which up to four can compete. A driving range and putting green are available for practice and/or warmup.

For information, contact: Gamestar/Activision, Inc., 2350 Bayshore Frontage Road, Mountain View, CA 94043 — (415) 960-0410.

CIRCLE #170 ON READER SERVICE CARD

■ ■ ■

Introduction to Sound and Graphics on the Atari ST, by Tim Knight, has been published by COMPUTE! Books.

Included in this 195-page volume are sections on creating graphics using LOGO and FORTH, generating sound effects, drawing in BASIC, setting up your ST and using GEM.

The retail price is $14.95, from COMPUTE! Books, 324 West Wendover Avenue, Suite 200, Greensboro, NC 27408.

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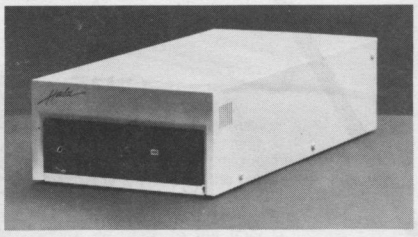
10-MEGABYTE DRIVE

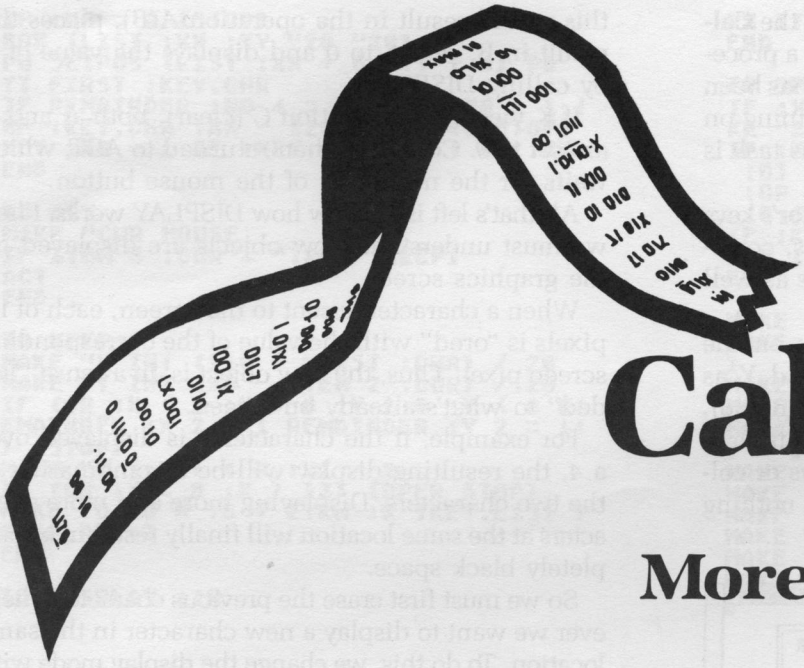
Haba is now shipping their external **10-megabyte hard disk drive**, which stores the equivalent of more than a dozen double-sided 800K disks.



Access time with the hard drive is much faster, using a data transfer rate of 5 megabits/second.

Complete with ST interface cable, the drive lists for $699.95. From Haba/Arrays, Inc., 6711 Valjean Avenue, Van Nuys, CA 91406 — (818) 994-1899.

CIRCLE #130 ON READER SERVICE CARD



ST Calculator

More on using LOGO

by Alain Birtz

The ST is one of the most powerful microcomputers currently on the market. Its low price, together with the GEM mouse-driven user interface, its exceptional graphics capabilities and its 68000 microprocessor, make it one of the most attractive machines available.

Its only defect (rapidly being remedied) is its lack of programming languages. The new owner of an ST, as a rule, has to settle for two languages: ST BASIC and DR LOGO. Although the LOGO itself is of high quality, the manual leaves something to be desired. It consists of a series of technical definitions of language statements, totally devoid of programming examples. This is a great obstacle for a LOGO novice. Program examples are absolutely necessary, and magazines like **ANALOG Computing** will have to provide the forum for any examples.

ST Calculator is written in LOGO for the ST. It allows numerical calculations similar to those of an ordinary hand-held calculator, which are carried out by clicking the mouse on the **Calculator**'s keys. It consists of six procedures and is activated by calling the procedure *C*.

The first thing to happen when you call C is that the text window is cleared and a message is printed. These are done by the first four lines of C.

Next, the graphics window is cleared, the word *Calculator* is printed (using the procedure *TT*, which allows one to print text in the graphics window), and the rectangles representing the **Calculator** and its window (where its numbers are displayed) are drawn (Lines 6-11). The variable *KEY.LIST* is defined in Line 12; it contains the symbols for each of the **Calculator**'s keys.

Next, the procedure *KEY* is called. KEY draws the **Calculator**'s keys. It takes four parameters: *NO*, a counter; *KEY.CHR*, which receives KEY.LIST as a value; and *XX* and *YY*, the coordinates of the rectangles forming the keys themselves.

KEY is a recursive procedure: it will call itself sixteen times, each time drawing one key and decrementing the counter *NO*. When the counter equals *0*, KEY terminates, and execution returns to Line 14 of C. The cursor is then positioned at the **Calculator**'s view window, and certain variables are initialized. C terminates by calling ACT.

ACT is an infinite loop. It calls itself after every click of the mouse's button. It determines the mouse state and transfers this information to the variable *CUR*. If the mouse's button is depressed (i.e., clicked), the third item in CUR has the value *TRUE*, and the procedure *KEEP* is called; if not, nothing happens. Then ACT is called again.

The MOUSE primitive is slow; the time it takes to respond to a click is great. Therefore, it's advisable to set the control panel response rate for the mouse button at maximum *(4)*.

ST Calculator *continued*

At this point in the program, we've drawn the **Calculator**, its window and its keys, and we have a procedure which tells us when the mouse button has been clicked. Now we need some way of determining on which key the mouse has been clicked. This task is accomplished by the procedure *KEEP*.

Imagine the area occupied by the **Calculator**'s keys as a grid of seven rows and seven columns, corresponding to the four rows of the actual keys as well as the three rows between the keys.

From the position of the mouse's arrow on the screen, KEEP calculates the variables *X* and *Y* as values along the row *(2-8)* and along the column *(0-6)*, respectively, where the arrow is located. If either X or Y is odd, then the arrow is between rows or columns (it cannot be pointing to a key), and nothing happens (line four of KEEP).

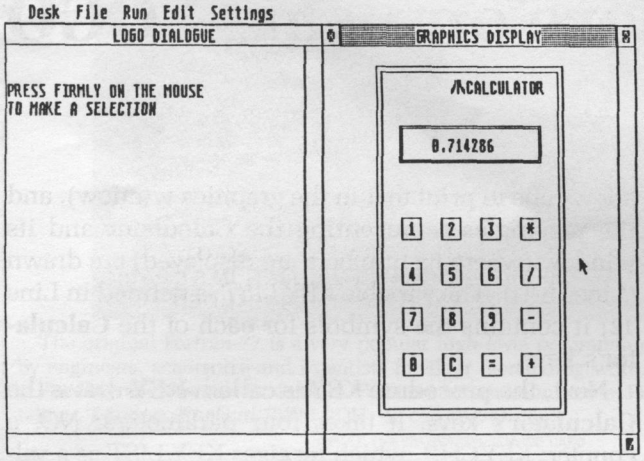


Figure 1.

Otherwise, KEEP calculates the value of the variable K in such a way that K gives the number of the item in KEY.LIST corresponding to the key selected. For example, if the / key (division operator) is selected, X and Y have the values *8* and *2*. K then gets the value *8*, and the eighth element of KEY.LIST is *(voila!)* /.

Two variables are used to perform calculations. B contains the "current" value, the number currently displayed in the **Calculator**'s window. A contains the second value, held in memory.

Initially A and B are set to *0*. If a numerical key *(0-9)* is clicked, KEEP modifies B to reflect the new value of the current number. It displays this updated number (via the procedure *DISPLAY*) in the **Calculator**'s window. If the key is not numeric, then KEY calls the procedure *OPER*.

OPER takes the values of A and B, carries out the operation determined by K (in the example above, this would result in the operation *A/B*), places the result in B, sets A to *0* and displays the value of B by calling DISPLAY.

If K yields the operation *C* (clear), both A and B are set to *0*. Control is then returned to ACT, which waits for the next click of the mouse button.

All that's left is to show how DISPLAY works. First, we must understand how objects are displayed on the graphics screen.

When a character is sent to the screen, each of its pixels is "ored" with the value of the corresponding screen pixel. Thus, the new object is, in a sense, "added" to what's already on-screen.

For example, if the character *3* is displayed over a *4*, the resulting display will be a combination of the two characters. Displaying more and more characters at the same location will finally result in a completely black space.

So we must first erase the previous character whenever we want to display a new character in the same location. To do this, we change the display mode with the primitive *PX* (PENREVERSE) and "reprint" the old character, effectively erasing it. After this, we can display the new character.

The number to be displayed is contained in TX, and the number previously displayed is in DP. DISPLAY erases DP with the sequence *PX TT :DP*, then assigns the value of TX to DP and, finally, displays DP.

> ***Attention:*** **In this listing, the exclamation points at the end of program lines shouldn't be typed in. They are there to indicate that the statement wraps around to the next line.**

Listing 1.
LOGO listing.

```
TO C
CT PRINT [] PRINT []
PRINT [PRESS FIRMLY ON THE MOUSE]
PRINT [TO MAKE A SELECTION]
CS HT HOME ; BY ALAIN BIRTZ
PU SETPOS [-20 130] PD
TT (WORD CHAR 14 CHAR 15 "CALCULATOR!
)
BOX [-90 -150 180 300]
BOX [-95 -155 190 310]
BOX [-70 70 140 30]
BOX [-72 68 144 34]
MAKE "KEY.LIST [1 2 3 * 4 5 6 / 7 8 !
9 - 0 C = +]
KEY 16 :KEY.LIST -70 0
PU SETPOS [-40 78] PD
MAKE "DP []
MAKE "A 0 MAKE "B 0
ACT
END

TO KEY :NO :KEY.CHR :XX :YY
```

```
IF :NO = 0 [STOP]
BOX (LIST :XX :YY "20 "20)
PU SETPOS (LIST :XX + 6 :YY + 4) PD
TT FIRST :KEY.CHR
IF REMAINDER :NO 4 = 1 [KEY :NO - 1 !
BF :KEY.CHR :XX - 120 :YY - 40 STOP]
KEY :NO - 1 BF :KEY.CHR :XX + 40 :YY
END

TO ACT
MAKE "CUR MOUSE
IF ITEM 3 :CUR = "TRUE [KEEP]
ACT
END

TO KEEP
MAKE "X INT (110 + FIRST :CUR) / 20
MAKE "Y INT (20 - ITEM 2 :CUR) / 20
IF (OR :X < 2 :X > 8 :Y > 6 :Y < 0 R!
EMAINDER :X 2 = 1 REMAINDER :Y 2 = 1!
) [STOP]
MAKE "K (:X + 4 * :Y) / 2
IF (OR :X = 8 :K > 13) [OPER STOP]
MAKE "B 10 * :B + ITEM :K :KEY.LIST !
DISPLAY :B
END

TO DISPLAY :TX
PX TT :DP MAKE "DP :TX TT :DP
END

TO OPER
IF :X = 8 [MAKE "A :B MAKE "OP :K MA!
KE "B 0 DISPLAY []]
IF :K = 15 [IF :OP = 4 [MAKE "B :A *!
 :B] IF :OP = 8 [MAKE "B :A / :B] IF!
 :OP = 12 [MAKE "B :A - :B] IF :OP =!
 16 [MAKE "B :A + :B] DISPLAY :B]
IF :K = 14 [MAKE "A 0 MAKE "B 0 DISP!
LAY []]
END

MAKE "GFILL "FALSE
MAKE "CUR [-22 -111 FALSE FALSE TRUE!
]
MAKE "Y 6
MAKE "X 4
MAKE "KEY.LIST [1 2 3 * 4 5 6 / 7 8 !
9 - 0 C = +]
MAKE "K 14
MAKE "C "# # # # # # # #
MAKE "B 0
MAKE "A 0
MAKE "OP 4
MAKE "DP []
```

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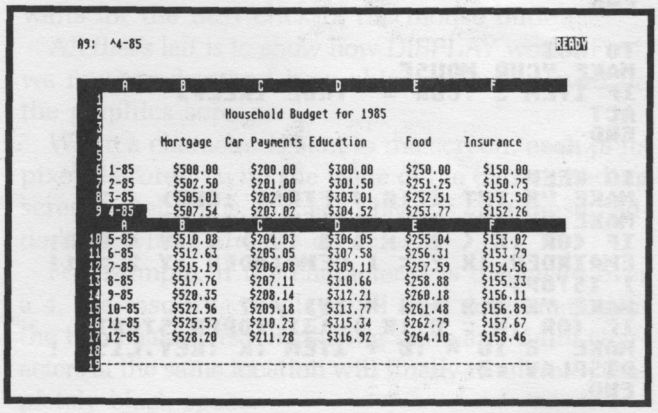

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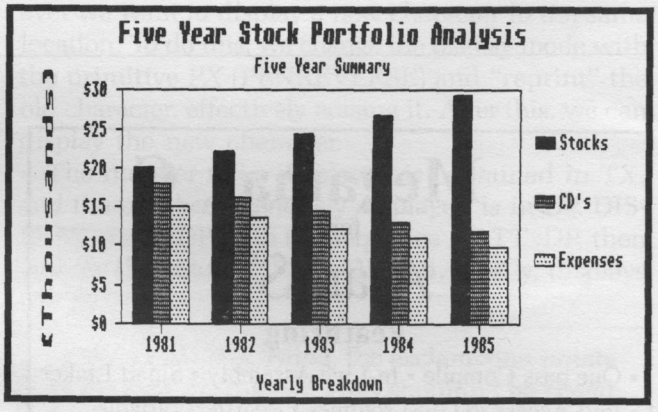

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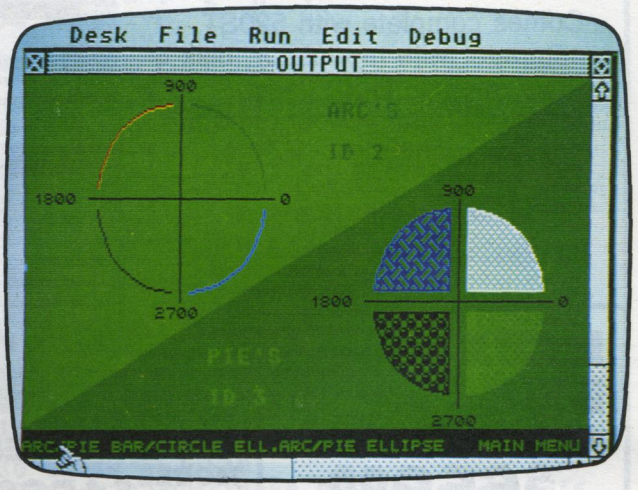
VDI Sampler

Functions from ST BASIC



by James Luczak

ST BASIC has a command to allow you to perform graphic operations—that used to take a lot of involved programming—quickly and easily. And it's *fast*. We're talking about the VDISYS() command.

The VDISYS() command gives you access to GEM's Virtual Display Interface (VDI) functions. Among other things, GEM's VDI has a full set of graphic functions to perform all sorts of graphic operations. Circles, ellipses, pie slices, rectangles, polygons and special effects text are only *a few* of the many operations you can utilize with the VDISYS() command.

The VDI Sampler program.

The **VDI Sampler** has three purposes. First, it contains the BASIC code required to call many of the VDI functions (Lines 3730 through 6340). Second, it demonstrates how VDI functions can be used in a program. Third, it displays many of the patterns, styles and special effects that can be put to use with VDI functions.

All graphics operations used in this program are performed with the help of the VDISYS() command.

Using the VDISYS() command.

VDISYS() is very easy to use; Figures 1, 2 and 3 contain all the necessary information to do so. The BASIC code required to employ the VDI functions is in the **VDI Sampler** program, Lines 3730 through 6340.

I found it easiest to set up the BASIC code for each function as a routine which can be called with the GOSUB command. Whenever you want the function, all you have to do is set whatever variables the VDI routine currently has to the desired value, then use a GOSUB to do the operation.

VDI COLOR INDEX

Index Number	Color	Index Number	Color
0	White	8	Low White
1	Black	9	Grey
2	Red	10	Light Red
3	Green	11	Light Green
4	Blue	12	Light Blue
5	Cyan	13	Light Cyan
6	Yellow	14	Light Yellow
7	Magenta	15	Light Magenta

Figure 1.

Figure 1, above, contains the COLOR INDEX values used by all the VDI functions. Figure 2, below, gives the DEFAULT values to which various functions are set.

VDI DEFAULT VALUES

Attribute	Default Value
Character Height	Low Resolution 6 Medium Resolution 8
Character Baseline	0 Degree Rotation
Text Style	0 — Normal Intensity
Polymarker Height	1 — Smallest Size
Polyline Endstyle	0 — Squared
Writing Mode	1 — Replace
Perimeter Visibility	1 — Visible

Figure 2.

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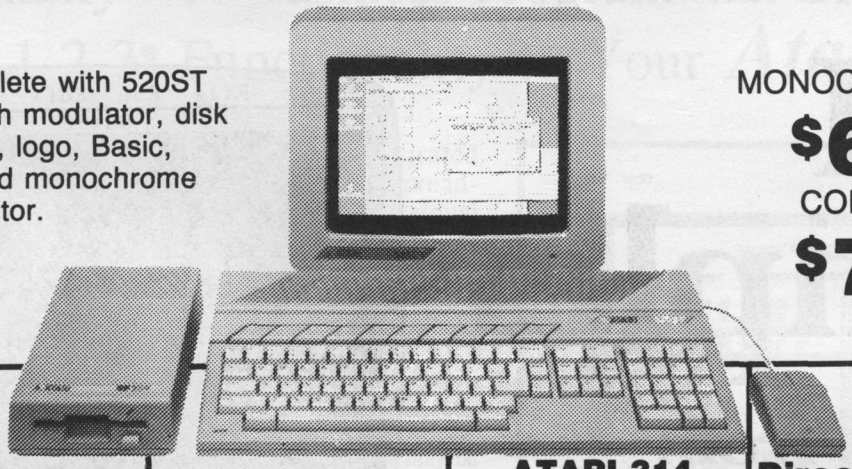

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// VDI Functions *continued*

Our third figure, on the following page, provides a description of most of the VDI functions used by the program. Some VDI functions are self explanatory; these are not included in the description.

The attributes referred to in Figure 3 are VDI functions that can be used to modify the appearance of another VDI function. For example, if you're drawing a circle and want it to appear as a filled disk, you could use the "fill interior style" function with a value of *1* (solid) before drawing the circle. Now, every time you draw a circle it will be filled with a solid color.

Using the VDI Sampler.

The **Sampler** is written for a low-resolution color system. If you don't have TOS in ROM yet, remove all desk accessories and turn buffered graphics off before loading the program.

The **Sampler** opens with a title page that will remain on-screen for approximately 5 seconds. (If you want to keep the title page on for a shorter or longer period, change the value in Line 6370 of the program.)

After the title, the main menu screen will appear. At the bottom of this is a menu bar. Use the mouse to click on any of the menu options. You'll hear a "beep" when you click on a valid option. Each option will display its introduction page, with a menu bar. Click the mouse on one of the options, and that option will be displayed.

The values which appear on some of the displays correspond to those in Figure 3. To return to the main menu, click on the Main Menu option located on the right of the menu bar. To exit the program, select the quit option on the main menu—or click the right-hand mouse button.

I find this a handy program to preview styles, patterns, special effects, and so forth—before using them in a program. The data statements at the end of the program contain text (in ASCII form), X- and Y-coordinates, and some color information used in **VDI Sampler.**

James Luczak bought his first Atari in 1980 and has, since 1979, written programs in BASIC, C, LOGO, FORTH and Action!, plus 6502 assembly. He enjoys writing dedicated database programs.

Listing 1.
BASIC listing.

```
100 'A  V.D.I.  SAMPLER FROM ST BASIC
110 '******** by JIM LUCZAK ********
120 a#=gb:gintin=peek(a#+8):gintout=pe
ek(a#+12)
130 dim coord(25),char(50),ml(26)
140 a$(1)="P  O  L  Y  L  I  N  E  S"
150 a$(2)="P  O  L  Y  M  A  R  K  E
R  S"
160 a$(3)="T  E  X  T"
170 a$(4)="F  I  L  L     P  A  T  T
E  R  N  S"
180 a$(5)="P  R  I  M  I  T  I  V  E
S"
190 fx=1:fy=22:fx1=304:fy1=188:dth=6
200 '------- DO TITLE PAGE -------
210 fullw 2:clearw 2
230 rt=3:wm=1:fis=1:fci=1:cx=fx:cy=fy:
cx1=fx1:cy1=fy1
240 gosub DOSHAPE:wm=2:gosub WMODE:plc
=2:gosub PCOLOR
250 id=6:sa=2700:ea=900:cx=1:cy=105:ra
dx=304:rady=83
260 gosub ELLARCPIE
270 while rady>40
280 rady=rady-2:poke ptsin+6,rady:vdis
ys(1)
290 wend
300 plc=10:gosub PCOLOR
310 sa=900:ea=2700:cx=304:rady=83
320 gosub ELLARCPIE
330 while rady>40
340 rady=rady-2:poke ptsin+6,rady:vdis
ys(1)
350 wend
370 rt=5:wm=1:fis=1:fsi=0:fci=1:cx=152
:cy=47:radx=100:rady=25
380 gosub DOSHAPE
390 rt=5:wm=2:fis=2:fsi=3:fci=3:gosub
DOSHAPE
400 rt=5:wm=1:fis=1:fci=1:cy=163:radx=
125:gosub DOSHAPE
410 rt=5:wm=2:fis=2:fsi=19:fci=4:gosub
 DOSHAPE
430 rt=1:wm=1:fis=1:fci=3:cx=70:cy=163
:rad=20
440 gosub DOSHAPE
450 rt=1:wm=2:fis=2:fsi=16:fci=2:gosub
 DOSHAPE
460 rt=1:wm=1:fis=1:fci=2:cx=235:gosub
 DOSHAPE
470 rt=1:wm=2:fis=2:fsi=20:fci=6:gosub
 DOSHAPE
480 wm=2:gosub WMODE
500 tc=15:th=24:te=4:cx=110:cy=54:gosu
b DOTEXT
510 tc=5:th=28:te=16:cx=45:cy=115:gosu
b DOTEXT
520 tc=8:th=dth:te=4:cx=130:cy=148:gos
ub DOTEXT
530 tc=6:th=15:cx=97:cy=170:gosub DOTE
XT
540 tc=11:th=dth:cx=110:cy=185:gosub D
OTEXT
550 gosub TIMER:menu=0:gosub MENUES
560 '--- MAIN PROGRAM LOOP ---
570 poke gintin,3:gemsys(78)
580 poke gintin,257:gemsys(78)
590 poke systab+24,1
600 while mkey<>2
610 gemsys(79)
620 mx=peek(gintout+2):my=peek(gintout
+4):mkey=peek(gintout+6)
630 if mkey=1 then gosub CHECKM
640 wend
650 '--- CLEANUP AND END ---
660 poke systab+24,0
670 poke gintin,0:gemsys(78)
680 poke gintin,256:gemsys(78)
690 rt=1:tc=1:th=dth:te=0
700 gosub DOTEXT
710 sound 0,0,0,0,0:clearw 2:end
730 CHECKM:
740 if my<180 or my>189 then return
```

VDI FUNCTION DESCRIPTIONS

POLYMARKER — *A polymarker is similar to the PLOT command. One or more polymarkers can be displayed simultaneously in different styles and colors.*

Line 3730 — Menu — Marker

ATTRIBUTES	ATTRIBUTE LINE #
Polymarker Type	3820
Polymarker Height	3890
Polymarker Color	3970
Writing Mode	5000

NOTE: Each polymarker needs an X- and Y-coordinate. For example, to display two polymarkers, you must give the X- and Y-coordinates for each marker, a total of four coordinates.

POLYMARKER TYPE — Identifies polymarker style.

Line 3820 — Menu — Marker — Item — Type

MARKER TYPE VALUE	DESCRIPTION	MARKER TYPE VALUE	DESCRIPTION
1	Dot	4	Square
2	Plus Sign	5	Diagonal Cross
3	Asterisk	6	Diamond

POLYLINE — Draws one or more lines simultaneously in different styles, colors, widths and end types.

Line 4040 — Menu — Lines

ATTRIBUTES	ATTRIBUTE LINE #
Polyline Type	4130
Polyline Width	4200
Polyline End Style	4280
Polyline Color	4360
Writing Mode	5000

NOTE: Each polyline requires four coordinates: X- and Y-coordinates for the starting point of the line and those for the line's ending point. For example, to draw two polylines, indicate two X,Y pairs (Line 4060) and provide X- and Y-coordinates for the starting and ending points for each line, a total of eight coordinates.

POLYLINE TYPE — *Identifies type of polyline.*

Line 4130 — Menu — Line — Item — Type

POLYLINE TYPE VALUE	DESCRIPTION	POLYLINE TYPE VALUE	DESCRIPTION
1	Solid Line	4	Dash-Dot Line
2	Long Dash Line	5	Dash Line
3	Dot Line	6	Dash-Dot-Dot Line

POLYLINE ENDSTYLE — Identifies end style of polyline.

Line 4280 — Menu — Lines — Item — Endstyle

ENDSTYLE VALUE	DESCRIPTION
0	Squared
1	Arrow
2	Rounded

TEXT — Writes text to any X,Y coordinate on the display screen.

Line 4430 — Menu — Text

ATTRIBUTES	ATTRIBUTE LINE #
Text Color	4540
Text Special Effects	4610
Text Height	4680
Text Baseline	4930
Writing Mode	5000

NOTE: Characters are referred to by their ASCII value.

TEXT SPECIAL EFFECTS — Identifies the text style to be used.

Line 4610 — Menu — Text — Item — Effects

SPECIAL EFFECTS VALUE	DESCRIPTION	SPECIAL EFFECTS VALUE	DESCRIPTION
1	Thickened	8	Underlined
2	Intensity - Light	16	Outlined
4	Skewed	32	Shadowed

NOTE: Any combination of special effects can be used. If, for example, you wanted skewed outlined text, add the values *4* (skewed) and *16* (outline) together, and use the result *(20)* as the special effects value.

WRITING MODE — *Identifies how subsequent drawing operations will be performed.*

Line 5000

WRITING MODE VALUE	DESCRIPTION	WRITING MODE VALUE	DESCRIPTION
1	Replace	3	XOR
2	Transparent	4	Reverse Transp.

NOTE: The writing mode specifies the operation performed between the current pixel color and the existing pixel color. The action of the writing mode is most easily observed when using the *text or fill pattern functions.*

ARC or PIE — Draws an arc or pie slice.

Line 5070 — Menu — Shapes — Item — Arc/Pie

ATTRIBUTES	ATTRIBUTE LINE #	
Polyline Type	4130	ARC
Polyline Width	4200	ARC
Polyline End Style	4280	ARC
Polyline Color	4360	ARC
Fill Interior Style	6080	PIE
Fill Style Index	6150	PIE
Fill Color	6220	PIE
Perimeter Visibility	6290	PIE
Writing Mode	5000	ARC/PIE

NOTE: This function will draw an arc or a pie, depending which primitive ID you specify *(ARC – 2, PIE – 3)*. Angles are referred to in tenths of a degree *(0-3600)*. The function draws in a *counterclockwise* direction. Zero degrees is 90 degrees to the right of vertical, with values increasing in a counterclockwise direction.

BAR — Draws a bar.

Line 5210 — Menu — Shapes — Item — Bar/Circle

ATTRIBUTES	ATTRIBUTE LINE #
Fill Interior Style	6080
Fill Style Index	6150
Fill Color	6220
Perimeter Visibility	6290
Writing Mode	5000

CIRCLE — Draws a circle.

Line 5320 — Menu — Shapes — Item — Bar/Circle

ATTRIBUTES	ATTR. LINE #	ATTRIBUTES	ATTR. LINE #
Fill Interior Style	6080	Perimeter Visibility	6290
Fill Style Index	6150	Writing Mode	5000
Fill Color	6220		

ELLIPTICAL ARC or PIE — Draws an elliptical arc or pie slice.

Line 5450 — Menu — Shapes — Item — Ell.Arc/Pie

ATTRIBUTES	ATTR. LINE #		ATTRIBUTES	ATTR. LINE #	
Polyline Type	4130	ARC	Fill Style Index	6150	PIE
Polyline Width	4200	ARC	Fill Color	6220	PIE
Polyline End Style	4280	ARC	Perimeter Visibility	6290	PIE
Polyline Color	4360	ARC	Writing Mode	5000	ARC/PIE
			Fill Interior Style	6080	PIE

NOTE: This function will draw an elliptical arc or pie slice, depending which primitive ID you specify *(Elliptical Arc – 6, Elliptical Pie – 7)*. Angles are referred to in tenths of degrees *(0-3600)*. The function draws in a *counterclockwise* direction. Zero degrees is 90 degrees to the right of vertical, with values increasing in a counterclockwise direction.

ELLIPSE — Draws an ellipse.

Line 5580 — Menu — Shapes — Item — Ellipse

ATTRIBUTES	ATTR. LINE #	ATTRIBUTES	ATTR. LINE #
Fill Interior Style	6080	Perimeter Visibility	6290
Fill Style Index	6150	Writing Mode	5000
Fill Color	6220		

ROUNDED RECTANGLE and FILLED ROUNDED RECTANGLE — Draws a rounded or filled rounded rectangle.

Line 5690

ATTRIBUTES	ATTRIBUTE LINE #	
Polyline Type	4130	Rounded Rectangle
Polyline Width	4200	Rounded Rectangle
Polyline Color	4360	Rounded Rectangle
Fill Interior Style	6080	Filled Rounded Rectangle
Fill Style Index	6150	Filled Rounded Rectangle
Fill Color	6220	Filled Rounded Rectangle
Perimeter Visibility	6290	Filled Rounded Rectangle
Writing Mode	5000	Rounded/Filled Rounded Rect.

FILLED AREA — Fills a complex polygon with the specified color or pattern.

Line 5800

ATTRIBUTES	ATTR. LINE #	ATTRIBUTES	ATTR. LINE #
Fill Interior Style	6080	Perimeter Visibility	6290
Fill Style Index	6150	Writing Mode	5000
Fill Color	6220		

EXAMPLE: To use this function to fill a triangle, enter *3* for the number of lines (Line 5820). Give the X- and Y-coordinates for the starting point, second point and ending point of the triangle. VDI will automatically connect the ending point to the starting point, to form a closed polygon. The function will then fill the triangle. VDI will not display a form with only one endpoint.

CONTOUR FILL — *Fills an area until it finds the end of the screen or the color specified.*

Line 5890

ATTRIBUTES	ATTRIBUTE LINE #
Fill Interior Style	6080
Fill Style Index	6150
Fill Color	6220
Perimeter Visibility	6290
Writing Mode	5000

NOTE: If you specify a *negative* value in Line 5930, VDI will search for any color other than the seed point.

FILL RECTANGLE — Fills the rectangular area specified.

Line 5980

ATTRIBUTES	ATTRIBUTE LINE #
Fill Interior Style	6080
Fill Style Index	6150
Fill Color	6220
Perimeter Visibility	6290
Writing Mode	5000

FILL INTERIOR STYLE — Identifies interior style.

Line 6080

INTERIOR STYLE VALUE	DESCRIPTION	INTERIOR STYLE VALUE	DESCRIPTION
0	Hollow	3	Hatch
1	Solid	4	User defined
2	Pattern		

FILL STYLE INDEX — Identifies style index.

Line 6150

See menu option FILL for example of style indices.

```
750 gosub CHECKMOUSELOC
760 if hc1=-1 then return
770 sound 1,0,10,4,0:wave 1,1,9,256,0
780 if hc1=n1/2 and menu=0 then mkey=2
:return
790 if hc1=n1/2 then menu=0:ft=0:gosub
 MENUE5:return
800 if menu=0 then menu=hc1:gosub MENU
E5:return
810 item=hc1:gosub ITEM5
820 return
840 CHECKMOUSELOC:
850 mc=0:hc=0:hc1=1
860 while mc=0
870 if mx>= m1(hc) and mx<= m1(hc+1) t
hen mc=1
880 if mc=0 then hc1=hc1+1
890 hc=hc+2:if hc>n1 then mc=1
900 wend
910 if hc1> n1/2 then hc1=-1
920 return
940 DOSHAPE:
950 gosub WMODE:gosub FILLSTYLE:gosub
FILLINDEX:gosub FILLCOLOR
960 on rt goto SHAPE1,SHAPE2,SHAPE3,SH
APE4,SHAPE5,SHAPE6
970 SHAPE1:gosub CIRCL:rt=0:return
980 SHAPE2:gosub BAR:rt=0:return
990 SHAPE3:gosub RECTFILL:rt=0:return
1000 SHAPE4:gosub FILLA:rt=0:return
1010 SHAPE5:gosub ELLIPS:rt=0:return
1020 SHAPE6:gosub ARCPIE:rt=0:return
1040 DOTEXT:
1050 gosub TCOLOR:gosub THEIGHT:gosub
TEFFECT
1060 if rt=1 then rt=0:return
1070 read n:for dt=0 to n-1:read char(
dt):next dt
1080 gosub GTEXT:return
1100 INTRO:
1110 restore INTRODATA
1120 wm=2:gosub WMODE
1130 rt=1:tc=4:th=20:te=16:gosub DOTEX
T
1140 gotoxy 9,2:?"W e l c o m e  T o"
1150 rt=1:tc=7:th=28:te=4:gosub DOTEXT
1160 gotoxy 6,7:?"V D I    S a m p l e
 r"
1170 rt=1:tc=9:th=dth:te=0:gosub DOTEX
T
1180 gotoxy 2,10:?"Use"
1190 rt=1:tc=2:te=16:gosub DOTEXT
1200 gotoxy 6,10:?"MOUSE"
1210 rt=1:tc=9:te=0:gosub DOTEXT
1220 gotoxy 12,10:?"to choose from men
u bar"
1230 rt=1:tc=1:te=16:gosub DOTEXT
1240 for x=12 to 16
1250 gotoxy 17,x:?chr$(7);chr$(2)
1260 next x:return
1280 MENUE5:
1290 poke gintin,256:gemsys(78)
1300 gosub FINDMENU
1310 rt=3:wm=1:fis=1:fci=1:cx=fx:cy=fy
:cx1=fx1:cy1=fy1
1320 gosub DOSHAPE:wm=2:gosub WMODE
1330 tc=3:th=dth:te=0:cx=1:cy=186:if m
enu=5 then th=4
1340 gosub DOTEXT
1350 read n:n1=n:for x=0 to n-1
1360 read m1(x):next x
1370 read cx2,cy2,fci,fci1,fsi1,tc
1380 rt=3:wm=1:fis=1:cx=fx:cy=fy:cx1=f
x1:cy1=176
1390 gosub DOSHAPE
1400 if menu=0 then gosub INTRO:goto 1
450
1410 rt=3:wm=2:fis=2:fci=fci1:fsi=fsi1
1420 gosub DOSHAPE
1430 rt=1:th=28:te=0:gosub DOTEXT
1440 gotoxy cx2,cy2:?a$(menu)
1450 poke gintin,257:gemsys(78):return
1470 FINDMENU:
1480 if menu=0 then restore MENU0DATA:
return
1490 on menu goto MENU1,MENU2,MENU3,ME
NU4,MENU5
1500 MENU1:restore MENU1DATA:return
1510 MENU2:restore MENU2DATA:return
1520 MENU3:restore MENU3DATA:return
1530 MENU4:restore MENU4DATA:return
1540 MENU5:restore MENU5DATA:return
1560 ITEM5:
1570 poke gintin,256:gemsys(78)
1580 on menu goto MITEM1,MITEM2,MITEM3
,MITEM4,MITEM5
1590 MITEM1:on item goto ITEM1A,ITEM1B
,ITEM1C
1600 MITEM2:on item goto ITEM2A,ITEM2B
1610 MITEM3:on item goto ITEM3A,ITEM3B
,ITEM3C
1620 MITEM4:on item goto ITEM4A,ITEM4B
1630 MITEM5:on item goto ITEM5A,ITEM5B
,ITEM5C,ITEM5D
1650 CLEARITEM:
1660 cx=fx:cy=fy:cx1=fx1:cy1=176
1670 rt=3:wm=1:fis=1:gosub DOSHAPE
1680 wm=2:gosub WMODE
1690 cx=100:cy=35:gosub DOTEXT
1700 cx=10:cy=50:return
1720 ITEM1A:
1730 restore ITEM1ADATA
1740 tc=6:th=8:te=16:fci=1:gosub CLEAR
ITEM
1750 tc=3:th=dth:te=0:plc=2:gosub PCOL
OR
1760 for x=1 to 6:plt=x
1770 gosub PTYPE:gosub DOTEXT:cy=cy+5
1780 for y=1 to 2
1790 n=2:coord(0)=10:coord(1)=cy:coord
(2)=300:coord(3)=cy
1800 gosub PLINE:cy=cy+5
1810 next y:cy=cy+5:next x
1820 plt=1:gosub PTYPE
1830 poke gintin,257:gemsys(78):return
1850 ITEM1B:
1860 restore ITEM1BDATA
1870 tc=5:th=8:te=16:fci=1:gosub CLEAR
ITEM
1880 tc=2:th=dth:te=0:plc=3:gosub PCOL
OR
1890 for x=1 to 7 step 3
1900 plw=x:gosub PWIDTH:gosub DOTEXT
1910 cy=cy+5:for y=1 to 3
1920 n=2:coord(0)=10:coord(1)=cy:coord
(2)=300:coord(3)=cy
1930 gosub PLINE:cy=cy+10
1940 next y:cy=cy+x
1950 next x:plw=1:gosub PWIDTH
1960 poke gintin,257:gemsys(78):return
1980 ITEM1C:
1990 restore ITEM1CDATA
2000 tc=0:th=8:te=16:fci=1:gosub CLEAR
ITEM
2010 tc=8:th=dth:te=0:plc=6:gosub PCOL
OR
2020 for x=0 to 2
2030 plsb=x:plse=x:gosub PSTYLE:gosub
DOTEXT
2040 cy=cy+7:for y=1 to 3
2050 n=2:coord(0)=10:coord(1)=cy:coord
(2)=300:coord(3)=cy
2060 gosub PLINE:cy=cy+10
2070 next y:cy=cy+7
2080 next x:plsb=0:plse=0:gosub PSTYLE
2090 poke gintin,257:gemsys(78):return
```

VDI Functions *continued*

```
2110 ITEM2A:
2120 restore ITEM2ADATA
2130 tc=2:th=8:te=4:fci=6:gosub CLEARI
TEM
2140 tc=7:th=dth:te=0:pmc=4:gosub PMCO
LOR
2150 read n:n2=n:for x=0 to (n*2)-1
2160 read coord(x):next x
2170 for x=1 to 6:pmt=x:gosub PMTYPE
2180 cy=cy+10:gosub DOTEXT:cy=cy+6
2190 coord(1)=cy:coord(3)=cy:coord(5)=
cy:coord(7)=cy
2200 n=n2:gosub PMARKER:cy=cy+4:next x
2210 pmt=1:gosub PMTYPE
2220 poke gintin,257:gemsys(78):return
2240 ITEM2B:
2250 restore ITEM2BDATA
2260 tc=6:th=8:te=4:fci=4:gosub CLEARI
TEM
2270 tc=10:th=dth:te=0:pmc=5:gosub PMC
OLOR
2280 read n:for x=0 to n-1
2290 read coord1(x):next x:cy=40
2300 for x=1 to 5:cy=cy+8:gosub DOTEXT
:cy=cy+6
2310 for y=0 to 5:pmt=y+1:gosub PMTYPE
2320 n=1:coord(0)=coord1(y):coord(1)=c
y
2330 pmh=x*10:gosub PMHEIGHT:gosub PMA
RKER
2340 next y:cy=cy+4+(x*3):next x
2350 pmh=1:gosub PMHEIGHT:pmt=1:gosub
PMTYPE
2360 poke gintin,257:gemsys(78):return
2380 ITEM3A:
2390 restore ITEM3ADATA
2400 tc=2:th=8:te=4:fci=8:gosub CLEARI
TEM
2410 tc=1:te=0
2420 for x=4 to 12 step 2:cy=cy+5
2430 th=dth:cx=10:gosub DOTEXT
2440 char(0)=86:char(1)=68:char(2)=73:
char(3)=32:char(4)=83:char(5)=65
2450 char(6)=77:char(7)=80:char(8)=76:
char(9)=69:char(10)=82
2460 th=x:gosub THEIGHT:cx=120:n=11:go
sub GTEXT
2470 cy=cy+(x*3):next x:th=dth:gosub T
HEIGHT
2480 poke gintin,257:gemsys(78):return
2500 ITEM3B:
2510 restore ITEM3BDATA
2520 tc=4:th=8:te=4:fci=13:gosub CLEAR
ITEM
2530 rt=1:tc=7:th=dth:te=0:gosub DOTEX
T
2540 for x=1 to 4:read tbl,cx,cy,n
2550 for x1=0 to n-1:read char(x1):nex
t x1:gosub TBASE
2560 for y=1 to 3:gosub GTEXT
2570 if x=1 then cy=cy+10
2580 if x=2 then cx=cx+10
2590 if x=3 then cy=cy-10
2600 if x=4 then cx=cx-10
2610 next y:next x:tbl=0:gosub TBASE
2620 poke gintin,257:gemsys(78):return
2640 ITEM3C:
2650 restore ITEM3CDATA
2660 tc=6:th=8:te=4:fci=10:gosub CLEAR
ITEM
2670 rt=1:tc=4:th=8:te=0:gosub DOTEXT
2680 for x=0 to 6:read te,cx
2690 gosub DOTEXT:cy=cy+20
2700 next x:te=0:gosub TEFFECT
2710 poke gintin,257:gemsys(78):return
2730 ITEM4A:
2740 fc1=6:fci1=1:gosub SUBREFRESH
```

```
2750 if ft=0 then ft=1:fis1=3:fsi1=12
2760 fsi1=fsi1+1
2770 if fsi1>12 and fis1=3 then fis1=2
:fsi1=1:tl=9:b$="PATTERN":c$="24"
2780 if fsi1>24 then fsi1=1:fis1=3:tl=
10:b$="HATCH":c$="12"
2790 goto SUBREDRAW
2810 ITEM4B:
2820 fci=6:fci1=1:gosub SUBREFRESH
2830 if ft=0 then ft=1:fis1=2:fsi1=1
2840 fsi1=fsi1-1
2850 if fsi1<1 and fis1=3 then fis1=2:
fsi1=24:tl=9:b$="PATTERN":c$="24"
2860 if fsi1<1 and fis1=2 then fis1=3:
fsi1=12:tl=10:b$="HATCH":c$="12"
2870 goto SUBREDRAW
2890 SUBREFRESH:
2900 cx=fx:cy=fy:cx1=152:cy1=176
2910 rt=3:wm=1:fis=1:gosub DOSHAPE
2920 cx=153:cx1=304
2930 rt=3:fci=fci1:gosub DOSHAPE
2940 return
2960 SUBREDRAW:
2970 cx=fx:cx1=152:rt=3:wm=2:fsi=fsi1:
fis=fis1:fci=2:gosub DOSHAPE
2980 cx=153:cx1=304:rt=3:fsi=fsi1:fis=
fis1:fci=5:gosub DOSHAPE
2990 wm=1:gosub WMODE:rt=1:tc=1:th=dth
:te=0:gosub DOTEXT
3000 gotoxy tl,3:?b$;fsi" of "c$
3010 poke gintin,257:gemsys(78):return
3030 ITEM5A:
3040 restore ITEM5ADATA
3050 fis=1:for y=1 to 2:read fci,n
3060 for xi=0 to (n*2)-1:read coord(xi
):next xi
3070 rt=4:gosub DOSHAPE:next y
3080 fis=2:rad=40:sa=0:ea=900
3090 for x=1 to 4:read plc,fci,fsi,cx,
cy,cx1,cy1
3100 gosub PCOLOR:rt=6:id=2:gosub DOSH
APE
3110 cx=cx1:cy=cy1
3120 rt=6:id=3:gosub DOSHAPE
3130 sa=sa+900:ea=ea+900:next x
3140 plc=1:gosub PCOLOR
3150 n=2:for x=1 to 4:for y=0 to 3
3160 read coord(y):next y:gosub PLINE:
next x
3170 rt=1:tc=1:th=4:te=0:gosub DOTEXT
3180 for x=1 to 8:read cx,cy:gosub DOT
EXT:next x
3190 wm=2:gosub WMODE:rt=1:tc=7:th=dth
:te=0:gosub DOTEXT
3200 gotoxy 18,1:?"ARC'S":gotoxy 18,3:
?"ID 2"
3210 rt=1:tc=3:gosub DOTEXT
3220 gotoxy 11,13:?"PIE'S":gotoxy 11,1
5:?"ID 3"
3230 poke gintin,257:gemsys(78):return
3250 ITEM5B:
3260 restore ITEM5BDATA
3270 fci=4:fci1=11:gosub SUBREFRESH
3280 wm=1:gosub WMODE:cy1=170:fis=2
3290 for x=1 to 6:read fci,fsi,cx,cy,c
x1
3300 rt=2:gosub DOSHAPE:next x
3310 rad=20:for x=1 to 4:read fci,fsi,
cx,cy
3320 rt=1:gosub DOSHAPE:next y
3330 rt=1:rad=40:fis=3:fsi=3:fci=1:cx=
228:cy=109
3340 gosub DOSHAPE:wm=2:gosub WMODE
3350 rt=1:tc=5:th=8:te=16:gosub DOTEXT
3360 gotoxy 6,1:?"B A R S"
3370 rt=1:tc=2:gosub DOTEXT
3380 gotoxy 19,1:?"C I R C L E S"
3390 poke gintin,257:gemsys(78):return
3410 ITEM5C:
3420 restore ITEM5CDATA
3430 cx=fx:cy=fy:cx1=304:cy1=99
3440 rt=3:wm=1:fis=1:fci=1:gosub DOSHA
PE
3450 cy=100:cy1=176
3460 rt=3:fci=0:gosub DOSHAPE:id=6
3470 wm=2:gosub WMODE:rt=1:tc=0:th=dth
:te=0:gosub DOTEXT
3480 n=1:cy1=27:cy2=95:cy3=65:ry=68:sa
1=1800:ea1=0:id=6
3490 sa=sa1:ea=ea1:cx=15:cy=cy1:radx=7
:rady=ry
3500 for x=2 to 15:read char(0)
3510 if id=7 then fsi=x:fci=x:gosub FI
LLINDEX:gosub FILLCOLOR
3520 if id=6 then plc=x:gosub PCOLOR
3530 gosub ELLARCPIE
3540 cx1=cx:cx=cx-3:cy=cy3:gosub GTEXT
:cx=cx1
3550 if sa=sa1 then sa=ea1:ea=sa1:cy=c
y2 else sa=sa1:ea=ea1:cy=cy1
3560 cx=cx+21:next x:if id=7 then goto
 3590
3570 tc=1:gosub TCOLOR:fis=2:gosub FIL
LSTYLE
3580 sa1=1350:ea1=450:ry=30:cy1=138:cy
2=138:cy3=150:id=7:goto 3490
3590 cx=5:cy=27:tc=0:th=4:te=0:gosub D
OTEXT
3600 cy=105:tc=1:gosub DOTEXT
3610 poke gintin,257:gemsys(78):return
3630 ITEM5D:
3640 restore ITEM5DDATA
3650 tc=2:th=8:te=16:fci=1:gosub CLEAR
ITEM
3660 cx=152:cy=105:radx=150:rady=65
3670 for x=1 to 10
3680 rt=5:fis=1:fci=1:gosub DOSHAPE
3690 rt=5:fis=2:fsi=x:fci=x:gosub DOSH
APE
3700 radx=radx-10:rady=rady-5:next x
3710 poke gintin,257:gemsys(78):return
3730 PMARKER:
3740 poke contrl,7:'OPCODE
3750 poke contrl+2,n:'Number of marker
s
3760 poke contrl+6,0
3770 for lp=0 to (n*2)-1:'Enter coordi
nates
3780 poke ptsin+(lp*2),coord(lp)
3790 next lp
3800 vdisys(1):return
3820 PMTYPE:
3830 poke contrl,18:'OPCODE
3840 poke contrl+2,0
3850 poke contrl+6,1
3860 poke intin,pmt:'Marker type
3870 vdisys(1):return
3890 PMHEIGHT:
3900 poke contrl,19:'OPCODE
3910 poke contrl+2,1
3920 poke contrl+6,0
3930 poke ptsin,0
3940 poke ptsin+2,pmh:'Marker height
3950 vdisys(1):return
3970 PMCOLOR:
3980 poke contrl,20:'OPCODE
3990 poke contrl+2,0
4000 poke contrl+6,1
4010 poke intin,pmc:'Color index
4020 vdisys(1):return
4040 PLINE:
4050 poke contrl,6:'OPCODE
4060 poke contrl+2,n:'Number of X,Y pa
irs in line
4070 poke contrl+6,0
4080 for lp=0 to (n*2)-1:'Enter coordi
```

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nates
4090 poke ptsin+(lp*2),coord(lp)
4100 next lp
4110 vdisys(1):return
4130 PTYPE:
4140 poke contrl,15:'OPCODE
4150 poke contrl+2,0
4160 poke contrl+6,1
4170 poke intin,plt:'Polyline type
4180 vdisys(1):return
4200 PWIDTH:
4210 poke contrl,16:'OPCODE
4220 poke contrl+2,1
4230 poke contrl+6,0
4240 poke ptsin,plw:'Polyline width
4250 poke ptsin+2,0
4260 vdisys(1):return
4280 PSTYLE:
4290 poke contrl,108:'OPCODE
4300 poke contrl+2,0
4310 poke contrl+6,2
4320 poke intin,plsb:'End style for be
gining of line
4330 poke intin+2,plse:'End style for
end of line
4340 vdisys(1):return
4360 PCOLOR:
4370 poke contrl,17:'OPCODE
4380 poke contrl+2,0
4390 poke contrl+6,1
4400 poke intin,plc:'Polyline color in
dex
4410 vdisys(1):return
4430 GTEXT:
4440 poke contrl,8:'OPCODE
4450 poke contrl+2,1
4460 poke contrl+6,n:'NUmber of charac
ters to display
4470 for lp=0 to n-1:'Enter text to di
splay (in ASCII)
4480 poke intin+(lp*2),char(lp)
4490 next lp
4500 poke ptsin,cx:'X coordinate
4510 poke ptsin+2,cy:'Y coordinate
4520 vdisys(1):return
4540 TCOLOR:
4550 poke contrl,22:'OPCODE
4560 poke contrl+2,0
4570 poke contrl+6,1
4580 poke intin,tc:'Text color index
4590 vdisys(1):return
4610 TEFFECT:
4620 poke contrl,106:'OPCODE
4630 poke contrl+2,0
4640 poke contrl+6,1
4650 poke intin,te:'Text effect word
4660 vdisys(1):return
4680 THEIGHT:
4690 poke contrl,12:'OPCODE
4700 poke contrl+2,1
4710 poke contrl+6,0
4720 poke ptsin,0
4730 poke ptsin+2,th:'Character height
4740 vdisys(1)
4750 charw=peek(ptsout):'Character wid
th
4760 charh=peek(ptsout+2):'Character h
eight
4770 cellw=peek(ptsout+4):'Cell width
4780 cellh=peek(ptsout+6):'Cell height
4790 return
4810 THEIGHTP:
4820 poke contrl,107:'OPCODE
4830 poke contrl+2,0
4840 poke contrl+6,1
4850 poke intin,th:'Cell height
4860 vdisys(1)
4870 charw=peek(ptsout):'Character wid
th
4880 charh=peek(ptsout+2):'Character h
eight
4890 cellw=peek(ptsout+4):'Cell width
4900 cellh=peek(ptsout+6):'Cell height
4910 return
4930 TBASE:
4940 poke contrl,13:'OPCODE
4950 poke contrl+2,0
4960 poke contrl+6,1
4970 poke intin,tbl:'Baseline angle
4980 vdisys(1):return
5000 WMODE:
5010 poke contrl,32:'OPCODE
5020 poke contrl+2,0
5030 poke contrl+6,1
5040 poke intin,wm:'Writing mode code
5050 vdisys(1):return
5070 ARCPIE:
5080 poke contrl,11:'OPCODE
5090 poke contrl+2,4
5100 poke contrl+6,2
5110 poke contrl+10,id:'Primitive ID
 2=ARC  3=PIE
5120 poke intin,sa:'Start angle in ten
ths of degrees (0-3600)
5130 poke intin+2,ea:'End angle in ten
ths of degrees (0-3600)
5140 poke ptsin,cx:'X coordinate of ce
nter point
5150 poke ptsin+2,cy:'Y coordinate of
center point
5160 for lp=4 to 10 step 2:poke ptsin+
lp,0:next lp
5170 poke ptsin+12,rad:'Radius
5180 poke ptsin+14,0
5190 vdisys(1):return
5210 BAR:
5220 poke contrl,11:'OPCODE
5230 poke contrl+2,2
5240 poke contrl+6,0
5250 poke contrl+10,1:'Primitive ID
1=BAR
5260 poke ptsin,cx:'X coordinate of ba
r
5270 poke ptsin+2,cy:'Y coordinate of
bar
5280 poke ptsin+4,cx1:'X coordinate of
 bar diagonally opposite
5290 poke ptsin+6,cy1:'Y coordinate of
 bar diagonally opposite
5300 vdisys(1):return
5320 CIRCL:
5330 poke contrl,11:'OPCODE
5340 poke contrl+2,3
5350 poke contrl+6,0
5360 poke contrl+10,4:'Primitive ID
4=CIRCLE
5370 poke ptsin,cx:'X coordinate of ce
nter point
5380 poke ptsin+2,cy:'Y coordinate of
center point
5390 poke ptsin+4,0
5400 poke ptsin+6,0
5410 poke ptsin+8,rad:'Radius
5420 poke ptsin+10,0
5430 vdisys(1):return
5450 ELLARCPIE:
5460 poke contrl,11:'OPCODE
5470 poke contrl+2,2
5480 poke contrl+6,2
5490 poke contrl+10,id:'Primitive ID
 6=ELL.ARC  7=ELL.PIE
5500 poke intin,sa:'Start angle in ten
ths of degrees
5510 poke intin+2,ea:'End angle in ten
ths of degrees (0-3600)
```

```
5520 poke ptsin,cx:'X coordinate of ce
nter point
5530 poke ptsin+2,cy:'Y coordinate of
center point
5540 poke ptsin+4,radx:'Radius of X ax
is
5550 poke ptsin+6,rady:'Radius of Y ax
is
5560 vdisys(1):return
5580 ELLIPS:
5590 poke contrl,11:'OPCODE
5600 poke contrl+2,2
5610 poke contrl+6,0
5620 poke contrl+10,5:'Primitive ID
5=Ellipse
5630 poke ptsin,cx:'X coordinate of ce
nter point
5640 poke ptsin+2,cy:'Y coordinate of
center point
5650 poke ptsin+4,radx:'Radius of X ax
is
5660 poke ptsin+6,rady:'Radius of Y ax
is
5670 vdisys(1):return
5690 RRECT:
5700 poke contrl,11:'OPCODE
5710 poke contrl+2,2
5720 poke contrl+6,0
5730 poke contrl+10,id:'Primitive ID
 8=Rounded rect  9=Filled
5740 poke ptsin,cx:'X coordinate of re
ctangle
5750 poke ptsin+2,cy:'Y coordinate of
rectangle
5760 poke ptsin+4,cx1:'X coordinate di
agonally opposite
5770 poke ptsin+6,cy1:'Y coordinate di
agonally opposite
5780 vdisys(1):return
5800 FILLA:
5810 poke contrl,9:'OPCODE
5820 poke contrl+2,n:'Number of lines
in ploygon
5830 poke contrl+6,0
5840 for lp=0 to (n*2)-1:'Enter coordi
nates
5850 poke ptsin+(lp*2),coord(lp)
5860 next lp
5870 vdisys(1):return
5890 CONTOUR:
5900 poke contrl,103:'OPCODE
5910 poke contrl+2,1
5920 poke contrl+6,1
5930 poke intin,cc:'Color index defini
ng contour
5940 poke ptsin,cx:'X coordinate of sa
trting point
5950 poke ptsin+2,cy:'Y coordinate of
satrting point
5960 vdisys(1):return
5980 RECTFILL:
5990 poke contrl,114:'OPCODE
6000 poke contrl+2,2
6010 poke contrl+6,0
6020 poke ptsin,cx:'X coordinate of re
ctangle
6030 poke ptsin+2,cy:'Y coordinate of
rectangle
6040 poke ptsin+4,cx1:'X coordinate di
agonally opposite
6050 poke ptsin+6,cy1:'Y coordinate di
agonally opposite
6060 vdisys(1):return
6080 FILLSTYLE:
6090 poke contrl,23:'OPCODE
6100 poke contrl+2,0
6110 poke contrl+6,1
6120 poke intin,fis:'Fill interior sty
le code
6130 vdisys(1):return
6150 FILLINDEX:
6160 poke contrl,24:'OPCODE
6170 poke contrl+2,0
6180 poke contrl+6,1
6190 poke intin,fsi:'Fill style index
code
6200 vdisys(1):return
6220 FILLCOLOR:
6230 poke contrl,25:'OPCODE
6240 poke contrl+2,0
6250 poke contrl+6,1
6260 poke intin,fci:'Fill color index
6270 vdisys(1):return
6290 PERMV:
6300 poke contrl,104:'OPCODE
6310 poke contrl+2,0
6320 poke contrl+6,1
6330 poke intin,pv:'Perimeter flag  0=
Invisible  1=Visible
6340 vdisys(1):return
6360 TIMER:
6370 poke gintin,5000:'5 Second wait
6380 poke gintin+2,0
6390 gemsys(24):'OPCODE
6400 return
6410 '--- PROGRAM DATA ---
6440 INTRODATA:
6450 data 5,86,32,68,32,73
6460 data 13,83,32,65,32,77,32,80,32,7
6,32,69,32,82
6470 data 4,70,82,79,77
6480 data 11,65,32,78,32,65,32,76,32,7
9,32,71
6490 data 9,67,79,77,80,85,84,73,78,71
6510 MENU0DATA:
6520 data 34,76,73,78,69,32,77,65,82,7
5,69,82,32,84,69,88,84,32
6530 data 70,73,76,76,32,83,72,65,80,6
9,83,32,32,81,85,73,84
6540 data 12,0,32,42,88,98,128,138,168
,178,224,250,280
6550 data 0,0,5,0,0,0
6560 MENU1DATA:
6570 data 31,84,89,80,69,32,87,73,68,8
4,72,32,69,78,68,83
6580 data 84,89,76,69,32,32,32,77,65,7
3,78,32,77,69,78,85
6590 data 8,0,32,42,80,90,152,186,256
6600 data 5,8,2,3,9,0
6610 MENU2DATA:
6620 data 23,84,89,80,69,32,72,69,73,7
1,72,84,32,32,32
6630 data 77,65,73,78,32,77,69,78,85
6640 data 6,0,32,42,88,122,192
6650 data 2,8,6,4,10,4
6660 MENU3DATA:
6670 data 33,83,73,90,69,32,66,65,83,6
9,76,73,78,69,32
6680 data 69,70,70,69,67,84,83,32,32,3
2,77,65,73,78,32,77,69,78,85
6690 data 8,0,32,42,104,114,168,202,27
2
6700 data 12,8,3,7,12,2
6710 MENU4DATA:
6720 data 25,78,69,88,84,32,80,82,69,8
6,73,79,85,83,32,32,32
6730 data 77,65,73,78,32,77,69,78,85
6740 data 6,0,32,43,104,130,200
6750 data 2,8,11,1,21,4
6760 MENU5DATA:
6770 data 50,65,82,67,47,80,73,69,32,6
6,65,82,47,67,73,82,67,76,69,32
6780 data 69,76,76,46,65,82,67,47,80,7
3,69,32,69,76,76,73,80,83,69,32
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6790 data 32,32,77,65,73,78,32,77,69,7
8,85
6800 data 10,0,43,50,109,116,181,188,2
29,248,301
6810 data 4,8,10,4,20,5
6830 ITEM1ADATA:
6840 data 10,76,73,78,69,32,84,89,80,6
9,83
6850 data 6,84,89,80,69,32,49,6,84,89,
80,69,32,50,6,84,89,80,69,32,51
6860 data 6,84,89,80,69,32,52,6,84,89,
80,69,32,53,6,84,89,80,69,32,54
6870 ITEM1BDATA:
6880 data 11,76,73,78,69,32,87,73,68,8
4,72,83
6890 data 7,87,73,68,84,72,32,49,7,87,
73,68,84,72,32,51
6900 data 7,87,73,68,84,72,32,53,7,87,
73,68,84,72,32,53
6910 ITEM1CDATA:
6920 data 9,69,78,68,83,84,89,76,69,83
6930 data 10,69,78,68,83,84,89,76,69,3
2,48,10,69,78,68,83,84,89,76,69,32,49
6940 data 10,69,78,68,83,84,89,76,69,3
2,50
6950 ITEM2ADATA:
6960 data 12,77,65,82,75,69,82,32,84,8
9,80,69,83
6970 data 4,75,55,125,55,200,55,275,55
6980 data 6,84,89,80,69,32,49,6,84,89,
80,69,32,50,6,84,89,80,69,32,51
6990 data 6,84,89,80,69,32,52,6,84,89,
80,69,32,53,6,84,89,80,69,32,54
7000 ITEM2BDATA:
7010 data 13,77,65,82,75,69,82,32,72,6
9,73,71,72,84
7020 data 6,75,115,155,195,235,275
7030 data 9,72,69,73,71,72,84,32,49,48
,9,72,69,73,71,72,84,32,50,48
7040 data 9,72,69,73,71,72,84,32,51,48
,9,72,69,73,71,72,84,32,52,48
7050 data 9,72,69,73,71,72,84,32,53,48
7060 ITEM3ADATA:
7070 data 9,84,69,88,84,32,83,73,90,69
7080 data 11,84,69,88,84,32,83,73,90,6
9,32,52
7090 data 11,84,69,88,84,32,83,73,90,6
9,32,54
7100 data 11,84,69,88,84,32,83,73,90,6
9,32,56
7110 data 12,84,69,88,84,32,83,73,90,6
9,32,49,48
7120 data 12,84,69,88,84,32,83,73,90,6
9,32,49,50
7130 ITEM3BDATA:
7140 data 8,66,65,83,69,76,73,78,69
7150 data 0,110,55,10,66,65,83,69,76,7
3,78,69,32,48
7160 data 900,50,150,12,66,65,83,69,76
,73,78,69,32,57,48,48
7170 data 1800,200,150,13,66,65,83,69,
76,73,78,69,32,49,56,48,48
7180 data 2700,250,55,13,66,65,83,69,7
6,73,78,69,32,50,55,48,48
7190 ITEM3CDATA:
7200 data 8,32,69,70,70,69,67,84,83
7210 data 0,80,10,48,32,32,32,78,79,82
,77,65,76
7220 data 1,80,11,49,32,84,72,73,67,75
,69,78,69,68
7230 data 2,80,11,50,32,73,78,84,69,78
,83,73,84,89
7240 data 4,75,10,52,32,32,32,83,75,69
,87,69,68
7250 data 8,77,12,56,32,85,78,68,69,82
,76,73,78,69,68
7260 data 16,75,11,49,54,32,79,85,84,7
6,73,78,69,68
7270 data 32,75,11,51,50,32,83,72,65,6
8,79,87,69,68
7280 ITEM5ADATA:
7290 data 3,3,1,22,304,22,1,176
7300 data 7,3,304,22,304,176,1,176
7310 data 7,0,5,90,70,240,115,2,5,16,8
0,70,230,115
7320 data 1,1,19,80,80,230,125,4,3,7,9
0,80,240,125
7330 data 85,30,85,120,35,75,135,75,23
5,75,235,167,185,120,285,120
7340 data 139,77,1,48,76,28,3,57,48,48
,5,77,4,49,56,48,48
7350 data 72,127,4,50,55,48,48
7360 data 289,122,1,48,226,73,3,57,48,
48,155,122,4,49,56,48,48
7370 data 222,175,4,50,55,48,48
7380 ITEM5BDATA:
7390 data 1,23,17,50,47,0,8,52,70,77,5
,24,82,90,102
7400 data 2,19,107,110,122,6,16,127,13
0,137,3,10,142,150,147
7410 data 2,10,182,62,4,21,274,62,7,12
,182,156,10,24,274,156
7420 ITEM5CDATA:
7430 data 69,76,76,73,80,84,73,67,65,7
6,32,65,82,67
7440 data 69,76,76,73,80,84,73,67,65,7
6,32,80,73,69
7450 data 4,73,68,32,54,4,73,68,32,55
7460 ITEM5DDATA:
7470 data 9,32,32,69,76,76,73,80,83,69
```

●

ST-CHECKSUM DATA.

(see page 63ST)

```
 100 data  388, 683, 932, 753, 140, 62
0, 70, 47, 401, 399, 4433
 200 data  639, 501, 2, 245, 356, 514,
 241, 775, 73, 32, 3378
 310 data  872, 504, 231, 765, 63, 781
, 322, 923, 144, 40, 4645
 430 data  616, 312, 25, 999, 27, 741,
 904, 961, 250, 234, 5069
 540 data  608, 858, 532, 619, 882, 56
5, 249, 719, 454, 953, 6439
 640 data  66, 165, 555, 612, 882, 203
, 123, 894, 390, 370, 4260
 750 data  195, 93, 10, 582, 896, 462,
 212, 350, 409, 193, 3402
 860 data  790, 585, 87, 655, 60, 155,
 352, 537, 944, 424, 4589
 970 data  639, 421, 63, 740, 832, 816
, 519, 75, 773, 78, 4956
 1080 data  112, 380, 911, 689, 47, 55
1, 3, 942, 231, 884, 4750
 1190 data  300, 79, 229, 609, 294, 97
, 950, 393, 475, 849, 4275
 1300 data  409, 163, 743, 703, 261, 7
78, 791, 31, 290, 277, 4446
 1400 data  99, 869, 273, 313, 706, 98
3, 802, 871, 147, 827, 5890
 1510 data  831, 835, 839, 843, 368, 8
56, 837, 857, 978, 870, 8114
 1620 data  992, 839, 890, 114, 416, 7
10, 868, 954, 381, 79, 6243
 1740 data  439, 275, 960, 44, 36, 947
, 993, 538, 849, 993, 6074
 1850 data  390, 87, 444, 281, 879, 99
2, 959, 946, 91, 548, 5617
 1950 data  82, 999, 399, 95, 410, 261
```

```
, 8, 229, 939, 924, 4346
 2060 data  69, 460, 149, 977, 366, 63
, 327, 497, 110, 232, 3250
 2170 data  830, 454, 466, 219, 43, 97
6, 375, 71, 333, 396, 4163
 2280 data  30, 20, 113, 997, 841, 452
, 130, 916, 983, 381, 4863
 2390 data  77, 337, 650, 7, 984, 43,
933, 388, 916, 988, 5323
 2500 data  382, 77, 443, 235, 289, 76
8, 844, 856, 856, 870, 5620
 2600 data  863, 801, 988, 392, 86, 44
3, 819, 367, 485, 877, 6121
 2710 data  990, 390, 390, 640, 864, 6
00, 13, 540, 394, 463, 5284
 2830 data  442, 867, 535, 104, 541, 5
5, 973, 421, 179, 248, 4365
 2940 data  470, 923, 666, 178, 589, 9
12, 971, 373, 67, 163, 5312
 3060 data  771, 896, 448, 936, 526, 2
76, 589, 716, 981, 925, 7064
 3160 data  937, 789, 185, 580, 380, 5
48, 600, 979, 384, 77, 5459
 3270 data  628, 463, 921, 895, 197, 8
97, 961, 749, 989, 67, 6767
 3370 data  554, 772, 988, 389, 81, 80
4, 152, 160, 391, 573, 4864
 3480 data  582, 811, 701, 309, 722, 6
07, 191, 249, 302, 16, 4490
 3580 data  720, 530, 762, 989, 400, 9
1, 437, 407, 79, 622, 5037
 3690 data  489, 592, 992, 576, 311, 9
77, 446, 274, 889, 452, 5998
 3800 data  729, 512, 433, 443, 451, 3
02, 736, 811, 435, 446, 5298
 3920 data  448, 131, 686, 737, 621, 4
26, 451, 424, 332, 709, 4965
 4040 data  333, 292, 311, 428, 256, 8
71, 427, 711, 401, 409, 4439
 4150 data  425, 433, 641, 718, 477, 4
11, 428, 430, 864, 258, 5085
 4260 data  719, 506, 496, 426, 437, 8
63, 333, 720, 492, 422, 5414
 4380 data  434, 442, 689, 720, 379, 3
05, 437, 965, 940, 656, 5967
 4490 data  445, 220, 467, 724, 500, 4
17, 438, 446, 686, 731, 5074
 4610 data  548, 495, 438, 446, 659, 7
31, 580, 423, 441, 443, 5204
 4720 data  126, 20, 725, 272, 610, 74
8, 952, 473, 797, 504, 5227
 4830 data  444, 452, 977, 730, 277, 6
15, 753, 950, 471, 324, 5993
 4940 data  429, 449, 457, 689, 742, 3
48, 401, 421, 429, 842, 5207
 5050 data  714, 418, 404, 440, 432, 4
4, 534, 374, 369, 689, 4418
 5160 data  295, 825, 401, 721, 997, 4
04, 434, 433, 234, 60, 4804
 5270 data  319, 392, 403, 718, 353, 4
08, 441, 437, 690, 378, 4539
 5380 data  698, 273, 273, 752, 400, 7
24, 877, 414, 444, 449, 5304
 5490 data  128, 744, 384, 379, 699, 2
69, 281, 730, 502, 420, 4536
 5600 data  443, 442, 813, 383, 703, 2
73, 285, 734, 379, 417, 4872
 5710 data  447, 446, 723, 982, 189, 3
72, 383, 738, 338, 317, 4935
 5820 data  113, 450, 278, 893, 456, 7
40, 677, 495, 450, 455, 5007
 5930 data  251, 883, 849, 742, 791, 5
09, 427, 426, 961, 168, 6007
 6040 data  351, 362, 717, 944, 412, 4
24, 432, 886, 717, 928, 6173
 6160 data  414, 431, 439, 385, 717, 9
29, 416, 431, 439, 739, 5340
 6270 data  724, 394, 482, 431, 439, 4
85, 724, 375, 369, 439, 4862
 6390 data  892, 459, 957, 919, 784, 1
75, 494, 576, 81, 828, 6165
 6520 data  464, 150, 513, 112, 835, 8
70, 862, 739, 165, 835, 5545
 6620 data  515, 752, 56, 264, 842, 55
5, 766, 935, 401, 842, 5928
 6720 data  154, 755, 125, 394, 849, 6
2, 84, 343, 853, 402, 4021
 6830 data  968, 351, 38, 29, 975, 656
, 632, 614, 975, 132, 5370
 6930 data  690, 347, 975, 967, 961, 4
4, 35, 948, 226, 489, 5682
 7030 data  787, 770, 15, 953, 59, 616
, 619, 615, 917, 913, 6264
 7130 data  956, 773, 184, 169, 354, 4
00, 965, 723, 913, 273, 5710
 7230 data  252, 935, 645, 227, 214, 9
65, 110, 441, 51, 23, 3863
 7330 data  664, 798, 76, 356, 151, 67
, 174, 963, 45, 971, 4265
 7430 data  261, 263, 784, 978, 49, 23
35
```

•

WHAT IS ST-CHECK?

Most program listings in **ST-Log** are followed by a table of numbers appearing as DATA statements, called "ST CHECKSUM DATA." These numbers are to be used in conjunction with **ST-Check** (which appeared in **ANALOG Computing/ST-Log** issue 41.

ST-Check (written by Clayton Walnum) is designed to find and correct typing errors when readers are entering programs from the magazine. For those readers who would like copies of the article, you may send for back issue 41 ($4.00).

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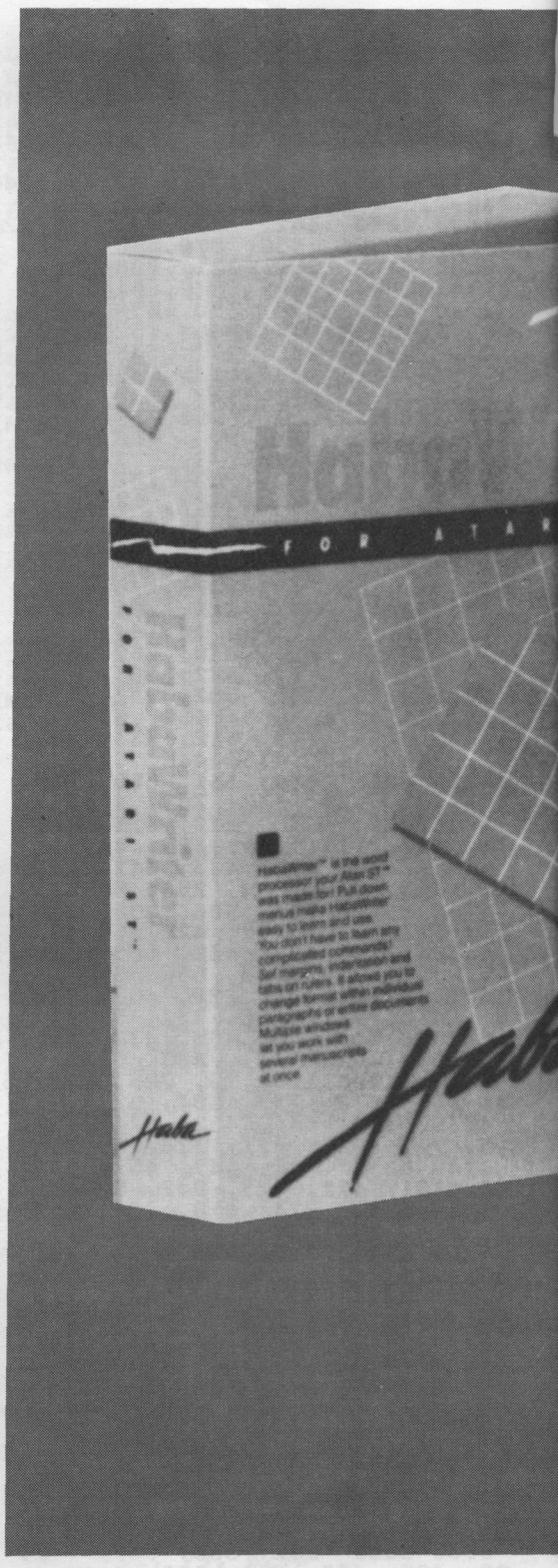

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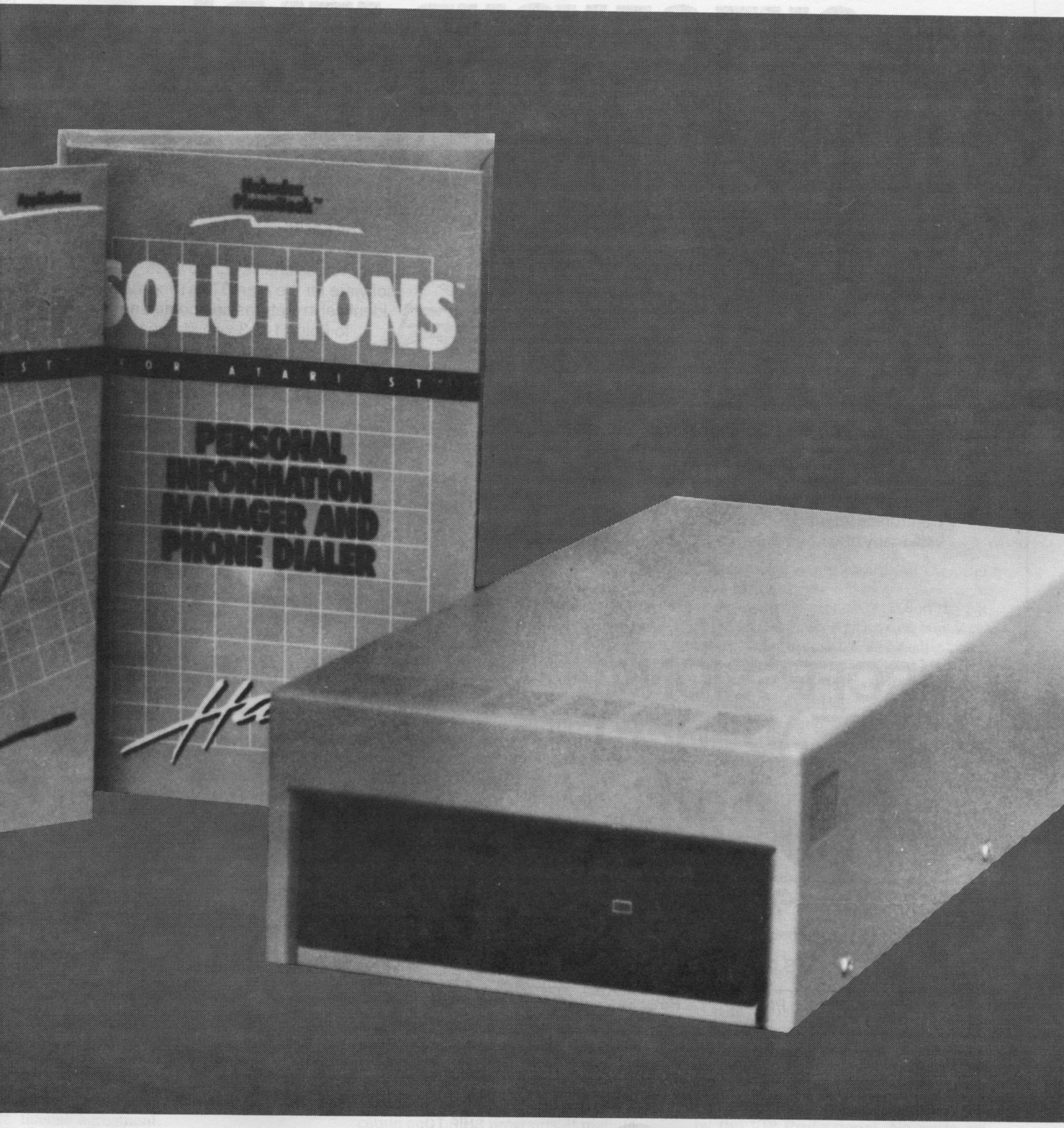

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by Arthur Leyenberger

When I first got the **VIP Professional**, I was eager to try it. I'd been a long-time user of Lotus 1-2-3, and I wanted to compare them head to head (or, more appropriately, cell to cell).

Lotus 1-2-3 was and is a breakthrough in the MS-DOS world. I was hoping the **Professional** would be the same for Atari. Here's where the tale begins.

In the carton, I found a thick reference manual. On skimming, it seemed easy to read. I also found the 3½-inch micro floppy disk. Eager to try the program on my 520ST, I booted up with TOS, then inserted the **Professional** disk in the drive. When I tried to get a disk directory, I got an error message.

Taking the disk out, I discovered what seemed to be a piece of adhesive tape on the disk's business end. Looking closer, I read a warning to the effect that, if I broke this seal, I was bound to the rules and regulations set forth in VIP's software license. Okay, I'd seen this kind of warning before. Typically, though, the disks would come wrapped in a sealed baggie; opening it would bind me to the license agreement.

I attempted to remove the sticker. It wouldn't come off—not easily. I soon realized the only way to remove it (and to use the disk) was to scrape it off.

I began doing so very carefully, trying to avoid getting crumbs inside the disk shell. I kept scraping, rubbing and, generally, getting nervous. I knew that if anything did get into the disk undetected, it might become history once accessed by the drive. Finally, I got the sticker off and inserted the disk.

VIP Professional booted fine. I didn't have time then for a full-length session. I just wanted to see how similar the screen and user interface were to the Lotus—and it looked very much the same. It *is* a Lotus clone, right?

My next surprise came on exiting the program. The message said, *insert TOS disk and turn the computer off and on*. I was slightly annoyed that I couldn't get back to the desktop. It was a nuisance, nothing more.

Next, I thought I'd better back the program up, so I wouldn't have to worry about those crumbs. Using MichTron's **M-Copy** program (the best currently available), I made a backup. When I tried to run the copy, I found it wouldn't work. It still needed the original disk in drive 1, using the key disk system. Surprise: **VIP** is copy protected.

I'm against copy protection for application and utility programs. If manufacturers want to protect games, that's okay with me. But a program used for serious work—especially at this price—shouldn't be copy protected. And, with those crumbs still causing nightmares, I get queasy every time I put the original in the drive.

So ends my preface. Right off the bat, I felt abused by VIP. The disk was stuck shut; I had to unstick it, causing possible disk damage— and I couldn't back it up completely. At least VIP could have included two disks.

It's been a month since that first experience with **VIP Professional**. I no longer feel angry. But I have seen several revisions of the program, each correcting previous bugs. I finally have a copy of **Professional** that's bug free, as far as I can tell. Now it's time for an *objective* review.

Professional by VIP Technologies is a spreadsheet for the ST, based upon the well-known, widely-used Lotus 1-2-3. As an integrated spreadsheet, **Professional** provides a sophisticated spreadsheet, database and presentation graphics capabilities, rolled into one program.

It really is a Lotus clone. As such, it will let you use the same keystrokes, applications, data files and templates as the original does. Worksheet files created on an IBM PC with Lotus 1-2-3 can be transferred to the ST, then accessed by the **VIP Professional**. No muss, no fuss.

The version of the **Professional** used for this review was the so-called text version, which doesn't use the GEM system

at all. No mouse control, drop-down menus or pointing and clicking. But that's how Lotus 1-2-3 works; many people have used this setup effectively for years.

Professional has two modes of operation. NAT is the native mode, used most of the time. The other is WKS and is Lotus compatible. In the latter mode, files in Lotus format can be read into and saved from **Professional**.

The native mode files load and save very quickly from the spreadsheet, whereas files in the WKS mode have to be translated when loaded. It's slightly slower. Pressing the ALT and UNDO keys on the ST toggle **Professional** into the two modes.

On a 520ST with TOS on disk, only about 40K of memory is available for your **Professional** spreadsheets. With TOS on ROM, a spreadsheet can be over 200K in size. If you have a 1-megabyte ST (either a 520 upgrade or a 1040), over ½ megabyte is available for your spreadsheet—more than the IBM PC allows Lotus 1-2-3.

The documentation is first rate. The comprehensive spiral bound handbook has over 200 pages, divided into tutorial and reference sections, plus a glossary, appendices and an index.

Well written and easy to understand, the tutorial gets you started with the program and introduces you to the basic concepts of **VIP Professional**. You're led through a sample budget worksheet with plenty of procedures and examples. The reference section gives details about the variety of available commands and functions.

The **VIP Professional** screen is divided into two areas, with a menu at the top line and the worksheet area filling the remainder. The menu line at the top gives the titles for commands accessed by pressing the / key.

For example, pressing */w* displays another set of menu titles, like column width, delete, erase, global, window, etc. Select an item, and you're prompted for an entry. Pressing ESC returns you to the previous menu level.

The worksheet area consists of a grid-like pattern of horizontal and vertical lines forming cells. Each cell may contain a piece of data. Columns are labeled *A, B, C...*, and rows are labeled by number, top to bottom.

The arrow cursor keys are used to move the cell pointer around the worksheet. Wherever the cell pointer rests indicates which cell will be affected by data entry or be a command's starting point. The current cell, as indicated by the pointer, is displayed at the top left of the screen.

Like other spreadsheets, any position in the sheet can be defined as a label, value or formula. Further, any formula can relate to any other positions (or combinations of positions) on the worksheet.

When a position's value changes, all items dependent on that value change automatically, without any effort on the user's part. This allows you to perform whatever calculations and manipulations of figures you wish—with amazing speed and accuracy.

There are a couple of negative aspects to **Professional**. The program currently only supports TOS-recognized printers, so Epson and Epson compatibles are the only printers that will work with the program's graphic output.

Unlike Lotus, **Professional** won't let you select output devices. Another problem, albeit minor, is that you can't format a disk from the program. Lotus 1-2-3 shares this snag.

Being copy protected, the **Professional** uses a key disk system. As mentioned earlier, this means you can copy the disk's contents to another disk, but the original program must be in drive A when it's run. However, the program can't be used with a hard disk. With the key disk in drive A, **Professional** simply will not run from drive C.

Many have complained about the **Professional**'s slow scrolling when redrawing the screen, as compared to Lotus 1-2-3. Scrolling in any direction in Lotus is instantaneous. With the former, a slight delay occurs if the screen is redrawn. VIP explains this by saying that the IBM PC only has 2K bytes of screen memory to update, whereas the ST has 32K bytes. That accounts for the slowness.

I understand the technicalities, but it's still no excuse. When a user is familiar with an excellent product (like **SynCalc** for the 8-bit Atari, which has no scrolling problems), they expect a more expensive, more sophisticated product to function as well as that, if not better.

Professional Lite is almost identical to **Professional**. Aside from a price $80 lower, **Lite** doesn't have the ability to use macros, has no database functions and has a matrix of "only" 256 by 2048 cells (**Professional** allows a whopping 8192 spreadsheet rows, while Lotus 1-2-3 will yield up to 2047 rows).

If you don't need these features, **Lite** is the one to buy. The discounted price will fall somewhere in the $79-$80 range, which makes it an excellent bargain.

The GEM version of **Professional** should be even better. It's due in the second quarter of 1986. Current VIP policy is that all registered owners of **Professional** will receive the GEM upgrade for free, instead of for the original $20 fee.

The bottom line is that **Professional** and **Professional Lite** from VIP Technologies are, as they claim, true imitations of Lotus 1-2-3. Both programs have better graph features than Lotus, and the 68000 processor of the ST makes calculations much faster than does the IBM PC's 8088.

The documentation is good, and the price is right for **Lite**—and for the full **Professional**, if you need it. Now that the bugs have been worked out, I have no problem with recommending either one.

C-MANSHIP

Part 5.

by Clayton Walnum

Okay, people. Pass your homework to the front of the class. What was that? Did I hear someone in the back say, "What homework?"

For those who need their memories refreshed, last month I suggested that you try writing a C version of a simple number guessing game. You were to have the computer pick a number from *1* to *100*, then allow a player to enter guesses. With each guess, the player was to receive a clue as to whether he was too high or too low.

My solution for this project is found in Listing 1. Does your program look something like this? Maybe, maybe not. At this early point in your C career, I think the following qualities are most important.

First of all, does it work? If you can give me an affirmative, you've earned 70 points. At this stage of the game, getting programs up and running is a good part of the battle.

Now, did you use a structured approach? Does the function main() concern itself with the major steps of the game, allotting details to other functions? If so, give yourself another 20 points. When you become more familiar with C, this category will be more pointworthy. In fact, eventually, an unstructured program will be an automatic zero. Strict, huh?

Finally, how readable is your code? Have you used indentation? Are there blank lines between each function? Did you use meaningful names for your functions and variables? Another 10 points to those who've added this touch of elegance.

Game time again.

Now that you've tallied up your homework score, type in Listing 1 and compile it. If you need help, see the sidebar accompanying Part 3 (issue 41) of this series.

To play the game, run the program and follow the prompts. When you're asked to input a number, end your response with the SPACE BAR (remember the strange way scanf() works). Everything work okay? Let's examine this program in a little more detail.

The function main() is written in a manner that makes the program's general operation clearly apparent. All the details are taken care of in other functions. In other words, the program is *structured*.

We start off by initializing the flag play to TRUE. This will get us into the while loop at Line 9. As long as play is true, this loop will repeat, allowing the user to play many games without rerunning the program each time.

Once in the loop, we must initialize some variables. The counter turns tallies the player's guesses. The flag win tells main() when the player has made a correct guess.

After initializing the variables, we call the function getnum(), which returns a random number between *1* and *100*. Next, since we had the forethought to initialize win to false, we enter the while loop at Line 12. This loop will repeat until win becomes true,

keeping the player guessing until he comes up with the right number.

In the body of the loop, we increment the turn counter, get the player's guess, then check if he's right. If not, win remains false and the loop repeats. If it's been guessed correctly, program execution drops through to Line 17, where the player is told how many guesses were made.

Line 18 calls play_again() to see if the player wants to continue. If so, the flag play remains true, and the outer while loop repeats. When play becomes false, the program ends, and the user's returned to the desktop.

Easy, right? You should've followed the above with little difficulty.

The other functions are just as simple. The function get_num() uses the same method we incorporated last month in our dice game to get a random number. The only difference is that now we're getting a number between *1* and *100* rather than between *1* and *6*.

The function get_guess() incorporates a while loop, forcing the player to enter a number within the proper range. The loop will repeat until the gamester bends to our will.

The function check_guess() checks if the player's guess was too high, too low, or right on the money, then prints the appropriate message. If the player has guessed right, then wn is set to TRUE (and, thus, win), and the game is over.

Finally, the function play_again() asks if the player wants another whack at it. Once again, we use a while loop to guarantee a proper response. The call to getchar() at Line 58 gets rid of the extra character scanf() likes to leave lying around.

Some classy information.

Before we take a look at the next two listings, we need to discuss a fun topic called "Storage Classes."

All storage you define in your C programs has a storage class, whether you're aware of it or not. In our previous program examples, the storage classes were set automatically. We didn't have to concern ourselves with the details. That's all fine and dandy for a beginner, but sooner or later we're going to have to know how our variables are treated by the system.

There are four C keywords that refer to the storage classes. They are: *extern*, *auto*, *static* and *register*.

The keyword *extern* stands for external. Any variable that's not defined within a function falls into this class. Both Listing 1 and Listing 2 contain examples. Notice the arrays week[] and weeks[].

Unlike local variables that disappear once we're through with them, external variables may be accessed anywhere within your program. The only rule to remember is that, if their declaration appears in another file or after a function that refers to them, they must be declared as external in the function where they're used. Here's a declaration example:

```
extern int numbers;
```

Automatic (or *auto*) variables are those declared within a function. They remain healthy and happy as long as we stay within the function where they were declared. The moment we exit, they vanish into that great CPU in the sky. It's not necessary to declare these variables by their storage class (we never have, right?)—but, if you wanted to, this is what it would look like:

```
auto int number;
```

Variables of the class *static* are similar to automatic variables, except their values aren't forgotten when the function is exited. Don't try to access them in other parts of your program, though. They're still strangers there. Look at this code fragment:

```
main()
{
for (x=0; x<5; ++x)
   counter();
}

counter()
{
static int count=1;
printf("%d ", ++count);
}
```

The output from this example would be:

```
2 3 4 5 6
```

Each time we call counter(), the variable count is incremented and printed out. If we hadn't declared count as a static variable, the output would have been a string of *2*s.

Do you see why? When a static variable is initialized as we did in counter(), it receives its initial value the first time we call the function. Thereafter, the declaration and initialization is ignored. This is only logical, since what good would a static variable be if it was reset each time we called the function?

By not declaring count as static, it automatically becomes automatic (no, I'm not being redundant). Each time we call the function, it gets set to *1*, then it's incremented and printed. This gives us that string of *2*s.

One last note on static variables. An interesting variation of this class can be created by defining it outside any function. This type of variable is called "external static." This class varies from regular ex-

ternal variables, in that it can be accessed only within the file where it appears, and only in functions following its declaration.

The last class we need to discuss are register variables. They're defined like this:

```
register int number;
```

When we declare a register variable, we're requesting that the value be stored in one of the ST's registers where processing is much quicker. Notice I used the word *requesting*. If there's no register free in which to store our variable, it becomes an automatic variable.

Hip, hip array!

We took a brief look at arrays when we wrote our sort program a couple of months ago. Now we're going to dig a little deeper.

First, let's tackle Listing 2. Suppose you're selling a peculiar product called a whamble (a what?) in your small business. At the end of the week, you want to write a quick and dirty program that'll print the number of units sold that week. Listing 2 is just such a program. When you run it, your output should look like this:

```
Sales for day 1: 5
Sales for day 2: 7
Sales for day 3: 2
Sales for day 4: 10
Sales for day 5: 7
Sales for day 6: 1
Sales for day 7: 6

Total sales: 38
```

The first thing we must do in this program is initialize an array. In our sorting program, we didn't worry about that. All we did was declare the array, then fill it, later in the program, with the numbers the user input. Sometimes, though, you'll need to have the array data stored and ready to process at run time. Line 2 shows you how to do this.

To initialize an array as part of its declaration, the array name is followed by an equal sign, which, in turn, is followed by the elements of the array, separated by commas and placed between brackets. Here are more examples:

```
int numbers[] = {1,2,4};
int numbers[3] = {1,2,4};
float numbers[] = {1.1,2.2,4.4};
```

The first is just like the declaration on Line 2, and the second example is, in this case, functionally the same as the first. However, it does present potential difficulties.

For instance, in the first example, the compiler automatically makes the array size the same as the number of values that follow. In the second example, we're telling the compiler that, no matter what, we want a three-element array. Here's a strange one:

```
int numbers[4] = {1,2};
```

What do you suppose happens here? Well, the compiler sets aside an array containing four elements, then looks to see what we've got stuffed between the brackets.

The first value goes into the first element, the second into the second. After that, if it's an external or static array, the remaining elements are initialized to *0*. Otherwise, whatever garbage happens to be in those locations filling out the remainder of the array becomes an authorized resident. Trouble, for sure. Here's another problem maker:

```
int numbers[2] = {1,2,4};
```

There's no way you're going to get away with this. Your compiler is sure to present you with some snide comments on your programming skills—and they'll be well deserved. You can't get three data items into a two-element array.

Continuing with Listing 2, after we've initialized our array, the program uses a for loop to access each element, add it to the total and print it out. Except for a little nuance with the way we've initialized the for loop, you've seen all this before. Just remember that an array starts at element *0*.

Now, how about that nuance I mentioned? Look at Line 6. I hope you remember about for loops. The first expression in the parentheses is the initialization, the second is the loop control, and the third is the loop's step value.

In this example, we've taken the opportunity to initialize not only the loop variable, but the accumulator total as well. This is a handy way to set variables used within a loop to their starting values.

Line 7 offers a new assignment operator for your inspection, one that's quite similar to the increment and decrement operators. Line 7 does the same work as this line of code:

```
TOTAL=TOTAL+WEEK[i]
```

The right side of the expression is added to the left.

Another dimension.

C is also capable of handling multi-dimensional arrays. You can think of these as arrays of arrays. Listing 3 illustrates how to handle them.

The declaration is similar to that of a one-dimensional array, except we've added another set of brackets, to tell the compiler how we would like the array set up.

Look at Line 2. Here we're declaring an array with

two sets of seven elements. You can think of this as a matrix, with two rows and seven columns.

When we initialize the array, each row of data is placed within its own set of braces. The rows, just like the data within, are separated by a comma. Finally, the entire array is enclosed with another set of braces. This tells the compiler how we want each element placed. Take a look at this:

```
int a[2][3] = {
        {1,2},
        {3,4,5}
            }
```

Here, we've declared an array which contains two arrays of three elements each. But wait a minute! In our initialization, we're missing a data element for the first subarray. How's this going to work out? Is the first element of the second row going to end up as the third element in the first?

Nope. The *1* will be placed in the first element of the first row. The *2* will go in the second. The third element of the first row will be initialized to *0*. (Remember that rule about external data?) The second row will be initialized just the way we want it. No mix-ups.

To tell you the truth, you don't need all those extra braces. We could've initialized weeks[][] by placing all the data between one set of brackets, like this:

```
{3,6,7,4,3,8,9,5,3,7,9,3,2,6}
```

The array will still function properly, but it's much harder to see how the data's divided up—and we've left ourselves open for possible errors. If we should accidentally (or deliberately, if you happen to enjoy that sort of thing) leave out one of the data elements, the compiler will no longer sort it out for us, making sure everything gets into its proper location.

It'll assign each element consecutively until it runs out of data, and then initialize the rest to *0*. Your program is then *sure* to act peculiarly. This type of error can be extremely difficult to locate.

Whambles for sale.

Okay, enough talk. Get Listing 3 compiled. A program run will look like this:

```
Sales for day 1: 3
Sales for day 2: 6
Sales for day 3: 7
Sales for day 4: 4
Sales for day 5: 3
Sales for day 6: 8
Sales for day 7: 9

Sales for week 1: 40

Sales for day 1: 5
Sales for day 2: 3
Sales for day 3: 7
Sales for day 4: 9
Sales for day 5: 3
Sales for day 6: 2
Sales for day 7: 6

Sales for week 2: 35

Total sales for month: 75
```

Two weeks. Wow, what a short month. Yes, I know there are usually four weeks in a month. I limited the output, so the data wouldn't scroll off your screen. What a nice guy!

This program is an example of indexing a two-dimensional array. Lines 9 and 10 set up nested for loops. The outer loop handles the indexing of the weeks; the inner loop indexes days.

The day loop is performed seven times for each iteration of the week loop. Line 11 shows how all this relates to our array.

The first subscript refers to each row of data (weeks). The second is the columns, or days. The first time we get to Line 11, w and d both equal *0*. So we're looking at weeks[0][0], that is, the data in row 0 and column 0. If we look at the array initialization, we see that this is the value *3*.

The day's total sales are printed, then the inner loop is repeated, incrementing d and advancing us to the row 0's next element. Looking at the data, we see that weeks[0][1] equals *6*.

This loop repeats until d is no longer less than *7*. At that point, we drop through to Line 14 and print the total for the week, and add to our monthly total.

Returning to the outer loop, w is incremented, and we re-enter the inner loop, resetting d to *0*. Now we're referencing weeks[1][0], row 1 and column 0, or the value 5. The inner loop continues through row 1 just as it did with row 0.

When we return to the outer loop, the value of w is incremented again, and thus is no longer less than *2*. The looping is completed, and program execution continues at Line 18, where the monthly total is printed.

Red and flustered.

That's it for this month. Sit back and relax. Put your feet up, massage your temples to get rid of that thundering headache (arrays are like that; yeah, they are).

Now that we've got all the work out of the way, it's confession time. It seems that a couple of the listings from issue 40's **C-manship** got a bit messed up. I'm still not sure how it happened, but if you were getting strange results, you can place the blame firmly on my shoulders.

The following corrections should be made (this includes those of you with disk subscriptions).

Line 8 of Listing 3 should be:

```
printf ( ">%010d<\n", num );
```

Line 11 of Listing 4 and Line 9 of Listing 6 should be:

```
ch = getchar();
```

Also, a couple of sentences got dropped from the end of page 75. The last part of the paragraph should read:

> In other words, in our program, every place the word *TEXT* appears, the string *Your full name is* will be substituted. Notice that there's no semi-colon at the end of a #define statement. It's a compiler directive and not subject to the semi-colon rule.

Happy trails.

Next month, we'll start developing our own input routines, so we won't be at the mercy of such functions as scanf() and gets(). Till then, fool around a bit with arrays. They're neat little critters.

Listing 1.
C listing.

```
#include <stdio.h>
#include <osbind.h>
#define TRUE 1
#define FALSE 0

main()
{
   int num, guess, win, turns, play;

   play = TRUE;
   while (play) {
      turns = 0; win = FALSE;
      num = get_num();
      while (!win) {
         ++turns;
         guess = get_guess();
         win = check_guess(num, guess);
      }
      printf("It took you %d turns.\n\n", turns);
      play = play_again();
   }
}

int get_num()
{
   int n;

   n = (int) Random();
   n = abs(n) % 99 + 1;
   return(n);
}

int get_guess()
{
   int g;

   g = 0;
```

```
    while (g<1 || g>100) {
       printf("Enter a number from 1 to 100: ");
       scanf("%d", &g);
       printf("\n\n");
    }
    return(g);
}

int check_guess(num, guess)
int num, guess;
{
    int wn=FALSE;

    if (guess < num)
       printf("Too low\n\n");
    else if (guess > num)
       printf("Too high\n\n");
    else {
       printf("You guessed it!\n");
       wn = TRUE;
       }
    return(wn);
}

int play_again()
{
    int ch, p;

    p = -1;
    ch = getchar();
    while ( (p!=TRUE) && (p!=FALSE) ) {
       printf("Play again? ");
       if ( (ch=getchar()) == 'y' || ch == 'Y')
          p = TRUE;
       else if (ch == 'n' || ch == 'N')
          p = FALSE;
    }
    printf("\n\n");
    return(p);
}
```

●

Listing 2.
C listing.

```
#include <stdio.h>

int week[] = {5,7,2,10,7,1,6};

main()
{
    int i,total,ch;

    for (i=0, total=0; i<7; i++) {
       total += week[i];
       printf("Sales for day %d: %d\n", i+1, week[i]);
       }
    printf("\n");
    printf("Total sales: %d", total);
    ch = getchar();
}
```

●

Listing 3.
C listing.

```
#include <stdio.h>

int weeks[2][7] = {
   {3,6,7,4,3,8,9},
   {5,3,7,9,3,2,6}
      };

main()
{
   int w,d,mtot,wtot,ch;

   for (w=0, mtot=0; w<2; w++) {
      for (d=0,wtot=0; d<7; d++) {
         wtot += weeks[w][d];
         printf("Sales for day %d: %d\n", d+1, weeks[w][d]);
         }
      printf("\n");
      printf("Sales for week %d: %d\n\n", w+1, wtot);
      mtot += wtot;
      }
   printf("\n\n");
   printf("Total sales for month: %d\n", mtot);
   ch = getchar();
}
```

●

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by Douglas Weir

The Atari ST may have been "made for America," as the ads put it, but there are signs that it has also prompted a German invasion. A Dusseldorf, West Germany company called Data Becker has apparently had teams of experts busy since the ST was first introduced, writing a series of books to cover just about every programming aspect of the machine.

Presenting the Atari ST, the first volume of the series, translated into English and published in the United States by Abacus Software, appeared last fall. At the time, I thought it a bit long on copy and short on hard information. Now, however, it's been joined by three comrades, in the same distinctive field-gray paper covers. One of these is very good, and two are really excellent.

Atari ST Machine Language falls into the "very good" category. The authors advise you to "get a book on the 68000 processor and its instructions" (something like the official Motorola manual) as a companion to this volume, intended only as an introduction to assembly language programming on the ST. The 274-page book has eight chapters, covering the expected topics: binary representation, 68000 architecture, flow of control, data structures, etc.

Beware the discussion of assemblers in chapter 6; the authors have some sort of generic assembler in mind, not the (notorious) "AS68" supplied with the Atari Developer's Kit.

The two final chapters first take you, step-by-step, through the development of a simple decimal-to-binary conversion program; then eight sample ST assembly language programs are presented in chapter 8. Programs are accompanied by detailed descriptions of their operation, and each comes complete with its own keyboard and console I/O routines (all run under TOS—GEM is not discussed in this book).

Essentially, the book is arranged as a read-it-through tutorial, with no exercises. Written in a pleasant style, its occasional mistranslations only serve to make the prose rather endearing.

Despite their reliance on flowcharting as a program development tool, I found the authors' treatment of most topics superior to (for example) that in the well-known Kane, Hawkins and Leventhal book, *68000 Assembly Language Programming*, published by McGraw Hill.

You'll have to pick your way through a fair number of misprints (though most are obvious), and you'll have to put up with having no index (apparently one more result of the famous "No Index" law enacted for computer book publishers several years ago).

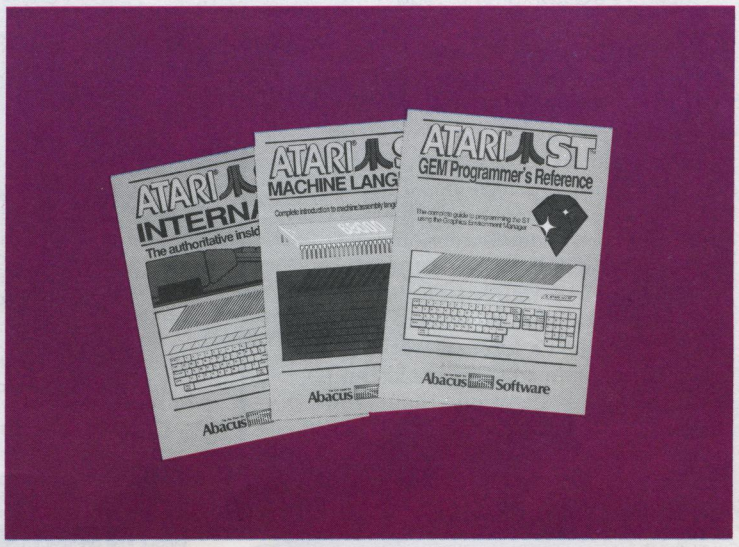
Still, I do think you'll find this book very useful if you are just starting assembly language programming on the ST—especially when used with the Motorola manual and your own assembler's documentation.

Programmers now have a handy one-volume GEM guide in the ***Atari ST GEM Programmer's Reference*** (414 pages). Anyone programming with GEM should have a copy of this book. The bulk of its contents—which we find in chapters 3 and 4—cover the VDI and AES functions.

Each function is listed separately, with at least one page to itself, in a format similar to (but more readable than) that used in the Digital Research manuals in the Atari Developer's Kit. There are two short sections, "Sample Programs using the VDI" and "Sample Programs using the AES," containing short C and assembly language programs.

An interesting aspect of the assembly language programs is that they're completely self-contained. All the *contrl* and *intin*, etc. arrays are declared explicitly, and calls are made directly through the entry point in the ST BDOS, rather than by linking to AESBIND and VDIBIND. It's nice to know how to do this, if one has to.

Where appropriate, the authors have included ST-specific information on particular functions. For example, we're told that *vst_load_fonts()* will always return a null, since no additional character sets are now available for the ST.



There are, however, cases where we get less information than the DRI manuals offer: for example, pages 5-19 of the VDI manual go into quite a bit of detail on *vst__point()* (a function to set the current graphic text character height), while the Abacus entry on page 133 confines itself to a few vague sentences.

Chapter 1 is a fairly cursory overview of GEM on the ST (I'm starting to think that GEM/TOS on the ST could be a Japanese art film, where everyone's account of the same subject is unrecognizably different from everyone else's). Chapter 2 includes short introductions to programming in C and assembly language. Also in chapter 2 is a description of the main parts of the Atari Developer's Kit, with some helpful tips on using the C compiler, assembler and linker. As seems usual with these Abacus books, there are misprints, but most are obvious, and none of those I noticed would lead to serious misunderstanding.

In the appendices, you'll find a list of VDI and AES functions, as well as a list of the 68000 instruction set. There's also (surprise!) an index, but the authors have managed to maintain partial compliance with the above-mentioned law by *not* putting the VDI and AES function lists in alphabetical order.

All joking aside, I found this a very useful book, one I think no serious GEM programmer should do without.

Finally, with 446 pages, ***Atari ST Internals*** is the biggest and the best of the current lot. This book is filled with indispensable information.

You might also want to acquire a copy of the most recent version of the Atari *Hitchhiker's Guide to the Bios*, included in the Developer's Kit. The authors of the Abacus book seem to have used an earlier version of the *Guide*, so that (for the most part) anything discussed beyond page 43 of the August 26 version of the *Guide* is not covered here. This includes such things as Cartridge Support, ROM Initialization, Boot Sectors, etc., which a lot of programmers can probably do without.

The book has two main divisions, the first covering hardware aspects of the ST; the second, software. There's a short section on the 68000, 7 pages on the four custom chips, and sections on the floppy disk controller chip, 68901 multifunction chip, 6850 ACIA chips and the sound chip. The latter sections consist of short introductions and fairly detailed descriptions of pinouts and chip architecture. Addresses and descriptions of all the ST's I/O registers are given.

Next comes an 18-page section on the keyboard interface, with descriptions of the mouse and the keyboard processor commands, and a chart of ST key codes. A 2-page assembly language program, which the authors used to read the 6301 (keyboard processor) ROM and output it to a printer, is included. It provides, incidentally, an example of how to use some of the GEMDOS and XBIOS calls.

Shorter sections on the video connection, the Centronics interface, the RS-232 and MIDI interface, the cartridge slot, and the floppy disk and DMA interface follow. These are all hardware descriptions and consist, for the most part, of pinout discussions. All in all, the hardware section of the book occupies the first 100 pages.

Software aspects take up the rest of the book. GEMDOS, BIOS and XBIOS calls receive detailed treatment on pages 105-205. The GEMDOS functions are the TOS "system-level" calls—used, for example, to access the disk, get keyboard input, etc. Many of them resemble the IBM PC MS-DOS system calls.

Each function is described, and most are accompanied by assembly language examples to show how they're used. The ST BIOS and XBIOS functions are allotted a page each. Both have their own explanatory text and assembly code samples. (I noticed an important misprint on page 199: XBIOS function number 34—*kbdvbase*—returns its pointer in *d0*, not *a0*.)

There is a good discussion of the "line a" codes on pages 206-233. Pages 234-254 deal with the ST's exception vectors, the VT52 emulator and the ST system variables. There is (yet another) summary of the 68000 instruction set on pages 255-267.

Finally, on pages 268-442, you'll find a complete (fully commented) assembly-language source code listing of the ST BIOS. This includes the code for all the GEMDOS, BIOS and XBIOS calls, the 68901, keyboard and VT52 routines, and the screen dump.

Even if your BIOS version is different from that given here (you can check, by comparing the date-of-creation bytes close to the beginning of the listing with yours), you will certainly find this section extremely useful, if you're at all interested in the ST's internal workings.

I highly recommend this book. But I feel bound to mention that—you guessed it—there's no index, and the wealth of information presented can make this a handicap in the early stages of using the book.

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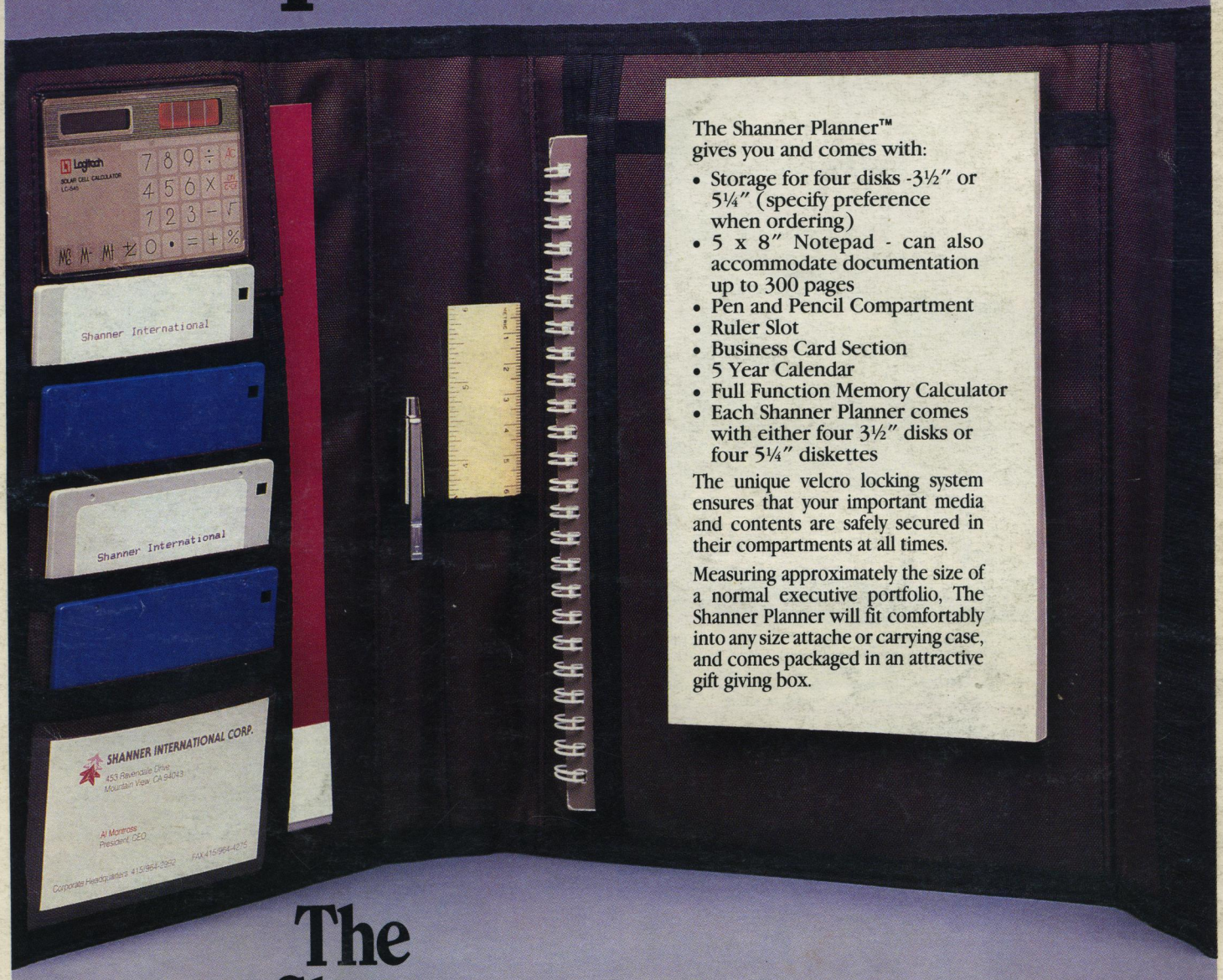

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CIRCLE #131 ON READER SERVICE CARD

M/L Editor

For use in machine language entry

by Clayton Walnum

M/L Editor provides an easy method to enter our machine language listings. It won't allow you to skip lines or enter bad data. For convenience, you may enter listings in multiple sittings. When you're through typing a listing with **M/L Editor**, you'll have a complete, runnable object file on your disk.

There is one hitch: it's for disk users only. My apologies to those with cassette systems.

Listing 1 is **M/L Editor**'s BASIC listing. Type it in and, when it's free of typos, save a copy to disk, then run it.

On a first run, you'll be asked if you're starting a new listing or continuing from a previously saved point. Press *S* to start, or *C* to continue.

You'll then be asked for a filename. If you're starting a new listing, type in the filename you want to save the program under, then press RETURN. If there's already a file by that name on the disk, you'll be asked if you wish to delete it. Press *Y* to delete the file, or *N* to enter a new filename.

If you're continuing a file, type in the name you gave the file when you started it. If the program can't find the file, you'll get an error message and be prompted for another filename. Otherwise, **M/L Editor** will calculate where you left off, then go on to the data entry screen.

Each machine language program in **ANALOG Computing** is represented by a list of BASIC data statements. Every line contains 16 bytes, plus a checksum. Only the numbers following the word *DATA* need be considered.

M/L Editor will display, at the top of the screen, the number of the line you're currently working on. As you go through the line, you'll be prompted for each entry. Simply type the number and press RETURN. If you press RETURN without a number, the default is the last value entered.

This feature provides a quick way to type in lines with repetitions of the same number. As an added convenience, the editor will not respond to the letter keys (except *Q*, for "quit"). You must either enter a number or press RETURN.

When you finish a line, **M/L Editor** will compare the entries' checksum with the magazine's checksum. If they match, the screen will clear, and you may go on to the next line.

If the checksums *don't* match, you'll hear a buzzing sound. The screen will turn red, and the cursor will be placed back at the first byte of data. Compare the magazine listing byte by byte with your entries. If a number's correct, press RETURN.

If you find an error, make the correction. When all data's valid, the screen will return to grey, and you'll be allowed begin the next line.

Make sure you leave your disk in the drive while typing. The data is saved continuously.

You may stop at any time (except when you have a red screen) by entering the letter *Q* for byte #1. The file will be closed, and the program will return you to BASIC. When you've completed a file, exit **M/L Editor** in the same way.

When you've finished typing a program, the file you've created will be ready to run. In most cases, it should be loaded from DOS via the L option. Some programs may have special loading instructions; be sure to check the program's article.

If you want the program to run automatically when you boot the disk, simply name the file AUTORUN.SYS (make sure you have DOS on the disk).

That's **M/L Editor**. Use it in good health.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor*, page 21.

Listing 1.
BASIC listing.

```
AZ 10 DIM BF(16),N$(4),A$(1),B$(1),F$(15)
   ,F1$(15)
BN 20 LINE=1000:RETRN=155:BACKSP=126:CHKS
   UM=0:EDIT=0
GO 30 GOSUB 450:POSITION 10,6:? "Start or
    Continue? ";:GOSUB 500:? CHR$(A)
ZG 40 POSITION 10,8:? "FILENAME";:INPUT F
   $:POKE 752,1:? " "
FE 50 IF LEN(F$)<3 THEN POSITION 20,10:?
   "  ":GOTO 40
NF 60 IF F$(1,2)<>"D:" THEN F1$="D:":F1$(
   3)=F$:GOTO 80
KL 70 F1$=F$
TN 80 IF CHR$(A)="S" THEN 120
FD 90 TRAP 430:OPEN #2,4,0,F1$:TRAP 110
HQ 100 FOR X=1 TO 16:GET #2,A:NEXT X:LINE
   =LINE+10:GOTO 100
WM 110 CLOSE #2:OPEN #2,9,0,F1$:GOTO 170
VT 120 TRAP 160:OPEN #2,4,0,F1$:GOSUB 440
   :POSITION 10,10:? "FILE ALREADY EXISTS
   !!":POKE 752,0
ZU 130 POSITION 10,12:? "ERASE IT? ";:GOS
   UB 500:POKE 752,1:? CHR$(A)
VH 140 IF CHR$(A)="N" OR CHR$(A)="n" THEN
    CLOSE #2:GOTO 30
QG 150 IF CHR$(A)<>"Y" AND CHR$(A)<>"y" T
   HEN 130
BH 160 CLOSE #2:OPEN #2,8,0,F1$
IE 170 GOSUB 450:POSITION 10,1:? "NOW ON
   LINE: ";LINE:CHKSUM=0
GH 180 L1=3:FOR X=1 TO 16:POSITION 13*(X<
   10)+12*(X>9),X+2:POKE 752,0:? "BYTE #"
   ;X;": ";:GOSUB 310
KH 190 IF EDIT AND L=0 THEN BYTE=BF(X):GO
   TO 210
FY 200 BYTE=VAL(N$)
BU 210 POSITION 22,X+2:? BYTE;"  "
YZ 220 BF(X)=BYTE:CHKSUM=CHKSUM+BYTE*X:IF
    CHKSUM>9999 THEN CHKSUM=CHKSUM-10000
MS 230 NEXT X:CHKSUM=CHKSUM+LINE:IF CHKSU
   M>9999 THEN CHKSUM=CHKSUM-10000
IG 240 POSITION 12,X+2:POKE 752,0:? "CHEC
   KSUM: ";:L1=4:GOSUB 310
EW 250 IF EDIT AND L=0 THEN 270
QM 260 C=VAL(N$)
SY 270 POSITION 22,X+2:? C;"   "
IL 280 IF C=CHKSUM THEN 300
DI 290 GOSUB 440:EDIT=1:CHKSUM=0:GOTO 180
LW 300 FOR X=1 TO 16:PUT #2,BF(X):NEXT X:
   LINE=LINE+10:EDIT=0:GOTO 170
FV 310 L=0
LG 320 GOSUB 500:IF A=ASC("Q") AND X=1 AN
   D  NOT EDIT THEN 420
PO 330 IF A<>RETRN AND A<>BACKSP AND (A<4
   8 OR A>57) THEN 320
TD 335 IF A=RETRN AND L=0 AND X>1 THEN 35
   0
JR 340 IF ((A=RETRN AND  NOT EDIT) OR A=B
   ACKSP) AND L=0 THEN 320
DW 350 IF A=RETRN THEN POKE 752,1:? " ":R
   ETURN
GG 360 IF A<>BACKSP THEN 400
SA 370 IF L>1 THEN N$=N$(1,L-1):GOTO 390
AS 380 N$=""
RE 390 ? CHR$(BACKSP);:L=L-1:GOTO 320
BB 400 L=L+1:IF L>L1 THEN A=RETRN:GOTO 35
   0
WX 410 N$(L)=CHR$(A):? CHR$(A);:GOTO 320
KW 420 GRAPHICS 0:END
YT 430 GOSUB 440:POSITION 10,10:? "NO SUC
   H FILE!":FOR X=1 TO 1000:NEXT X:CLOSE
   #2:GOTO 30
FD 440 POKE 710,48:SOUND 0,100,12,8:FOR X
   =1 TO 50:NEXT X:SOUND 0,0,0,0:RETURN
MY 450 GRAPHICS 23:POKE 16,112:POKE 53774
   ,112:POKE 559,0:POKE 710,4
XR 460 DL=PEEK(560)+256*PEEK(561)+4:POKE
   DL-1,70:POKE DL+2,6
HW 470 FOR X=3 TO 39 STEP 2:POKE DL+X,2:N
   EXT X:FOR X=4 TO 40 STEP 2:POKE DL+X,0
   :NEXT X
ZW 480 POKE DL+41,65:POKE DL+42,PEEK(560)
   :POKE DL+43,PEEK(561):POKE 87,0
AC 490 POSITION 2,0:? "analog ml editor":
   POKE 559,34:RETURN
WZ 500 OPEN #1,4,0,"K:":GET #1,A:CLOSE #1
   :RETURN
```

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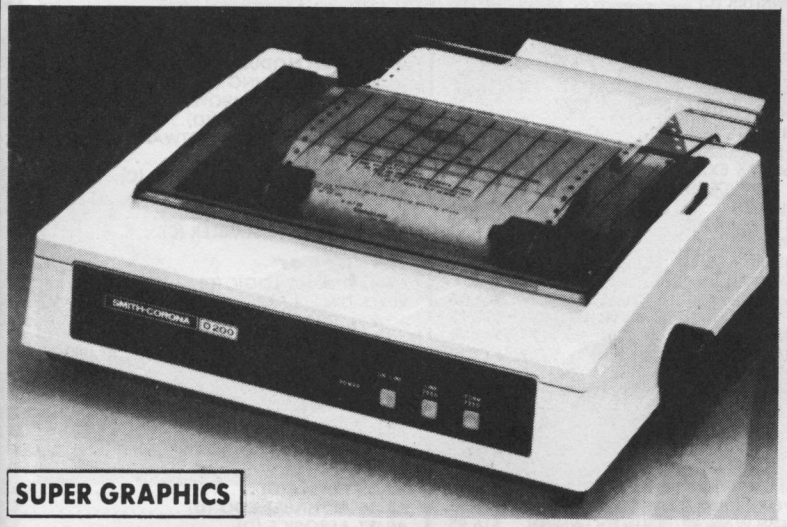

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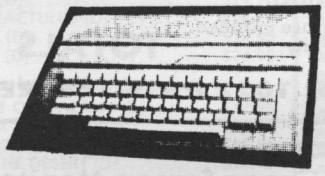

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CIRCLE #145 ON READER SERVICE CARD

Home Shopper

by Matthew J.W. Ratcliff

Grocery shopping is drudgery. I *hate* going to the store, fighting the crowds, waiting in lines and spending a gillion dollars—only to realize while unpacking that I forgot my *coffee!*

When making a shopping list, you usually perform a "data search" on your cupboards. It's all too easy to overlook items you're completely out of. **Home Shopper** is designed to help you make a perfect list every time. It's easily customized to fit your shopping habits and favorite grocery store, by changing data statements.

This article provides the **Home Shopper** program and SHOPEDIT, a quick-and-dirty store database editor. You must provide data from your favorite grocery store, so be prepared to take notes next time you shop. After your first big shopping trip with a **Home Shopper** list, you'll wonder how you ever got along without it!

Let's go shopping.

When run, **Shopper** will go through a short setup period. The program will then check the disk for an old list. If none is found, it will continue with the main menu.

If a list is there, you're prompted to SELECT the old list or START a new one. Once an old list is loaded, you can update it.

The store database isn't included in Listing 1. The second listing will help you create and edit a STORE.DAT file, which can be merged with **Shopper**.

The main menu.

Next up is the control center of **Home Shopper**. You're presented with six selections. The current choice is highlighted in inverse. Pressing SELECT moves the highlighter down to the next line and it will wrap around to the top.

You may use a joystick in port 1 to move the selector either up or down. When the desired function is marked, press the START key or the fire button.

Make a complete list.

When you go shopping here, the first store aisle will be displayed from your "grocer database" (more on the data later). A mini menu is displayed at the

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top of the screen, and the joystick or SELECT will move the pointer. Pressing fire or the START key will mark an item by highlighting it. If already marked, then this will "unmark" it.

The quantity is shown to the far right of the screen. Pressing a number *1* to *9* will mark and set that amount for the current item. Pressing *C* will toggle a coupon marker for the current item. When tagged, a *C* will appear next to the item's quantity.

When the list is printed, *C* appears next to the items for which you've got coupons. This serves as a reminder to *use* these money savers. If you loaded an old list, or included weekly essentials (see below), those marked items will show up.

When you've selected all the necessary items, press OPTION to go to the next aisle. Moving the joystick to the right is equivalent to hitting OPTION. Move the stick left to go back to the previous aisle. Shopping through the entire store with the OPTION key function, you'll be returned to the main menu after the last aisle. Pressing ESC returns you to the main menu.

While "shopping," you may also make a special note by pressing RETURN. For example, you might select spices in the general cooking aisle. Press RETURN and make a note to yourself, like this:

GET OREGANO AND CLOVES.

One or two lines may be entered for each aisle. If a note's already there, you'll be reminded. You may enter a new one, or just press RETURN to keep the old note. This applies to both the first and second lines. Once you've made all the selections from this aisle, move on to the next with OPTION, or ESCape to the main menu.

If you don't want to shop the entire store, select the "just browsing" function. You'll exit the main menu to a display of all the store's aisles, listed by topic (or content). Select the desired aisle in the normal manner.

Next, you'll be switched to the shopping display described above. Pressing OPTION will return you to the browse section. Press OPTION again at that screen to return to the main menu.

We shop for some items, like bread and milk, every week. The "include weekly essentials" function will automatically mark all the items that you usually need.

It's very easy to change or add to this list, as we'll explain later. The essentials line will flash as items are read and marked. When all your usual purchases are in the list, the flashing will stop.

Once your roster is complete, select the "print shopping list" function. The printout is arranged by aisles, laid out as they are in your market. This saves a *lot* of time.

Under each aisle heading appears a list of items you've selected from that aisle. There'll be a blank (to check things off while shopping), followed by the quantity desired and the item name. If you'd entered any special notes for an aisle, they'll appear at the end of the aisle's item list. A brief shopping list is shown below.

```
Aisle: PRODUCE
     ___ Qty. 1 > Bananas
Aisle: TOILETRIES
     ___ Qty. 4 > Batteries
WE NEED 'C' AND 'D' BATTERIES
FOR NATHAN'S NEW TOYS.
Aisle: COFFEE/SOUP
     ___ Qty. 4 > Coffee
     ___ Qty. 1 > Tea Bags
Aisle: DETERGENTS/HOUSEWARES
   *C*___ Qty. 1 > Dishwashing Liquid
DON'T FORGET THAT NEW BRAND
THAT WE HAVE THE COUPON FOR!
Aisle: FROZEN FOODS
     ___ Qty. 4 > Pizza
     ___ Qty. 4 > Bagels
     ___ Qty. 1 > Ice Cream
Aisle: BREAD/CEREALS
     ___ Qty. 1 > Wheat Bread
     ___ Qty. 4 > Sweet Rolls
Aisle: BABY/PAPER NEEDS
     ___ Qty. 1 > Diapers
Aisle: MILK/EGGS/CRACKERS
     ___ Qty. 1 > Milk 2%
```

If you're updating for your big monthly shopping trip, you'll want the "save shopping list" option. The disk file is called SHOPLIST. It isn't a list like the one you get with the print function above, but a set of numbers and a string the program works with.

When you're through, and have printed and saved your list, use the "quit" option. The BREAK key is disabled in this program, to prevent an accidental abort.

The database.

The **Shopper** requires a mini database in the data lines 8000-9524. Up to twenty-three different aisles may be defined, with as many as nineteen items in each.

The aisle contents and item lists will appear in Lines 8000-8459. Each aisle topic must appear on a line which is a multiple of 20 (8000, 8020, 8040, and so on).

The nineteen consecutive line numbers following each topic line may contain item data, one per line. If less than twenty-three aisles are used, then define a topic line, DATA END. Here's a sample data list:

```
Home Shopper, Sample DATAbase List

8000 DATA DAIRY/POULTRY
8001 DATA Milk
```

```
8002 DATA American Cheese
8003 DATA Butter
8004 DATA Eggs

8020 DATA DRINKS/JUNKFOOD
8021 DATA Coke
8022 DATA 7-Up
8023 DATA Pepsi
8024 DATA Potato Chips
8025 DATA Taco Chips
8026 DATA Party Nuts

8040 DATA BAKERY
8041 DATA Wheat Bread
8042 DATA White Bread
8043 DATA Bagels
8044 DATA Sweet Rolls

8060 DATA END

8990 REM Weekly Essentials - Milk & Br
ead
9000 DATA 8001
9010 DATA 8041

9500 REM Store Layout by aisle
9501 DATA 8020
9502 DATA 8040
9503 DATA 8000
9504 DATA -1
```

The weekly essentials list appears in Lines 9000-9430. Each data item here is simply a line number in the 8000 range. It points to a particular item (not topic) that you need every week. For example:

```
9000 DATA 8121
```

where data line 8121 may indicate "milk." Set this data area up according to your shopping habits, with SHOPEDIT (Listing 2).

Lines 9501-9523 describe the sequential layout of the store where you shop. Each data item is the line number of an aisle's topic. If fewer than twenty-three aisles are defined, put in a *DATA -1* line to mark the end.

This lets you arrange the data any way you wish. If the store should change some aisles, or if you start shopping at a different store, just rearrange the data line number sequence in Lines 9501-9523.

Putting it together.

Type and save Listings 1 and 2. Go to your favorite grocery store and make a list for your database. As you go through the store, write down each aisle and all the items you might need from it. Number the topics of the aisles in the order in which you'll be shopping.

Some aisles may have more than nineteen items you'll need often, but most stores don't have twenty-three aisles, either. You can break up the larger aisles into parts A and B in the data.

Some aisles will have items too numerous to list individually—like the cooking section, where all the spices are. For this section, just list *"DATA Spices"* and use **Shopper**'s "note" feature to be more specific.

Once you get home with your store data list, run SHOPEDIT. It will check for a file called STORE.DAT. If not found, you'll be prompted to create a new one. Once created, it will be merged with SHOPEDIT.

Next, all the aisle topics are listed to the screen. Press the aisle's letter key to edit. Data lines for that aisle's topic and item list are LISTed to the screen, *CONT* is printed, and the program stops.

Use the control arrow and editing keys to change these data lines. Press RETURN on the lines you change. Don't enter empty data lines, however. When your aisle is complete, position the cursor on the *CONT* line and press RETURN.

The aisle topic menu is displayed again. When the database is complete, press Z to exit. Follow the final instructions to merge your new data with the **Home Shopper**.

If you wish to do a major update to this data later, use SHOPEDIT again. Load **Shopper**, then:

```
LIST "D:STORE.DAT",8000,9999
```

Now, run SHOPEDIT to make the necessary changes. This won't change the essentials or the store sequence data areas.

Enter your own essentials list beginning at Line 9000. To change the order in which the store is printed, rearrange the number list in Lines 9501-9523.

Using the USR routines.

The data in Lines 2050-2460 defines two USR routines for **Shopper**. You may find both are nice additions to some of your own software.

The USR that begins at location 1536 is my "highlighter." It will toggle a line on the display between normal and inverse video. (The line should be all inverse, or normal video, before the USR call—it can be confusing otherwise.) The call format is:

```
A=USR(1536,LINE)
```

The value of *LINE* may be from *0* to *23*. This USR routine will place a value in the calling variable (*A* above). It will be *0* if the line was just toggled off, *1* if on (it goes by the first byte of the screen line). This USR also disables the BREAK key each time it's called.

The second USR routine creates a customized mode 0 screen with a Display List Interrupt (DLI). It places a blank scan line, with the DLI bit set, after the screen line you specify. It will also set a different color for the lower screen area. This allows a two-color mode 0 display, separating menu and work

areas nicely. It should be called like this:

```
GRAPHICS 0:POKE 710,COLR1
:A=USR(1620,LINE,COLR2)
```

Always execute a GRAPHICS 0 command just before this USR call. It won't work with any other mode. The value of *LINE* should be from *0* to *22*. Unpredictable things can happen if it's greater than *22*.

COLR1 sets the color of the display above the DLI; *COLR2* sets it below. Once the DLI is set, you may wish to change the lower screen area's color. The following will do the trick:

```
POKE 711,NEWCOLR2
```

Checkout.

I hope you find **Home Shopper** lets you spend more time computing and less time fighting crowds. I tried to make it friendly enough for even the noncomputer types in your household. This is a real "home" application that gets a lot of use around my house. My wife Nancy *always* uses it before going for groceries —and she seldom used a computer before **Shopper** came along. A

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor*, page 21.

Listing 1.
BASIC listing.

```
JD 10 REM The Home Shopper - By M. Ratcli
   ff
KL 20 REM a customizable, easy to use
RP 30 REM weekly/monthly grocery shopping
FX 40 REM guide.  Up to 23 Isles, 19 Item
   s per Isle max.
ZO 50 DIM SHOP(460),INSTR$(1920),AISLE$(4
   0),ITEM$(40),BL$(40)
CR 60 GRAPHICS 0:? "The Home Shopper, Set
   up..."
LV 70 INSTR$(1)="▽":INSTR$(1920)="▽":INST
   R$(2)=INSTR$:BL$(1)=" ":BL$(40)=" ":BL
   $(2)=BL$
NI 80 FOR I=1 TO 460:SHOP(I)=0:NEXT I
OK 90 CLOSE #1:OPEN #1,4,0,"K:"
VS 100 CONSOL=53279:CH=764:POKE 82,0:POKE
    83,39:REM MARGINS
QS 110 START=6:SELECT=5:OPTION=3:UPSEL=8:
   BAKOPT=9
QJ 120 RESTORE 2050:I=1536
RX 130 READ A:IF A<0 THEN 150
KX 140 POKE I,A:I=I+1:GOTO 130
ZV 150 CLOSE #2:TRAP 250
PN 160 OPEN #2,4,0,"D:SHOPLIST":A=USR(153
   6,0):SLIN=2:COLR=144:GOSUB 1950:GOSUB
   2030:?
UB 170 ? :? "[SELECT]-Load Old Shopping L
   ist"
CE 180 ? :? "[START] -Work On a new List"
YE 190 GOSUB 1960
AT 200 IF A=START THEN LIS=0:GOTO 250
PA 210 IF A<>SELECT THEN 190
FB 220 TRAP 250:POSITION 6,8:? "     ....
   Loading ....":LIS=1
```

Home Shopper *continued*

```
TF 230 INPUT #2,ITEM,COUNT:IF ITEM>0 THEN
    SHOP(ITEM)=COUNT:GOTO 230
XZ 240 FOR I=0 TO 47:INPUT #2,ITEM$:INSTR
   $(I*40+1,I*40+40)=ITEM$:A=USR(1536,8):
   NEXT I
NK 250 GOSUB 2010:REM LEGGO
AR 260 REM MAIN MENU HERE
YN 270 CLOSE #2:SLIN=4:COLR=81:GOSUB 1950
   :GOSUB 2030
UJ 280 ? "              Fire=[START]"
IM 285 ? "   Joystick: ";CHR$(27);"↑";CHR
   $(27);"↓";" = select  ";CHR$(27);"←";C
   HR$(27);"→ = option"
VK 290 ? "   [SELECT]-Menu Function  [STA
   RT]-GO":POKE 82,6:? :Y=5
XP 300 ? "Make Complete Shopping List"
LV 310 ? "Just Browse through Aisles"
AC 320 ? "Include Weekly Essentials"
MZ 330 ? "Print Shopping List"
HV 340 ? "Save Shopping List"
HW 350 ? "Quit the Home Shopper"
XH 360 POKE 82,0:?
NP 370 POSITION 0,Y:A=USR(1536,Y)
SE 380 GOSUB 1960:IF A=START THEN 460
EN 390 B=USR(1536,Y)
HW 400 IF A=UPSEL THEN Y=Y-1
SX 410 IF Y<5 THEN Y=10
CR 420 IF A=SELECT THEN Y=Y+1:IF Y>10 THE
   N Y=5
RP 430 GOSUB 2010
TG 440 IF PEEK(CONSOL)<>7 THEN 430
PM 450 GOTO 370
ME 460 I=Y-4:BROWSE=0:AISLE=1:ON I GOTO 6
   80,480,1340,1450,1720,1900
QB 470 GOTO 380
VG 480 COLR=144:SLIN=0:GOSUB 1950
FM 490 ? "[SELECT]-Aisle [START]-GO [OPTI
   ON]-MENU"
WR 500 FOR I=0 TO 29
UQ 510 LINE=8000+20*I
SC 520 RESTORE LINE:READ AISLE$
MR 530 IF AISLE$="END" THEN MAX=I:GOTO 56
   0
GX 540 ? "     ";AISLE$
GF 550 NEXT I
SM 560 Y=AISLE:A=USR(1536,Y)
YE 570 GOSUB 1960
QA 580 IF A=OPTION THEN 250
LK 590 IF A<>START THEN 610
OC 600 BROWSE=1:AISLE=Y:LINE=8000+20*(AIS
   LE-1):SHP=(AISLE-1)*19:GOTO 690
RM 610 IF  NOT A THEN 570
EC 620 B=USR(1536,Y)
BP 630 IF A=UPSEL THEN Y=Y-1:IF Y<1 THEN
   Y=MAX
MH 640 IF A=SELECT THEN Y=Y+1:IF Y>MAX TH
   EN Y=1
ED 650 A=USR(1536,Y)
RX 660 GOSUB 2010
QM 670 GOTO 570
DS 680 AISLE=1:LINE=8000:SHP=(AISLE-1)*19
SC 690 SLIN=3:COLR=4:GOSUB 1950
KV 700 REM MINI MENU
LE 710 ? "[SELECT]-Next Item [START]-UN/M
   ark Item"
ZW 720 ? "[OPTION]-Next Aisle[RETURN]-Mak
   e Note"
OW 730 ? "[1-9Key]-Set Qty.  [ESCAPE]-Mai
   n Menu"
```

```
XQ 740 RESTORE LINE:READ AISLE$:IF AISLE$
   ="END" THEN GOTO 270:REM EXIT
YI 750 ? "Aisle: ";AISLE$:A=USR(1536,3):F
   OR I=1 TO 19
XU 760 READ ITEM$:DATLIN=PEEK(183)+256*PE
   EK(184)
RF 770 IF DATLIN>=LINE+20 THEN MAX=I-1:GO
   TO 810
UW 780 POSITION 0,I+3:? "   ";ITEM$;:B=SH
   OP(SHP+I):IF B>10 THEN B=B-10:POSITION
    36,I+3:? "C";
FQ 790 IF B THEN POSITION 34,I+3:? B;:POS
   ITION 0,0:? :A=USR(1536,I+3)
ON 800 NEXT I:MAX=19
DI 810 POSITION 0,23:? " ----------'C' =
   coupon marker ----------";
LI 820 Y=4:POSITION 0,4:IF SHOP(SHP+Y-3)
   THEN ? "==>":GOTO 840
TI 830 ? "==>"
AT 840 POSITION 0,Y:IF SHOP(SHP+Y-3) THEN
    ? "==>":GOTO 860
TM 850 ? "==>"
YF 860 GOSUB 1960
GD 870 IF PEEK(CH)<>255 THEN 1080
PT 880 IF A<>START THEN 930
IT 890 A=USR(1536,Y):SHOP(SHP+Y-3)=A:POSI
   TION 34,Y:? "   ";
VS 900 IF A THEN POSITION 34,Y:? "[REV]";:L
   IS=LIS+1
PA 910 IF  NOT A THEN LIS=LIS-1:IF LIS<0
   THEN LIS=0
MY 920 GOTO 1070
GN 930 IF A<>OPTION THEN 960
EN 940 IF BROWSE THEN 480
QL 950 AISLE=AISLE+1:LINE=LINE+20:SHP=(AI
   SLE-1)*19:GOTO 690
HR 960 IF A<>BAKOPT THEN 1010
ET 970 IF BROWSE THEN 480
VD 980 AISLE=AISLE-1:LINE=LINE-20:SHP=(AI
   SLE-1)*19
UV 990 IF LINE<8000 THEN 950
SZ 1000 GOTO 690
QU 1010 IF A<>SELECT AND A<>UPSEL THEN 10
   70
PY 1020 POSITION 0,Y:? "   ";:IF SHOP(SHP+
   Y-3) THEN POSITION 0,Y:? "[REV]"
UM 1030 IF A=SELECT THEN Y=Y+1:IF Y>MAX+3
   THEN Y=4
RQ 1040 IF A=UPSEL THEN Y=Y-1:IF Y<4 THEN
    Y=MAX+3
GP 1050 POSITION 0,Y:IF SHOP(SHP+Y-3) THE
   N ? "==>":GOTO 1070
PM 1060 ? "==>"
YE 1070 GOSUB 2010
DA 1080 IF PEEK(CH)=255 THEN 840
EH 1090 REM PROCESS KEYS
DW 1100 GET #1,A:IF A<>155 THEN 1210
WB 1110 SLIN=3:COLR=0:GOSUB 1950:? "
        *NOTE*":? "Type your special note
   .":A=USR(1536,0):POKE 752,0
VU 1120 ? "This AISLE is: ":? AISLE$:? "T
   ype and press [RETURN].":A=USR(1536,3)
QS 1130 ? "Two lines allowed.":A=80*(AISL
   E-1)+1
DB 1140 IF INSTR$(A,A)<>"V" THEN ? "NOTE1
   ":? INSTR$(A,A+39);
PG 1150 IF INSTR$(A+40,A+40)<>"V" THEN ?
   "NOTE2:":? INSTR$(A+40,A+79);
FQ 1160 ? "[RETURN] only = no change":? "
   NOTE1: ";:GOSUB 1180
VQ 1170 A=A+40:? "NOTE2: ";:GOSUB 1180:GO
   TO 690
TR 1180 INPUT ITEM$:IF ITEM$="" THEN RETU
   RN
EU 1190 INSTR$(A,A+39)=BL$
QJ 1200 INSTR$(A,A+LEN(ITEM$)-1)=ITEM$:RE
   TURN
EZ 1210 IF A=27 THEN 270
VG 1220 IF A<49 OR A>57 THEN 1270
ZG 1230 IF  NOT SHOP(SHP+Y-3) THEN B=USR(
   1536,Y)
ML 1240 B=INT(SHOP(SHP+Y-3)/10)*10:SHOP(S
   HP+Y-3)=A-48+B:REM SET QTY, KEEP COUPO
   N FLAG
XQ 1250 POSITION 34,Y:? CHR$(A+128);:IF S
   HOP(SHP+Y-3)>10 THEN ? "C";:GOTO 840
XY 1260 FOR I=1 TO 2:? CHR$(32+128*(SHOP(
   SHP+Y-3)>0));:NEXT I:GOTO 840
VJ 1270 IF A<>67 THEN 1070
MQ 1280 IF  NOT SHOP(SHP+Y-3) THEN SHOP(S
   HP+Y-3)=11:A=USR(1536,Y):A=49:GOTO 125
   0
BG 1290 A=SHOP(SHP+Y-3):IF A>10 THEN SHOP
   (SHP+Y-3)=A-10:A=A+38:GOTO 1250
XG 1300 SHOP(SHP+Y-3)=A+10:A=A+48:GOTO 12
   50
LE 1310 REM Automatically Mark Items in
MH 1320 REM in weekly essentials list sta
   rting
UX 1330 REM at line 9000.
EF 1340 RESTORE 9000:POSITION 5,22:? "**
   Marking Weekly Items **":LIS=1
WE 1350 A=USR(1536,Y):REM SHOW WE'RE BUSY
WT 1360 READ ESLIN
ET 1370 A=ESLIN-8000:AISLE=INT(A/20)*19
RF 1380 ITEM=A-20*INT(A/20):SHOP(AISLE+IT
   EM)=1
FP 1390 DATLIN=PEEK(183)+256*PEEK(184)
UU 1400 IF DATLIN>9499 THEN 1430
JA 1410 FOR W=15 TO 0 STEP -5:SOUND 0,120
   ,10,W:NEXT W
XO 1420 SOUND 0,0,0,0:GOTO 1350
QQ 1430 A=USR(1536,Y):IF A=0 THEN A=USR(1
   536,Y)
HW 1440 POSITION 5,22:? "
                ":GOTO 380
YQ 1450 IF LIS THEN 1480
WQ 1460 POSITION 5,22:? "** NO [REV]LIST YET *
   *":GOSUB 2010:POSITION 5,22
TH 1470 GOSUB 1960:? "                    ";
   GOTO 380
HF 1480 SLIN=1:COLR=225:GOSUB 1950
MD 1490 ? "    ** Shopping List Printout
   **":A=USR(1536,0)
RK 1500 ? :? "Be sure PRINTER is ready an
   d [RETURN]"
SW 1510 ? "(Press 'A' & [RETURN] to abort
   )";:INPUT ITEM$:IF ITEM$="A" THEN 270
ZJ 1520 TRAP 1700:POSITION 10,6:? "....Wo
   rking...."
WI 1530 OPEN #2,8,0,"P:":LINE=9501:REM St
   ore Layout
XD 1540 RESTORE LINE:READ ILIN:IF ILIN<0
   THEN 1680
FX 1550 RESTORE ILIN:READ AISLE$:B=USR(15
   36,6)
VF 1560 IF AISLE$="END" THEN 1680
BB 1570 BROWSE=0:AISLE=1+INT((ILIN-8000)/
   20)
KP 1580 FOR J=1 TO 19
ZK 1590 A=SHOP(19*(AISLE-1)+J):READ ITEM$
IA 1600 IF  NOT A THEN 1650
TP 1610 IF  NOT BROWSE THEN BROWSE=1:? #2
   ;"Aisle: ";AISLE$
VX 1620 IF A>10 THEN ? #2;"  *C*";:A=A-10
   :GOTO 1640
DA 1630 ? #2;"     ";
YP 1640 ? #2;"___ Qty. ";A;" > ";ITEM$
TR 1650 NEXT J:A=80*(AISLE-1)+1:IF INSTR$
   (A,A)<>"V" THEN ? #2;INSTR$(A,A+39)
CM 1660 IF INSTR$(A+40,A+40)<>"V" THEN ?
   #2;INSTR$(A+40,A+79)
OS 1670 LINE=LINE+1:IF LINE<9524 THEN 154
   0
BJ 1680 ? #2:? #2:? #2
BR 1690 CLOSE #2:GOTO 270
DD 1700 ? :? "*** PRINTER ERROR *** # ";P
   EEK(195)
GS 1710 ? "Press [RETURN] to continue ";:
   INPUT ITEM$:GOTO 1690
DQ 1720 SLIN=1:COLR=98:GOSUB 1950:GOSUB 2
   030:? :? "Save Shopping List ....":? :
   ?
```

```
NL 1730 ? "Are You Sure (Y/N) ? ";:GET #1
   ,A
ZM 1740 IF CHR$(A)<>"Y" THEN GOTO 270
UB 1750 ? :? "Be sure DISK is ready,"
BS 1760 ? "and press [RETURN] key to cont
   inue ?"
SM 1770 GET #1,A:?
YE 1780 POSITION 10,9:? "....Working...."
TQ 1790 TRAP 1870
AF 1800 CLOSE #2:OPEN #2,8,0,"D:SHOPLIST"
   :BROWSE=0
SP 1810 FOR I=1 TO 460
HP 1820 IF SHOP(I)=0 THEN 1840
ZZ 1830 ? #2;I;",";SHOP(I):BROWSE=1:B=USR
   (1536,9)
XE 1840 NEXT I:? #2;"-1,-1"
TY 1850 IF BROWSE=0 THEN ? "*** NO LIST H
   ERE ***"
VH 1860 FOR I=0 TO 47:A=40*I:? #2;INSTR$(
   A+1,A+40):A=USR(1536,9):NEXT I:CLOSE #
   2:GOTO 270
PG 1870 TRAP 40000
GS 1880 ? "** DISK ERROR **  # ";PEEK(195
   )
WM 1890 ? :? "Press [RETURN] to continue
   ";:INPUT ITEM$:GOTO 1860
LY 1900 SLIN=1:COLR=178:GOSUB 1950
ID 1910 GOSUB 2030:A=USR(1536,0)
AB 1920 ? :? "Quit Now (Y/N) ? ";
VB 1930 GET #1,A:IF CHR$(A)<>"Y" THEN 270
BN 1940 GRAPHICS 0:POKE 82,2:? :END
QW 1950 GRAPHICS 0:A=USR(1620,SLIN,COLR):
   POKE 710,66:POKE 752,1:POKE 702,64:POK
   E 694,0:RETURN
VJ 1960 A=PEEK(CONSOL):IF A<>7 OR PEEK(CH
   )<>255 THEN RETURN
RP 1970 SK=STICK(0):A=SELECT*(SK=13)+UPSE
   L*(SK=14)+START*(STRIG(0)=0)+OPTION*(S
   K=7)+BAKOPT*(SK=11)
EG 1980 IF A=0 THEN 1960
BS 1990 RETURN
KH 2000 FOR W=15 TO 0 STEP -1:SOUND 0,180
   ,10,W:NEXT W:SOUND 0,0,0,0:RETURN
QL 2010 POKE CH,255:FOR W=15 TO 0 STEP -1
   :SOUND 0,45,10,W:NEXT W:SOUND 0,0,0,0:
   IF PEEK(CONSOL)<>7 THEN 2010
AG 2020 RETURN
BC 2030 ? "  * The Home Shopper,By Mat*Ra
   t *":RETURN
AJ 2040 REM ML USR ROUTINE DATA
NZ 2050 DATA 104,240,10,201,1
XW 2060 DATA 240,7,170,104,104
PR 2070 DATA 202,208,251,96,165
UP 2080 DATA 88,133,214,165,89
AG 2090 DATA 133,215,104,104,240
LJ 2100 DATA 15,168,24,169,40
UC 2110 DATA 101,214,144,2,230
KE 2120 DATA 215,133,214,136,208
DO 2130 DATA 242,160,0,177,214
PJ 2140 DATA 48,6,169,1,133
HL 2150 DATA 212,208,4,169,0
ZR 2160 DATA 133,212,132,213,132
PF 2170 DATA 77,160,39,177,214
LD 2180 DATA 73,128,145,214,136
LN 2190 DATA 16,247,165,16,16
HG 2200 DATA 7,41,127,133,16
BK 2210 DATA 141,14,210,96,104
QR 2220 DATA 240,10,201,2,240
VL 2230 DATA 7,170,104,104,202
FY 2240 DATA 208,251,96,104,104
KO 2250 DATA 168,104,104,141,175
OV 2260 DATA 6,162,23,169,2
GB 2270 DATA 157,182,6,202,16
TE 2280 DATA 250,169,128,153,182
JS 2290 DATA 6,165,20,197,20
MQ 2300 DATA 240,252,169,163,141
RR 2310 DATA 0,2,169,6,141
JS 2320 DATA 1,2,169,192,141
JV 2330 DATA 14,212,165,88,141
OJ 2340 DATA 180,6,165,89,141
NU 2350 DATA 181,6,169,176,141
QM 2360 DATA 48,2,169,6,141
WL 2370 DATA 49,2,96,72,173
YI 2380 DATA 175,6,141,10,212
EX 2390 DATA 141,24,208,104,64
YL 2400 DATA 0,112,112,112,66
YX 2410 DATA 0,0,2,2,2
AW 2420 DATA 2,2,2,2,2
AZ 2430 DATA 2,2,2,2,2
BC 2440 DATA 2,2,2,2,2
BF 2450 DATA 2,2,2,2,2
QC 2460 DATA 2,65,176,6,-1
```

Listing 2.
BASIC listing.

```
VH 10 DIM A$(40),AISLE$(40),TOPIC$(40):CL
   OSE #2:OPEN #2,4,0,"K:"
QB 20 GRAPHICS 0:? "Shopper Mini-Editor"
KS 30 ? :? "Put shopper DISK in drive #1"
OJ 40 ? "and press [RETURN] ";:INPUT A$
EG 50 TRAP 70:? :? :? "GOTO 220":? "↑↑
   ↑";:POKE 764,12
CA 60 ENTER "D:STORE.DAT":GOTO 220
DV 70 POKE 764,255:? "{No STORE data file
   .":? "Create a new one (Y/N) ";:INPUT
   A$
DA 80 IF A$<>"Y" THEN 20
LV 90 TRAP 210:CLOSE #1:OPEN #1,8,0,"D:ST
   ORE.DAT"
AZ 100 FOR I=8000 TO 8440 STEP 20
DW 110 ? #1;I;" DATA END"
FV 120 NEXT I
GB 130 ? #1;"8990 REM Weekly Essentials L
   ist by Line Number"
FH 140 ? #1;"9000 DATA 8001"
PN 150 ? #1;"9500 REM Aisle Print Sequenc
   e topic lines list"
AB 160 J=8000:FOR I=9501 TO 9523
QV 170 ? #1;I;" DATA ";J:J=J+20
GH 180 NEXT I
QU 190 ? #1;"9524 DATA -1"
DZ 200 CLOSE #1:? "Dummy STORE.DAT file c
   omplete.";:? "Press [RETURN] to continu
   e ";:INPUT A$:GOTO 20
BR 210 CLOSE #1:? "FILE ERROR ";PEEK(195)
   :? "DURING STORE.DAT WRITE.":END
NX 220 GRAPHICS 0:? "Letter of AISLE to e
   dit (Z exits):":TRAP 260:POKE 752,1
FJ 230 C=193:FOR I=8000 TO 8440 STEP 20
CB 240 RESTORE I:READ TOPIC$:? CHR$(C);"
    ";TOPIC$;:C=C+1:IF I<8440 THEN ?
CB 250 NEXT I:POSITION 0,0
AD 260 POKE 702,64:POKE 694,0:GET #2,A:IF
    A=ASC("Z") THEN 410:REM DONE IF Z
YM 270 A=A-65:IF A<0 OR A>23 THEN 260
YA 280 A=8000+A*20
NI 290 RESTORE A:GRAPHICS 0:LIST A:? "↑";
   :READ TOPIC$
WK 300 FOR I=1 TO 19
GV 310 READ A$:DATLIN=PEEK(183)+256*PEEK(
   184)
DQ 320 IF DATLIN>=A+20 THEN C=I:GOTO 370
DW 330 LIST A+I:IF I<19 THEN ? "↑";
GB 340 NEXT I
HL 350 ? "CONT":STOP
NA 360 GOTO 220
EX 370 FOR J=C TO 19
IJ 380 ? A+J;" DATA "
GV 390 NEXT J
OG 400 GOTO 350
RP 410 GRAPHICS 0:? "SAVE DATA NOW:"
UH 420 ? "Get SHOPPER disk ready."
BD 430 ? "Press [RETURN] to write"
LN 440 ? "STORE.DAT file ";:INPUT A$
FM 450 TRAP 210:LIST "D:STORE.DAT",8000,9
   999
WE 460 ? "{Store data file complete."
AR 470 ? "Next, LOAD ";CHR$(34);"D:SHOPPE
   R.BAS";CHR$(34)
```

(continued on next page)

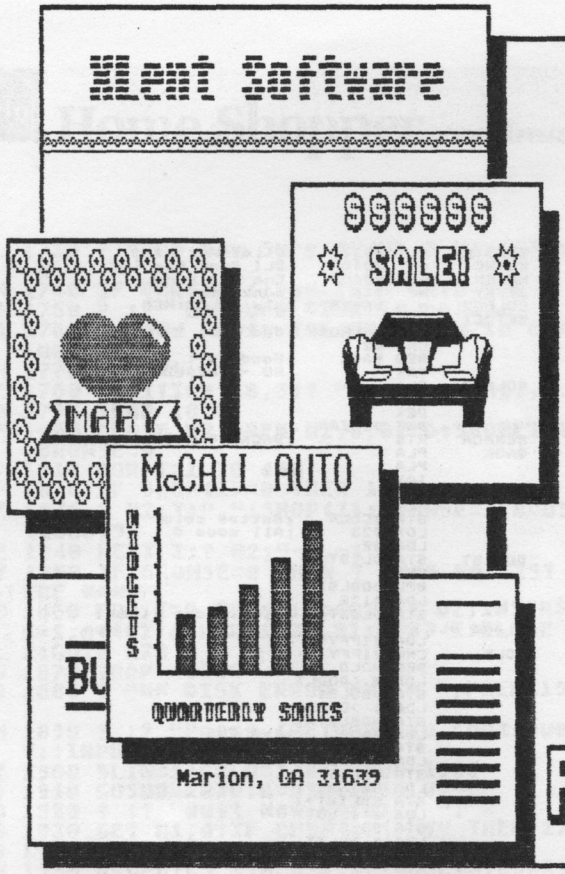
```
EU 480 ? "Then ENTER ";CHR$(34);"D:STORE.
   DAT";CHR$(34)
KU 490 ? "And then SAVE ";CHR$(34);"D:SHO
   PPER.BAS";CHR$(34)
TZ 500 ? "To complete the STORE update."
NT 510 ? :? "The Home Shopper, By Mat*Rat
   "
DU 520 ? "Brought to you by ANALOG Comput
   ing."
BA 530 TRAP 40000:END
```

●

Listing 3.
Assembly listing.

```
; Home Shopper screen line
; inverter USR routine.
;
; A=USR(1536,LINE)
;
; Where LINE is any valid screen
; line, dependant on the graphics
; mode.  It is up to he/she who
; uses this utility to keep track
; of line limits.
; Will invert MSBIT of every byte
; on the line.  On exit
; A=0 if 1st MSBIT off and
; A=1 if 1st MSBIT on
;
; Designed to tag/untag screen
; lines of text quick & easy.
;
SAVMSC  =   88      ; Screen Ram ptr
ATRACT  =   77      ;Attract mode
POKMSK  =   16      ;Disable Break
IRQEN   =   53774   ;Here too
RTN     =   $D4     ;Return Info Here
ZWRK    =   $D6     ;Z-page work
        .ORG $0600
        .OPT OBJ
;
; Validate USR call format
;
START   PLA
        BEQ ERR     ;1 param reqd
        CMP #1      ;got it?
        BEQ AOK     ;Yup!
        TAX         ;No, Clean house
CLEAR   PLA         ;and return
        PLA         ;to BASIC
        DEX
        BNE CLEAR
ERR     RTS         ;exit-bad call
;
; Good call. Setup Screen Pointer
;
AOK     LDA SAVMSC  ;setup work ptr
        STA ZWRK    ;to screen
        LDA SAVMSC+1
        STA ZWRK+1  ;RAM
;
; Get Screen Line
;
        PLA
        PLA
        BEQ NOADD   ;Line Zero
        TAY         ;add it up
OFSET   CLC         ;lazy multiply
        LDA #40
        ADC ZWRK
        BCC SAVLO
        INC ZWRK+1
SAVLO   STA ZWRK
        DEY
        BNE OFSET   ;40 bytes/line
NOADD   LDY #0
        LDA (ZWRK),Y ;Gonna be on or
        BMI WILBZ   ;or off
        LDA #1      ;Inverse-on
        STA RTN
        BNE DOHI
WILBZ   LDA #0      ;Inverse-off
        STA RTN
DOHI    STY RTN+1
        STY ATRACT  ;Reset Atract
        LDY #39     ;Now Reverse
INVERT  LDA (ZWRK),Y
        EOR #$80    ;the inverse
        STA (ZWRK),Y
        DEY
        BPL INVERT
        LDA POKMSK  ;Break On?
        BPL EXIT    ;No-good
        AND #$7F
        STA POKMSK
        STA IRQEN
EXIT    RTS         ;Home Jives
; SETDLI - Set new display list
; and add DLI.
; A=USR(SETDLI,LINE,COLOR)
; Line - screen line, 1-23,
; where BLANK scan line with DLI
; should be placed.
; Color - color value for screen
; hue/intensity below DLI scan
; line.
VDSLST  =   $0200   ;Screen Dlist Inr
SDLSTL  =   $0230   ;Dlist Adr here
WSYNC   =   $D40A   ;DLI Sync hdw loc
NMIEN   =   $D40E   ;Ena DLI here
JIFFY   =   $14     ;60hz tic
COLPF2  =   $D018   ;HDW COLOR REG
SETDLI  PLA
        BEQ SERROR  ;Bad Call
        CMP #2
        BEQ SAOK    ;Good call
        TAX         ;NO - CLEANUP
SCLEAR  PLA
        PLA
        DEX
        BNE SCLEAR
SERROR  RTS         ;BACK TO BAS
SAOK    PLA
        PLA
        TAY
        PLA
        PLA
        STA BCOLR   ;Bottom color
        LDX #23     ;All mode 0
        LDA #2
DODLST  STA DLIST,X
        DEX
        BPL DODLST
        LDA #128
        STA DLIST,Y ;Blank Scan line
; and DLI
        LDA JIFFY
HOLD    CMP JIFFY
        BEQ HOLD
        LDA # <DODLI
        STA VDSLST
        LDA # >DODLI
        STA VDSLST+1
        LDA #$C0    ;INR ENA
        STA NMIEN
        LDA SAVMSC
        STA SDLIST
        LDA SAVMSC+1
        STA SDLIST+1
        LDA # <DLST
        STA SDLSTL
        LDA # >DLST
        STA SDLSTL+1
        RTS
; DODLI - Set color for
; bottom of screen
DODLI   PHA
        LDA BCOLR
        STA WSYNC
        STA COLPF2  ;set color
        PLA
        RTI
BCOLR   .BYTE 0
DLST    .BYTE 112,112,112,66
SDLIST  .WORD 0     ;SAVMSC goes here
DLIST   .BYTE 2,2,2,2,2,2
        .BYTE 2,2,2,2,2,2
        .BYTE 2,2,2,2,2,2
        .BYTE 2,2,2,2,2,2
        .BYTE 65
        .WORD DLST
        .END
```

●



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D&D Character Generator II

Part 3.

by Bob Curtin

Spell casters are the artillery in a dungeon. They're the heavy firepower, the intelligence gatherers, the healers and the special forces. The right spell, conjured at the right time, can save a party of delvers from certain destruction. Of course, this class of character is also the most difficult to play well.

This final installment of the **Dungeons & Dragons Character Generator II** (**DCG2**) brings you spell programs for each of the four classes of spell casters. Each group's enchantments are entirely unique, but they can all be broken up into two types, as far as the method each class will utilize to gain their own magic.

The Druidic characters and the Clerics simply choose which spells they want. Once all are selected, they're dumped to the printer without fanfare.

Magic-users and Illusionists, on the other hand, have a more complex process to endure. Each of these classes of character must pass a "chance to know" die roll before they may pick a particular spell. Within the context of **DCG2**, this is done for the player automatically, as each incantation is chosen. If a player passes the roll, the spell is marked in inverse text. It's not necessary to roll again to obtain further use of that spell. If the roll fails, though, the charm in question is removed from the list and may not be chosen.

Using the program.

Once you've typed in the listings and saved them to the disk containing the character generator and the equipment program, you need only run the character generator to use the spell program. If any of the classes of spell casters is chosen for a given character, the correct enchantment program will automatically be loaded and run.

After a short initialization period, the program will display a list (in whole or in part) of the first-level spells, along with the number remaining to be chosen in that level.

You may page up and down through the entire range of incantations by pressing the up or down arrows (the - or = keys). Spells may be chosen at any time and in any order. They'll be printed in the order chosen.

As each is acquired, it's marked in inverse text, so that the player may refer back to what he's chosen as he decides on additional sorcery. When all the spells have been chosen, simply press the ESC (escape) key to print them on the character sheet. The program will print the selections and go on to the equipment program.

Another feature included is the ability to add to or subtract from the number of incantations available in each level. Simply page to the desired level and press > to add a spell, or < to subtract one.

One of the reasons I chose to include this feature (aside from the obvious—maximum flexibility) was that it allows the magic users to replace full-fledged spells with a number of "cantrips," as dictated in the AD&D rules outlined in *Unearthed Arcana*.

Miscellaneous notes.

Observant readers will note that the four listings here are similar. Indeed, they're much the same program, altered for each of the numbers and types of spells. I suggest that you type in the MAGIC program first (Listing 1), then modify that listing for each of the other three classes. It'll save you a lot of typing and cut down on mistakes.

The program retains all modifications on the "chance to know" roll that are stated in the AD&D Players Handbook. I've provided no override on this modifier, but, if you wish to alter it, you can do so by changing the values assigned to the constant *CTN* in Lines 100 through 140 of the MAGIC program. Though I usually don't recommend tampering with AD&D rules, I understand that each Dungeon Master is in charge of his own dungeon and is, therefore, entitled to run it *any* way he desires.

I hope you've found this series entertaining and useful. It was designed to provide our Dungeon Master readers with a tool that can help free them of some of the more laborious and time-consuming chores of DMing. This series, coupled with the D&D housekeeping program from issue 8, can make your life as a DM a whole lot easier—and, at the same time, make you look like a pro.

Bob Curtin is a machinist who got into computing in 1982, when he bought an Atari 800. He uses it for writing, programming and telecommunications. He prefers the more cerebral computer games.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor*, page 21.

Listing 1.
BASIC listing *(save as "D:MAGIC").*

```
EM 10 DIM SPELL$(10000),A$(40),SP$(10),LE
   VEL(9,18),NAM$(30),LNAM$(165),AT(35,10
   ),STORE$(1800)
EQ 20 CLOSE #3:OPEN #3,4,0,"D:CHARACTR.DT
   A":INPUT #3;CHAR:INPUT #3;NAM$:CLOSE #
   3:OPEN #3,4,0,NAM$
GK 30 FOR E=1 TO 30:FOR J=1 TO CHAR
JG 40 INPUT #3,X:AT(E,J)=X
MK 50 NEXT J:NEXT E
IP 60 INPUT #3,LNAM$:CLOSE #3
ZU 70 N=AT(22,1):LV=AT(8,N)
LX 80 IN=AT(2,N):IF IN=9 THEN CTN=35:MIN=
   4:MAX=6
BN 90 FLAG=0:XX=1
PC 100 IF IN>9 THEN CTN=45:MIN=5:MAX=7
VX 110 IF IN>12 THEN CTN=55:MIN=6:MAX=9
FP 120 IF IN>14 THEN CTN=65:MIN=7:MAX=11
MZ 130 IF IN=17 THEN CTN=75:MIN=8:MAX=14
VG 140 IF IN=18 THEN CTN=85:MIN=9:MAX=18
UR 150 GRAPHICS 0:POKE 752,1:POKE 82,7:PO
   SITION 2,12:? "INITIALIZING, PLEASE WA
   IT..."
GI 160 CMD=PEEK(16):IF CMD>127 THEN CMD=C
   MD-128:POKE 16,CMD:POKE 53774,CMD
CC 170 SPELL$=" ":SPELL$(10000)=SPELL$:SP
   ELL$(2)=SPELL$:A=1:Z=19
XI 180 STORE$=" ":STORE$(1800)=STORE$:STO
   RE$(2)=STORE$:A=1:Z=19
FR 190 GOSUB 1150:RESTORE 760:GOTO 300
UB 200 IF A<41 THEN SL=1:SP$="    FIRST "
RJ 210 IF A<77 AND A>40 THEN SL=2:SP$="
   SECOND "
QR 220 IF A<109 AND A>76 THEN SL=3:SP$="
    THIRD "
WF 230 IF A<141 AND A>108 THEN SL=4:SP$="
    FOURTH "
KQ 240 IF A<171 AND A>140 THEN SL=5:SP$="
    FIFTH "
LG 250 IF A<201 AND A>170 THEN SL=6:SP$="
    SIXTH "
YM 260 IF A<225 AND A>200 THEN SL=7:SP$="
   SEVENTH "
DI 270 IF A<245 AND A>224 THEN SL=8:SP$="
    EIGHTH "
TD 280 IF A>=245 THEN SL=9:SP$="    NINTH
   "
ZQ 290 RETURN
AX 300 FOR E=1 TO 260
HQ 310 READ A$
KR 320 SPELL$(30*E+1,30*E+29)=A$
EL 330 NEXT E
BH 340 GOSUB 200:POKE 710,SL*16+6:POKE 70
   9,0:V=Z
MF 350 ? "{CLEAR}":FOR E=A TO A+Z:? SPELL$(E*30
   ,E*30+29):NEXT E:POSITION 0,22:? SP$;"
   LEVEL SPELLS REMAINING:          ↑":Z=19
RR 360 POSITION 33,22:? LEVEL(SL,LV);"↑"
RC 370 FOR E=1 TO V+1
SB 380 POSITION 5,E:? CHR$(E+64)
EX 390 NEXT E
PG 400 OPEN #1,4,0,"K:":GET #1,CMD:CLOSE
   #1
UT 410 IF CMD=27 THEN STORE$(XX*30,XX*30)
   ="*":GOTO 1520
DP 420 IF CMD=62 THEN LEVEL(SL,LV)=LEVEL(
   SL,LV)+1
GD 430 IF CMD=60 THEN LEVEL(SL,LV)=LEVEL(
   SL,LV)-1
SR 440 IF CMD>64 AND CMD<V+66 THEN GOSUB
   1320
RG 450 IF CMD=45 THEN A=A+20:IF A>245 THE
   N A=245
SH 460 IF CMD=61 THEN GOSUB 620:IF A<1 TH
   EN A=1
SM 470 IF CMD=61 THEN GOTO 340
EY 480 IF A=241 THEN A=225
YN 490 IF A=211 THEN A=201
FQ 500 IF A=181 THEN A=171
FC 510 IF A=149 THEN A=141
GR 520 IF A=117 THEN A=109
ZF 530 IF A=81 THEN A=77
JP 540 IF A=61 THEN Z=15
KD 550 IF A=97 THEN Z=11
DA 560 IF A=129 THEN Z=11
SC 570 IF A=161 THEN Z=9
TL 580 IF A=191 THEN Z=9
MC 590 IF A=221 THEN Z=3
FJ 600 IF A=245 THEN Z=15
NZ 610 GOTO 340
QL 620 IF A=225 THEN A=221:Z=3:RETURN
PZ 630 IF A=205 THEN A=201:Z=19:RETURN
ZG 640 IF A=201 THEN A=191:Z=9:RETURN
HV 650 IF A=191 THEN A=171:Z=19:RETURN
ZL 660 IF A=171 THEN A=161:Z=9:RETURN
EA 670 IF A=151 THEN A=161
PE 680 IF A=141 THEN A=129:Z=11:RETURN
XA 690 IF A=109 THEN A=97:Z=11:RETURN
TW 700 IF A=121 THEN A=109:RETURN
CT 710 IF A=89 THEN A=77:RETURN
```

```
UO 720 IF A=77 THEN A=61:Z=15:RETURN
TT 730 IF A=57 THEN A=41:RETURN
GH 740 A=A-20
ZN 750 RETURN
WC 760 DATA Affect Normal Fires,Alarm,Arm
   or,Burning Hands,Charm Person,Comprehe
   nd Languages,Dancing Lights
XN 770 DATA Detect Magic,Enlarge,Erase,Fe
   ather Fall,Find Familiar,Firewater,Fri
   ends,Grease,Hold Portal,Identify
HS 780 DATA Jump,Light,Magic Missile,Melt
   ,Mending,Message,Mount,Nystul's Magic
   Aura,Precipitation
YB 790 DATA Protection From Evil,Push,Rea
   d Magic,Run,Shield,Shocking Grasp,Slee
   p,Spider Climb,Taunt
SW 800 DATA Tenser's Floating Disk,Unseen
    Servant,Ventriloquism,Wizard Mark,Wri
   te
HO 810 DATA Audible Glamer,Bind,Continual
    Light,Darkness 15' Radius,Deeppockets
   ,Detect Evil,Detect Invisibility
AK 820 DATA ESP,Flaming Sphere,Fools Gold
   ,Forget,Invisibility,Irritation,Knock,
   Know Alignment,Leomund's Trap
OZ 830 DATA Levitate,Locate Object,Magic
   Mouth,Melf's Acid Arrow,Mirror Image,P
   reserve,Protection From Cantrips
TO 840 DATA Pyrotechnics,Ray of Enfeeblem
   ent,Rope Trick,Scare,Shatter,Stinking
   Cloud,Strength
BC 850 DATA Tasha's Hideous Laughter,Voca
   lize,Web,Whip,Wizard Lock,Zephyr,Blink
   ,Clairaudience,Clairvoyance
JS 860 DATA Cloudburst,Detect Illusion,Di
   spel Magic,Explosive Runes,Feign Death
   ,Fireball,Flame Arrow,Fly
AG 870 DATA Gust of Wind,Haste,Hold Perso
   n,Infravision,Invisibility 10' Radius,
   Item
EQ 880 DATA Leomund's Tiny Hut,Lightning
   Bolt,Material,Melf's Minute Meteor,Mon
   ster Summoning I,Phantasmal Force
UT 890 DATA Protection From Evil 10',Prot
   ect From Missiles,Secret Page,Sepia Sn
   ake Sigil,Slow,Suggestion,Tongues
RY 900 DATA Water Breathing,Wind Wall,Cha
   rm Monster,Confusion,Dig,Dimension Doo
   r,Dispel Illusion,Enchanted Weapon
HT 910 DATA Evard's Black Tentacles,Exten
   sion I,Fear,Fire Charm,Fire Shield,Fir
   e Trap,Fumble
ZU 920 DATA Hallucinatory Terrain,Ice Sto
   rm,Leomund's Secure Shelter,Magic Mirr
   or,Massmorph
RM 930 DATA Minor Globe/Invulnerability,M
   onster Summoning II,Otiluke's Resilien
   t Sphere,Plant Growth
II 940 DATA Polymorph Other,Polymorph Sel
   f,Rary's Enhancer,Remove Curse,Shout,S
   toneskin,Ultravision
VV 950 DATA Wall of Fire,Wall of Ice,Waza
   rd Eye,Airy Water,Animal Growth,Animat
   e Dead,Avoidance
UA 960 DATA Bigby's Interposing Hand,Clou
   dkill,Conjure Elemental,Cone of Cold,C
   ontact Other Plane,Dismissal
IY 970 DATA Distance Distortion,Dolor,Ext
   ension II,Fabricate,Feeblemind,Hold Mo
   nster,Leomund's Belabourment
LX 980 DATA Leomund's Secret Chest,Magic
   Jar,Monster Summoning III,Mordenkainen
   's Hound,Passwall,Sending
XP 990 DATA Stone Shape,Telekenesis,Telep
   ort,Transmute Rock to Mud,Wall of Forc
   e,Wall of Iron,Wall of Stone
RP 1000 DATA Anti-Magic Shell,Bigby's For
   ceful Hand,Chain Lightning,Contingency
   ,Control Weather,Death Spell
NX 1010 DATA Disintegrate,Enchant an Item
   ,Ensnarement,Extension II,Eyebite,Geas
   ,Glassee,Globe of Invulnerability
CU 1020 DATA Guards and Wards,Invisible S
   talker,Legend Lore,Lower Water,Monster
    Summoning IV
GK 1030 DATA Mordenkainen's Lucubration,M
   ove Earth,Otiluke's Freezing Sphere,Pa
   rt Water,Project Image,Reincarnation
YY 1040 DATA Repulsion,Spiritwrack,Stone
   To Flesh,Tensor's Transformation,Trans
   mute Water to Dust,Banishment
EU 1050 DATA Bigby's Grasping Hand,Cacode
   mon,Charm Plants,Delayed Blast Firebal
   l,Drawmij's Instant Summons
DF 1060 DATA Duo-Dimension,Foregage,Limit
   ed Wish,Mass Invisibility,Monster Summ
   oning V
CX 1070 DATA Mordenkainen's Mansion,Morde
   nkainen's Sword,Phase Door,Power Word
   (Stun),Reverse Gravity,Sequester
ZW 1080 DATA Simulacrum,Statue,Teleport W
   ithout Error,Torment,Truename,Vanish,V
   olley,Antipathy/Sympathy
NU 1090 DATA Bigby's Clenched Fist,Bindin
   g,Clone,Demand,Glassteel,Incendiary Cl
   oud,Mass Charm,Maze,Mind Blank
HG 1100 DATA Monster Summoning VI,Otiluke
   's Telekinetic Sphere,Otto's Irresisab
   le Dance,Permenancy
JW 1110 DATA Polymorph Any Object,Power W
   ord (Blind),Serten's Spell Immunity,Si
   nk,Symbol,Trap The Soul,Astral Spell
BE 1120 DATA Bigby's Crushing Hand,Crysta
   lbrittle,Energy Drain,Gate,Imprisonmen
   t,Meteor Swarm,Monster Summoning VII
WC 1130 DATA Mordenkainen's Disjunction,P
   ower Word (Kill),Prismatic Sphere,Shap
   e Change,Succor,Temporal Stasis
SS 1140 DATA Time Stop,Wish
KJ 1150 RESTORE 1230
ZX 1160 FOR E=1 TO 9
JC 1170 FOR I=1 TO 18
QN 1180 READ A
RG 1190 LEVEL(E,I)=A
ET 1200 NEXT I
DE 1210 NEXT E
AJ 1220 RETURN
NS 1230 DATA 1,2,2,3,4,4,4,4,4,4,4,4,5,5,
   5,5,5,5
FF 1240 DATA 0,0,1,2,2,2,3,3,3,4,4,4,5,5,
   5,5,5,5
AS 1250 DATA 0,0,0,0,1,2,2,3,3,3,4,4,5,5,
   5,5,5,5
QN 1260 DATA 0,0,0,0,0,0,1,2,2,2,3,4,4,4,
   5,5,5,5
MU 1270 DATA 0,0,0,0,0,0,0,0,1,2,3,4,4,4,
   5,5,5,5
IH 1280 DATA 0,0,0,0,0,0,0,0,0,0,0,1,2,2,
   2,3,3,3
ZY 1290 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,1,
   1,2,3,3
RC 1300 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
   0,1,2,2
KP 1310 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,
   0,0,0,1
FU 1320 TEST=INT(100*RND(0)+1)
BQ 1330 IF LEVEL(SL,LV)<=0 THEN POSITION
   0,22:? "{CLR}  YOU'VE NO SPELLS LEFT AT TH
   IS LEVEL!    ↑"
NT 1340 IF LEVEL(SL,LV)<=0 THEN FOR E=1 T
   O 100:NEXT E:RETURN
BP 1350 IF ASC(SPELL$((A+CMD-65)*30+1,(A+
   CMD-65)*30+1))>128 THEN TEST=0:GOTO 13
   70
AX 1360 GOSUB 1430
JY 1370 IF TEST<=CTN THEN GOSUB 1500:POSI
   TION 0,22:? "          YOU MAY CHOOSE TH
   AT SPELL       ↑"
GV 1380 IF TEST<=CTN THEN FOR E=1 TO 100:
   NEXT E:LEVEL(SL,LV)=LEVEL(SL,LV)-1
YO 1390 IF TEST<=CTN THEN A$=SPELL$((A+CM
   D-65)*30+1,(A+CMD-65)*30+29):GOSUB 146
   0:RETURN
HT 1400 SPELL$((A+CMD-65)*30+1,(A+CMD-65)
   *30+29)="                              "
5E 1410 POSITION 0,22:? "{CLR}       YOU MAY
```

```
   NOT HAVE THAT SPELL          ↑":FOR E=1 TO
    100:NEXT E
AN 1420 RETURN
OZ 1430 FLAG=0:IF SPELL$((A+CMD-65)*30+1,
   (A+CMD-65)*30+1)=" " THEN POSITION 0,2
   2:FLAG=1
UA 1440 IF FLAG=1 THEN ? "■THERE IS NO SP
   ELL LISTED AT THAT LETTER!↑":FOR E=1 T
   O 100:NEXT E:POP :GOTO 1420
AW 1450 RETURN
ZV 1460 IF ASC(A$(1,1))>128 THEN FOR E=1
   TO LEN(A$):A$(E,E)=CHR$(ASC(A$(E,E))+1
   28):NEXT E
HZ 1470 STORE$(XX*30,XX*30+29)=A$:XX=XX+1
AG 1480 FOR E=1 TO LEN(A$):A$(E,E)=CHR$(A
   SC(A$(E,E))+128):NEXT E:SPELL$((A+CMD-
   65)*30+1,(A+CMD-65)*30+29)=A$
BI 1490 RETURN
EH 1500 FOR SU=1 TO 5:SOUND 0,30,10,10:FO
   R U5=1 TO 2:NEXT U5:SOUND 0,10,10,10:F
   OR U5=1 TO 2:NEXT U5:NEXT SU
XN 1510 SOUND 0,0,0,0:RETURN
GW 1520 OPEN #1,8,0,"P:":XX=1:PRINT #1,CH
   R$(10);CHR$(14);"MAGICAL SPELLS",,"NOT
   ES";CHR$(20);CHR$(10)
XE 1530 PRINT #1,STORE$(XX*30,XX*30+29),"
   |"
LK 1540 XX=XX+1
GM 1550 IF STORE$(XX*30,XX*30)="*" THEN R
   UN "D:EQUIPMNT"
RL 1560 GOTO 1530
```


Listing 2.
BASIC listing *(save as "D:ILLUSION").*

```
EM 10 DIM SPELL$(10000),A$(40),SP$(10),LE
   VEL(9,18),NAM$(30),LNAM$(165),AT(35,10
   ),STORE$(1800)
EQ 20 CLOSE #3:OPEN #3,4,0,"D:CHARACTR.DT
   A":INPUT #3;CHAR:INPUT #3;NAM$:CLOSE #
   3:OPEN #3,4,0,NAM$
GK 30 FOR E=1 TO 30:FOR J=1 TO CHAR
JG 40 INPUT #3,X:AT(E,J)=X
MK 50 NEXT J:NEXT E
IP 60 INPUT #3,LNAM$:CLOSE #3
ZU 70 N=AT(22,1):LV=AT(8,N)
LX 80 IN=AT(2,N):IF IN=9 THEN CTN=35:MIN=
   4:MAX=6
BN 90 FLAG=0:XX=1
PC 100 IF IN>9 THEN CTN=45:MIN=5:MAX=7
VX 110 IF IN>12 THEN CTN=55:MIN=6:MAX=9
FP 120 IF IN>14 THEN CTN=65:MIN=7:MAX=11
MZ 130 IF IN=17 THEN CTN=75:MIN=8:MAX=14
VG 140 IF IN=18 THEN CTN=85:MIN=9:MAX=18
UR 150 GRAPHICS 0:POKE 752,1:POKE 82,7:PO
   SITION 2,12:? "INITIALIZING, PLEASE WA
   IT..."
GV 155 CMD=PEEK(16):IF CMD>127 THEN CMD=C
   MD-128:POKE 16,CMD:POKE 53774,CMD
SQ 160 SPELL$=" ":SPELL$(10000)=SPELL$:SP
   ELL$(2)=SPELL$:A=1:Z=15
OA 170 STORE$=" ":STORE$(1800)=STORE$:STO
   RE$(2)=STORE$:A=1:Z=15
GJ 180 GOSUB 750:RESTORE 1170:GOTO 290
WC 190 IF A<17 THEN SL=1:SP$="■ FIRST "
QM 200 IF A<33 AND A>16 THEN SL=2:SP$="■
   SECOND "
WK 210 IF A<49 AND A>32 THEN SL=3:SP$="■
   THIRD "
QU 220 IF A<61 AND A>48 THEN SL=4:SP$="■
   FOURTH "
JK 230 IF A<73 AND A>60 THEN SL=5:SP$="■
   FIFTH "
LF 240 IF A<85 AND A>72 THEN SL=6:SP$="■
   SIXTH "
SP 250 IF A>84 THEN SL=7:SP$="■SEVENTH "
ZO 280 RETURN
WA 290 FOR E=1 TO 92
HO 300 READ A$
KP 310 SPELL$(30*E+1,30*E+29)=A$
EJ 320 NEXT E
EY 330 GOSUB 190:POKE 710,SL*16+6:POKE 70
   9,0:V=Z
UP 340 ? "■":FOR E=A TO A+Z:? SPELL$(E*30
   ,E*30+29):NEXT E:POSITION 0,22:? SP$;"
   LEVEL SPELLS REMAINING:          ↑":Z=15
RP 350 POSITION 33,22:? LEVEL(SL,LV);"↑"
RA 360 FOR E=1 TO V+1
RZ 370 POSITION 5,E:? CHR$(E+64)
EV 380 NEXT E
PX 390 OPEN #1,4,0,"K:":GET #1,CMD:CLOSE
   #1
MZ 400 IF CMD=27 THEN STORE$(XX*30,XX*30)
   ="*":GOTO 1120
DN 410 IF CMD=62 THEN LEVEL(SL,LV)=LEVEL(
   SL,LV)+1
GB 420 IF CMD=60 THEN LEVEL(SL,LV)=LEVEL(
   SL,LV)-1
AJ 430 IF CMD>64 AND CMD<V+66 THEN GOSUB
   920
OC 440 IF CMD=45 THEN A=A+16:IF A>85 THEN
    A=85
RE 450 IF CMD=61 THEN GOSUB 610:IF A<1 TH
   EN A=1
RK 460 IF CMD=61 THEN GOTO 330
IW 470 IF A>=49 THEN Z=11
YR 475 IF A>=85 THEN Z=7
UW 480 IF A=65 THEN A=61
YO 490 IF A=77 THEN A=73
VV 500 IF A=89 THEN A=85:Z=8:V=8
NM 600 GOTO 330
5J 610 IF A=85 THEN A=73:Z=11:RETURN
```

```
OV 620 IF A=73 THEN A=61:Z=11:RETURN
SP 630 IF A=61 THEN A=49:Z=11:RETURN
IE 730 A=A-16
ZL 740 RETURN
WO 750 RESTORE 830
OB 760 FOR E=1 TO 7
WL 770 FOR I=1 TO 18
TC 780 READ A
EW 790 LEVEL(E,I)=A
FY 800 NEXT I
EM 810 NEXT E
ZI 820 RETURN
KU 830 DATA 1,2,2,3,4,4,4,4,5,5,5,5,5,5,5
   ,5,5,5
AG 840 DATA 0,0,1,2,2,3,3,3,3,4,4,5,5,5,5
   ,5,5,5
MY 850 DATA 0,0,0,0,1,1,2,2,3,3,3,4,4,4,4
   ,5,5,5
ZU 860 DATA 0,0,0,0,0,0,0,1,2,2,3,3,3,3,4
   ,4,4,5
HI 870 DATA 0,0,0,0,0,0,0,0,0,1,2,2,2,2,2
   ,3,3,3
ZQ 880 DATA 0,0,0,0,0,0,0,0,0,0,0,1,2,2,2
   ,2,2,3
VM 890 DATA 0,0,0,0,0,0,0,0,0,0,0,0,1,2,2
   ,2,2,2
XX 920 TEST=INT(100*RND(0)+1)
QF 930 IF LEVEL(SL,LV)<=0 THEN POSITION 0
   ,22:? "■  YOU'VE NO SPELLS LEFT AT THI
   S LEVEL!    ↑"
FS 940 IF LEVEL(SL,LV)<=0 THEN FOR E=1 TO
    100:NEXT E:RETURN
OT 950 IF ASC(SPELL$((A+CMD-65)*30+1,(A+C
   MD-65)*30+1))>128 THEN TEST=0:GOTO 970
SP 960 GOSUB 1030
DX 970 IF TEST<=CTN THEN GOSUB 1100:POSIT
   ION 0,22:? "          YOU MAY CHOOSE THA
   T SPELL        ↑"
MG 980 IF TEST<=CTN THEN FOR E=1 TO 100:N
   EXT E:LEVEL(SL,LV)=LEVEL(SL,LV)-1
DB 990 IF TEST<=CTN THEN A$=SPELL$((A+CMD
   -65)*30+1,(A+CMD-65)*30+29):GOSUB 1060
   :RETURN
HL 1000 SPELL$((A+CMD-65)*30+1,(A+CMD-65)
   *30+29)="                              "
RW 1010 POSITION 0,22:? "■       YOU MAY
   NOT HAVE THAT SPELL      ↑":FOR E=1 TO
    100:NEXT E
AF 1020 RETURN
OR 1030 FLAG=0:IF SPELL$((A+CMD-65)*30+1,
   (A+CMD-65)*30+1)=" " THEN POSITION 0,2
   2:FLAG=1
EE 1040 IF FLAG=1 THEN ? "■THERE IS NO SP
   ELL LISTED AT THAT LETTER!↑":FOR E=1 T
   O 100:NEXT E:POP :GOTO 1020
AO 1050 RETURN
ZN 1060 IF ASC(A$(1,1))>128 THEN FOR E=1
   TO LEN(A$):A$(E,E)=CHR$(ASC(A$(E,E))+1
   28):NEXT E
HR 1070 STORE$(XX*30,XX*30+29)=A$:XX=XX+1
ZY 1080 FOR E=1 TO LEN(A$):A$(E,E)=CHR$(A
   SC(A$(E,E))+128):NEXT E:SPELL$((A+CMD-
   65)*30+1,(A+CMD-65)*30+29)=A$
BA 1090 RETURN
DZ 1100 FOR SU=1 TO 5:SOUND 0,30,10,10:FO
   R US=1 TO 2:NEXT US:SOUND 0,10,10,10:F
   OR US=1 TO 2:NEXT US:NEXT SU
XF 1110 SOUND 0,0,0,0:RETURN
GO 1120 OPEN #1,8,0,"P:":XX=1:PRINT #1,CH
   R$(10);CHR$(14);"MAGICAL SPELLS",,"NOT
   ES";CHR$(20);CHR$(10)
WW 1130 PRINT #1,STORE$(XX*30,XX*30+29),"
   |"
LC 1140 XX=XX+1
GE 1150 IF STORE$(XX*30,XX*30)="*" THEN R
   UN "D:EQUIPMNT"
PH 1160 GOTO 1130
MB 1170 DATA Audible Glamer,Change Self,C
   hromatic Orb,Color Spray,Dancing Light
   s,Darkness,Detect Illusion
AK 1180 DATA Detect Invisibility,Gaze Ref
   lection,Hypnotism,Light,Phantasmal For
   ce,Phantom Armor
AN 1190 DATA Read Illusionist Magic,Spook
   ,Wall of Fog,Alter Self,Blindness,Blur
   ,Deafness,Detect Magic,Fastinate
TI 1200 DATA Fog Cloud,Hypnotic Pattern,I
   mproved Phantasmal Force,Invisibility,
   Magic Mouth,Mirror Image,Misdirection
IW 1210 DATA Ultravision,Ventriloquism,Wh
   ispering Wind,Continual Darkness,Conti
   nual Light,Delude,Dispel Illusion
ND 1220 DATA Fear,Hallucinatory Terrain,I
   llusionary Script,Invisibility (10' ra
   dius),Non-Detection,Paralyzation
IN 1230 DATA Phantom Steed,Phantom Wind,R
   ope Trick,Spectral Force,Suggestion,Wr
   aithform,Confusion
OW 1240 DATA Dispel Exhaustion,Dispel Mag
   ic,Emotion,Improved Invisibility,Massm
   orph,Minor Creation,Phantasmal Killer
JY 1250 DATA Rainbow Pattern,Shadow Monst
   ers,Solid Fog,Vacancy,Advanced Illusio
   n,Chaos,Demi-Shadow Monsters,Dream
OD 1260 DATA Magic Mirror,Major Creation,
   Maze,Projected Image,Shadow Door,Shado
   w Magic,Summon Shadow,Tempus Fugit
XP 1270 DATA Conjure Animals,Death Fog,De
   mi-Shadow Magic,Mass Suggestion,Mirage
    Arcane,Mislead,Permanent Illusion
AG 1280 DATA Phantasmagoria,Programmed Il
   lusion,Shades,True Sight,Veil,Alter Re
   ality,Astral Spell,Prismatic Spray
LD 1290 DATA Prismatic Wall,Shadow Walk,V
   ision,Weird,1st Level Magic-user spell
   s
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Listing 3.
BASIC listing *(save as "D:CLERK").*

```
EM 10 DIM SPELL$(10000),A$(40),SP$(10),LE
   VEL(9,18),NAM$(30),LNAM$(165),AT(35,10
   ),STORE$(1800)
EQ 20 CLOSE #3:OPEN #3,4,0,"D:CHARACTR.DT
   A":INPUT #3;CHAR:INPUT #3;NAM$:CLOSE #
   3:OPEN #3,4,0,NAM$
GK 30 FOR E=1 TO 30:FOR J=1 TO CHAR
JG 40 INPUT #3,X:AT(E,J)=X
MK 50 NEXT J:NEXT E
IP 60 INPUT #3,LNAM$:CLOSE #3
ZU 70 N=AT(22,1):LV=AT(8,N)
BM 80 FLAG=0:XX=1
FJ 90 GRAPHICS 0:POKE 752,1:POKE 82,7:POS
   ITION 2,12:? "INITIALIZING, PLEASE WAI
   T..."
WY 95 CMD=PEEK(16):IF CMD>127 THEN CMD=CM
   D-128:POKE 16,CMD:POKE 53774,CMD
FW 100 CMD=PEEK(16):IF CMD>127 THEN CMD=C
   MD-128:POKE 16,CMD:POKE 53774,CMD
BQ 110 SPELL$=" ":SPELL$(10000)=SPELL$:SP
   ELL$(2)=SPELL$:A=1:Z=19
WW 120 STORE$=" ":STORE$(1800)=STORE$:STO
   RE$(2)=STORE$:A=1:Z=19
NB 130 GOSUB 490:RESTORE 890:GOTO 220
TO 140 IF A<21 THEN SL=1:SP$="  FIRST "
MM 150 IF A<41 AND A>20 THEN SL=2:SP$="
   SECOND "
TI 160 IF A<61 AND A>40 THEN SL=3:SP$="
   THIRD "
PJ 170 IF A<77 AND A>60 THEN SL=4:SP$="
   FOURTH "
PW 180 IF A<93 AND A>76 THEN SL=5:SP$="
   FIFTH "
AJ 190 IF A<105 AND A>92 THEN SL=6:SP$="
   SIXTH "
OY 200 IF A>104 THEN SL=7:SP$=" SEVENTH "
ZA 210 RETURN
BH 220 FOR E=1 TO 116
HT 230 READ A$
KU 240 SPELL$(30*E+1,30*E+29)=A$
EO 250 NEXT E
CV 260 GOSUB 140:POKE 710,SL*16+6:POKE 70
   9,0:V=Z
MI 270 ? "K":FOR E=A TO A+Z:? SPELL$(E*30
   ,E*30+29):NEXT E:POSITION 0,22:? SP$;"
   LEVEL SPELLS REMAINING:          ↑":Z=19
RU 280 POSITION 33,22:? LEVEL(SL,LV);"↑"
RF 290 FOR E=1 TO V+1
RL 300 POSITION 5,E:? CHR$(E+64)
EH 310 NEXT E
PJ 320 OPEN #1,4,0,"K:":GET #1,CMD:CLOSE
   #1
KF 330 IF CMD=27 THEN STORE$(XX*30,XX*30)
   ="*":GOTO 840
DS 340 IF CMD=62 THEN LEVEL(SL,LV)=LEVEL(
   SL,LV)+1
GG 350 IF CMD=60 THEN LEVEL(SL,LV)=LEVEL(
   SL,LV)-1
ZD 360 IF CMD>64 AND CMD<V+66 THEN GOSUB
   640
VD 370 IF CMD=45 THEN A=A+20:IF A>105 THE
   N A=105:Z=11
TM 380 IF CMD=61 THEN GOTO 440
JX 390 IF A=61 THEN Z=15
YB 400 IF A=81 THEN A=77:Z=15
VJ 410 IF A=97 THEN A=93:Z=11
TZ 420 IF A=113 THEN A=105:Z=11
ON 430 GOTO 260
TS 440 IF A=105 THEN A=113:Z=11
XF 450 IF A=93 THEN A=97:Z=11
SP 460 IF A=77 THEN A=81:Z=11
DY 470 A=A-20:IF A<1 THEN A=1
OX 480 GOTO 260
XK 490 RESTORE 570
NN 500 FOR E=1 TO 7
VX 510 FOR I=1 TO 18
SO 520 READ A
EI 530 LEVEL(E,I)=A
GD 540 NEXT I
MC 550 NEXT E:A=1
ZN 560 RETURN
ZN 570 DATA 1,2,2,3,3,3,3,3,4,4,5,6,6,6,7
   ,7,8,8
UT 580 DATA 0,0,1,2,3,3,3,3,4,4,4,5,6,6,7
   ,7,8,8
NZ 590 DATA 0,0,0,0,1,2,2,3,3,3,4,5,6,6,7
   ,7,8,8
RI 600 DATA 0,0,0,0,0,0,1,2,2,3,3,3,4,5,5
   ,6,6,7
YO 610 DATA 0,0,0,0,0,0,0,0,1,2,2,2,2,3,4
   ,5,5,6
GI 620 DATA 0,0,0,0,0,0,0,0,0,0,1,2,2,2,2
   ,3,3,4
JC 630 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
   ,1,1,1
XY 640 TEST=INT(100*RND(0)+1)
QG 650 IF LEVEL(SL,LV)<=0 THEN POSITION 0
   ,22:? "K  YOU'VE NO SPELLS LEFT AT THI
   S LEVEL!   ↑"
FT 660 IF LEVEL(SL,LV)<=0 THEN FOR E=1 TO
    100:NEXT E:RETURN
MA 670 IF ASC(SPELL$((A+CMD-65)*30+1,(A+C
   MD-65)*30+1))>128 THEN TEST=0:GOTO 690
WD 680 GOSUB 750
HC 690 TEST=0:GOSUB 820
ER 700 LEVEL(SL,LV)=LEVEL(SL,LV)-1
LM 710 A$=SPELL$((A+CMD-65)*30+1,(A+CMD-6
   5)*30+29):GOSUB 780:RETURN
GD 720 SPELL$((A+CMD-65)*30+1,(A+CMD-65)*
   30+29)="                              "
ZU 730 POSITION 0,22:? "K       YOU MAY N
   OT HAVE THAT SPELL      ↑":FOR E=1 TO
   100:NEXT E
ZL 740 RETURN
MM 750 FLAG=0:IF SPELL$((A+CMD-65)*30+1,(
   A+CMD-65)*30+1)=" " THEN POSITION 0,22
   :FLAG=1
JM 760 IF FLAG=1 THEN ? "KTHERE IS NO SPE
   LL LISTED AT THAT LETTER!↑":FOR E=1 TO
    100:NEXT E:POP :GOTO 740
ZR 770 RETURN
VT 780 IF ASC(A$(1,1))>128 THEN FOR E=1 T
   O LEN(A$):A$(E,E)=CHR$(ASC(A$(E,E))+12
   8):NEXT E
XR 790 STORE$(XX*30,XX*30+29)=A$:XX=XX+1
IH 800 FOR E=1 TO LEN(A$):A$(E,E)=CHR$(AS
   C(A$(E,E))+128):NEXT E:SPELL$((A+CMD-6
   5)*30+1,(A+CMD-65)*30+29)=A$
ZG 810 RETURN
QS 820 FOR SU=1 TO 5:SOUND 0,30,10,10:FOR
    U5=1 TO 2:NEXT U5:SOUND 0,10,10,10:FO
   R U5=1 TO 2:NEXT U5:NEXT SU
RK 830 SOUND 0,0,0,0:RETURN
XZ 840 OPEN #1,8,0,"P:":XX=1:PRINT #1,CHR
   $(10);CHR$(14);"MAGICAL SPELLS",,"NOTE
   S";CHR$(20);CHR$(10)
KJ 850 PRINT #1,STORE$(XX*30,XX*30+29),"|
   "
JG 860 XX=XX+1
MF 870 IF STORE$(XX*30,XX*30)="*" THEN RU
   N "D:EQUIPMNT"
QY 880 GOTO 850
JT 890 DATA Bless,Ceremony,Combine,Comman
   d,Create Water,Cure Light Wounds,Detec
   t Evil,Detect Magic,Endure Cold/Heat
FP 900 DATA Invisibility to Undead,Light,
   Magic Stone,Penetrate Disguise,portent
   ,Precipitation,Protection From Evil
UG 910 DATA Purify Food & Drink,Remove Fe
   ar,Resist Cold,Sanctuary,Aid,Augery,Ch
   ant,Detect Charm,Detect Life
OI 920 DATA Dust Devil,Enthrall,Find Trap
   s,Hold Person,Holy Symbol,Know Alignme
   nt,Messenger,Resist Fire
YX 930 DATA Silence (15' Radius),Slow Poi
   son,Snake Charm,Speak With Animals,Spi
   ritual Hammer,Withdraw,Wyvern Watch
RV 940 DATA Animate Dead,Cloudburst,Conti
   nual Light,Create Food & Water,Cure Bl
   indness,Cure Disease,Death's Door
OM 950 DATA Dispel Magic,Feign Death,Flam
```

```
   e Walk,Glyph of Warding,Locate Object,
   Magical Vestment,Meld Into Stone
WI 960 DATA Negative Plane Protection,Pra
   yer,Remove Curse,Remove Paralysis,Spea
   k With Dead,Water Walk,Abjure
TW 970 DATA Cloak of Fear,Cure Serious Wo
   unds,Detect Lie,Divination,Exorcise,Gi
   ant Insect,Imbue with Spell Ability
VS 980 DATA Lower Water,Neutralize Poison
   ,Protection From Evil (10'),Speak With
    Plants,Spell Immunity,Spike Stones
YH 990 DATA Sticks To Snakes,Tongues,Air
   Walk,Animate Dead Monsters,Atonement,C
   ommune,Cure Critical Wounds
NO 1000 DATA Dispel Evil,Flame Strike,Gol
   em,Insect Plague,Magic Font,Plane Shif
   t,Quest,Rainbow,Raise Dead
XE 1010 DATA Spike Growth,True Seeing,Aer
   ial Servant,Animate Object,Blade Barri
   er,Conjure Animals,Find The Path
TW 1020 DATA Forbiddance,Heal,Heroes' Fea
   st,Part Water,Speak With Monsters,Ston
   e Tell,Word Of Recall,Astral Spell
FC 1030 DATA Control Weather,Earthquake,E
   xaction,Gate,Holy(Unholy)Word,Regenera
   te,Restoration,Resurrection,Succor
NG 1040 DATA Symbol,Wind Walk
```

Listing 4.

BASIC listing *(save as "D:DRUID").*

```
EM 10 DIM SPELL$(10000),A$(40),SP$(10),LE
   VEL(9,18),NAM$(30),LNAM$(165),AT(35,10
   ),STORE$(1800)
EQ 20 CLOSE #3:OPEN #3,4,0,"D:CHARACTR.DT
   A":INPUT #3;CHAR:INPUT #3;NAM$:CLOSE #
   3:OPEN #3,4,0,NAM$
GK 30 FOR E=1 TO 30:FOR J=1 TO CHAR
JG 40 INPUT #3,X:AT(E,J)=X
MK 50 NEXT J:NEXT E
IP 60 INPUT #3,LNAM$:CLOSE #3
ZU 70 N=AT(22,1):LV=AT(8,N)
BM 80 FLAG=0:XX=1
FJ 90 GRAPHICS 0:POKE 752,1:POKE 82,7:POS
   ITION 2,12:? "INITIALIZING, PLEASE WAI
   T..."
WY 95 CMD=PEEK(16):IF CMD>127 THEN CMD=CM
   D-128:POKE 16,CMD:POKE 53774,CMD
SE 100 SPELL$=" ":SPELL$(10000)=SPELL$:SP
   ELL$(2)=SPELL$:A=1:Z=15
NO 110 STORE$=" ":STORE$(1800)=STORE$:STO
   RE$(2)=STORE$:A=1:Z=15
LS 120 GOSUB 490:RESTORE 890:GOTO 210
VQ 130 IF A<17 THEN SL=1:SP$="    FIRST "
QT 140 IF A<33 AND A>16 THEN SL=2:SP$="
   SECOND "
WR 150 IF A<49 AND A>32 THEN SL=3:SP$="
   THIRD "
RB 160 IF A<61 AND A>48 THEN SL=4:SP$="
   FOURTH "
JR 170 IF A<73 AND A>60 THEN SL=5:SP$="
   FIFTH "
LM 180 IF A<85 AND A>72 THEN SL=6:SP$="
   SIXTH "
SW 190 IF A>84 THEN SL=7:SP$="SEVENTH "
YY 200 RETURN
YA 210 FOR E=1 TO 96
HR 220 READ A$
KS 230 SPELL$(30*E+1,30*E+29)=A$
EM 240 NEXT E
CH 250 GOSUB 130:POKE 710,SL*16+6:POKE 70
   9,0:V=Z
US 260 ? "K":FOR E=A TO A+Z:? SPELL$(E*30
   ,E*30+29):NEXT E:POSITION 0,22:? SP$;"
   LEVEL SPELLS REMAINING:      ↑":Z=15
RS 270 POSITION 33,22:? LEVEL(SL,LV);"↑"
RD 280 FOR E=1 TO V+1
SC 290 POSITION 5,E:? CHR$(E+64)
EF 300 NEXT E
PH 310 OPEN #1,4,0,"K:":GET #1,CMD:CLOSE
   #1
KD 320 IF CMD=27 THEN STORE$(XX*30,XX*30)
   ="*":GOTO 840
DQ 330 IF CMD=62 THEN LEVEL(SL,LV)=LEVEL(
   SL,LV)+1
GE 340 IF CMD=60 THEN LEVEL(SL,LV)=LEVEL(
   SL,LV)-1
ZB 350 IF CMD>64 AND CMD<V+66 THEN GOSUB
   640
OF 360 IF CMD=45 THEN A=A+16:IF A>85 THEN
    A=85
SK 370 IF CMD=61 THEN GOSUB 440:IF A<1 TH
   EN A=1
SO 380 IF CMD=61 THEN GOTO 250
IZ 390 IF A>=49 THEN Z=11
UG 400 IF A=65 THEN A=61
XY 410 IF A=77 THEN A=73
BQ 420 IF A=89 THEN A=85
OC 430 GOTO 250
SN 440 IF A=85 THEN A=73:Z=11:RETURN
OZ 450 IF A=73 THEN A=61:Z=11:RETURN
ST 460 IF A=61 THEN A=49:Z=11:RETURN
IJ 470 A=A-16
ZQ 480 RETURN
XK 490 RESTORE 570
NN 500 FOR E=1 TO 7
VX 510 FOR I=1 TO 18
SO 520 READ A
EI 530 LEVEL(E,I)=A
GD 540 NEXT I
ER 550 NEXT E
ZN 560 RETURN
MN 570 DATA 2,2,3,4,4,4,4,4,5,5,5,5,5,5,5
   ,5,5,5
HL 580 DATA 0,1,2,2,3,3,4,4,4,4,5,5,5,6,5
   ,5,5,5
WF 590 DATA 0,0,1,2,2,2,3,3,3,3,3,4,5,6,4
   ,5,5,5
KW 600 DATA 0,0,0,0,0,1,1,2,2,3,3,4,5,6,4
   ,4,4,5
QW 610 DATA 0,0,0,0,0,0,0,0,1,2,2,3,4,5,2
   ,3,3,3
FO 620 DATA 0,0,0,0,0,0,0,0,0,0,1,2,3,4,2
   ,2,2,3
YW 630 DATA 0,0,0,0,0,0,0,0,0,0,0,1,2,3,2
   ,2,2,2
XY 640 TEST=INT(100*RND(0)+1)
QG 650 IF LEVEL(SL,LV)<=0 THEN POSITION 0
   ,22:? "K  YOU'VE NO SPELLS LEFT AT THI
   S LEVEL!    ↑"
FT 660 IF LEVEL(SL,LV)<=0 THEN FOR E=1 TO
    100:NEXT E:RETURN
MA 670 IF ASC(SPELL$((A+CMD-65)*30+1,(A+C
   MD-65)*30+1))>128 THEN TEST=0:GOTO 690
WD 680 GOSUB 750
HC 690 TEST=0:GOSUB 820
ER 700 LEVEL(SL,LV)=LEVEL(SL,LV)-1
LM 710 A$=SPELL$((A+CMD-65)*30+1,(A+CMD-6
   5)*30+29):GOSUB 780:RETURN
GD 720 SPELL$((A+CMD-65)*30+1,(A+CMD-65)*
   30+29)="                              "
ZU 730 POSITION 0,22:? "K       YOU MAY N
   OT HAVE THAT SPELL      ↑":FOR E=1 TO
   100:NEXT E
ZL 740 RETURN
MM 750 FLAG=0:IF SPELL$((A+CMD-65)*30+1,(
   A+CMD-65)*30+1)=" " THEN POSITION 0,22
   :FLAG=1
JM 760 IF FLAG=1 THEN ? "KTHERE IS NO SPE
   LL LISTED AT THAT LETTER!↑":FOR E=1 TO
    100:NEXT E:POP :GOTO 740
ZR 770 RETURN
VT 780 IF ASC(A$(1,1))>128 THEN FOR E=1 T
   O LEN(A$):A$(E,E)=CHR$(ASC(A$(E,E))+12
   8):NEXT E
XR 790 STORE$(XX*30,XX*30+29)=A$:XX=XX+1
IH 800 FOR E=1 TO LEN(A$):A$(E,E)=CHR$(AS
   C(A$(E,E))+128):NEXT E:SPELL$((A+CMD-6
   5)*30+1,(A+CMD-65)*30+29)=A$
ZG 810 RETURN
QS 820 FOR SU=1 TO 5:SOUND 0,30,10,10:FOR
    US=1 TO 2:NEXT US:SOUND 0,10,10,10:FO
```

```
   R U5=1 TO 2:NEXT U5:NEXT SU
RK 830 SOUND 0,0,0,0:RETURN
XZ 840 OPEN #1,8,0,"P:":XX=1:PRINT #1,CHR
   $(10);CHR$(14);"MAGICAL SPELLS",,"NOTE
   S";CHR$(20);CHR$(10)
KJ 850 PRINT #1,STORE$(XX*30,XX*30+29),"|
   "
JG 860 XX=XX+1
MF 870 IF STORE$(XX*30,XX*30)="*" THEN RU
   N "D:EQUIPMNT"
QY 880 GOTO 850
CZ 890 DATA Animal Friendship,Ceremony,De
   tect Balance,Detect Magic,Detect Poiso
   n,Detect Snares & Pits,Entangle
XN 900 DATA Faerie Fire,Invisibility To A
   nimals,Locate Animals,Pass Without Tra
   ce,Precipitation,Predict Weather
QM 910 DATA Purify Water,Shillelagh,Speak
    With Animals,Barkskin,Charm Person/Ma
   mmal,Create Water,Cure Light Wounds
RU 920 DATA Feign Death,Fire Trap,Flame B
   lade,Goodberry,Heat Metal,Locate Plant
   s,Obscurement,Produce Flame
OY 930 DATA Reflecting Pool,Slow Poison,T
   rip,Warp Wood,Call Lightning,Cloudburs
   t,Cure Disease,Hold Animal
ZF 940 DATA Know Alignment
HX 950 DATA Neutralize Poison,Plant Growt
   h,Protection From Fire,Pyrotechnics,Sn
   are,Spike Growth,Starshine,Stone Shape
MI 960 DATA Summon Insects,Tree,Water Bre
   athing,Animal Summoning I,Call Woodlan
   d Beings,Control Temperature
AT 970 DATA Cure Serious Wounds,Dispel Ma
   gic,Hallucinatory Forest,Hold Plant,Pl
   ant Door,Produce Fire
BV 980 DATA Protection From Lightning,Rep
   el Insects,Speak With Plants,Animal Gr
   owth,Animal Summoning II
NR 990 DATA Anti-Plant Shell,Commune With
    Nature,Control Winds,Insect Plague,Mo
   onbeam,Pass Plant,Spike Stones
DA 1000 DATA Sticks To Snakes,Transmute R
   ock To Mud,Wall Of Fire,Animal Summoni
   ng III,Anti-Animal Shell
BS 1010 DATA Conjure Fire Elemental,Cure
   Critical Wounds,Feeblemind,Fire Seeds,
   Liveoak,Transmute Water to Dust
PL 1020 DATA Transport Via Plants,Turn Wo
   od,Wall Of Thorns,Weather Summoning,An
   imate Rock,Changestaff
EZ 1030 DATA Chariot of Sustarre,Confusio
   n,Conjure Earth Elemental,Control Weat
   her,Creeping Doom,Finger Of Death
YB 1040 DATA Fire Storm,Reincarnate,Sunra
   y,transmute Metal to Wood
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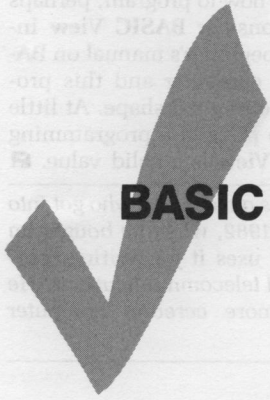

BASIC View

SOFTVIEW CONCEPTS
P.O. Box 1325
Lisle, IL 60532
(312) 968-0605
48K Disk $20.00

by Bob Curtin

Like anyone who's spent a lot of time programming, I've gathered disks full of programming aids and utilities, all designed to make my life easier when I don my programmer's hat. Some—like Brian Moriarty's **Snail** (issue 12), Tom Hudson's **H:BUG** (issue 18), and Charlie Bachand's **Burp!** (issue 9), have stood the test of time. They remain on one side or another of my DOS disk for easy access. But most of those little treasures have drifted to the back of my Flip'N' File, to age there gracefully.

Oh, it's not that I don't need help now and again. That's an absolute. I just can't see using an "aid" that requires more work of you than it's designed to save. Perhaps some of this cynicism is a result of thousands of hours in front of the keyboard (and getting set in my ways), but I think not.

Take, for instance, the product which started this whole monologue: **BASIC View** by Software Concepts. It's a reasonably priced, machine language BASIC debugging tool. With it, you can step through BASIC programs one statement at a time (each statement is displayed in the listing in inverse video, as it's executed), stopping to peer into variables along the way.

You can vary the speed of the program execution from a slow crawl to a very respectable clip. You can stop program execution, check the values of variables, and then restart execution where you stopped. This utility is perfect for debugging those convoluted, multi-nested loops BASIC's noted for.

A "browse" feature allows you to meander through the variable name table, checking values stored there. When you're ready, you may continue stepping through your program.

BASIC View also provides for finding the value of individual variables as the program is running, and even for stuffing values into variables. (You can look at individual elements of arrays—one- or two- dimensional—or the elements of string variables, as well.)

If, instead of entering a variable name into the "find" cell, you enter a number, **BASIC View** will interpret this number as an address and display the value stored there. You can even browse through your computer's memory and see what's going on there.

You may enter any line number from your program (or even one that's close) into the "stop" cell. The program will stop at that point. It's a very handy feature for debugging.

There's a "count" cell to let you enter an integer value. This value will decrement each time the line number stored in the stop cell is run in your program. When the value in count reaches *0*, **BASIC View** will stop executing your program.

All of this would be kind of useless if you couldn't see what your program was putting out, especially when it comes to graphics. Watching your program's listing as it's executed is certainly helpful, but you also need to see just what your program is producing at any given point.

No problem. Simply by pressing the OPTION key, you can toggle back and forth between the program output and the listing. A powerful feature, indeed.

Finally, **BASIC View** allows you to list your program, both forward and backward—a feature I'd love to see in Atari BASIC.

The 24-page manual covers everything you need to know to use the program, and includes some notes for advanced programmers.

Unfortunately, those notes may fall to blind eyes—because, in my opinion, this package has a few drawbacks that could keep it from being used extensively by advanced BASIC programmers.

One problem is the fact that **BASIC View** takes up over 13K of RAM. This leaves roughly 19.5K of program memory (and, if you're using a high resolution graphics mode in your program, that leaves a little over 12K for your BASIC program).

That's not to say **BASIC View** can't be used to debug programs of less than 20K; it certainly can. And it performs quite well. Generally, though, applications programs of any depth require much more memory. **BASIC View** will be useful in debugging individual routines (in fact, it's perfect in that role).

The next problem (cured in the newest version; see below) is that, any time **BASIC View** is stepping through a program in the "run" mode and encounters a GOSUB with additional statements on the same line after the GOSUB, the program and **BASIC View** will quietly—and irrevocably—go into a coma when an attempt to return from the subroutine is made.

Any GOSUB command must be the last statement on a given line. There was no mention of this phenomenon in the documentation which I had with the older version. That put a crimp in my programming style. I resented a programming "aid" which put artificial restrictions on the very language it was designed to help you with.

I'm told that Software Concepts has fixed this problem, and will replace older versions of the program with the new, at no charge.

The third objection I have—and this is nothing but a matter of preference on my part—is that, with the exception of using the keyboard for actual input of data, the program is run with a joystick.

When I'm deep into a programming session (and they regularly last fifteen to twenty hours at a stretch), every conceivable horizontal space within arm's reach is covered with listings, reference books, memory maps, graphics sketches and beer cans. I have enough to do keeping track of the keyboard, never mind changing environments and fumbling around with a joystick. There's absolutely no reason why all input couldn't have been made via the keyboard.

While, as a debugging tool for serious BASIC programmers, **BASIC View** falls somewhat short of the mark, it is an ideal teaching aid for beginning and intermediate BASIC programmers.

I have two children who've been programming in BASIC for some time. Lisa, my eight-year-old, took to **BASIC View** immediately (she's far the more talented of the two).

The concept of "variable" finally hit home when she saw the values of her program variables changing before her eyes. The FOR NEXT loop was also something she had used, but never fully conceptualized. Seeing the program flow helped her immensely. She's been using **BASIC View** as if it were a new video game—simply enjoying running some of her old programs through it, and writing new ones to see what happens.

In this context, I can't praise **BASIC View** enough. Programming texts, tutorials, magazine listings and even real, live teachers can give you the rules and syntax, illustrate how it should be done, even warn you of common programming errors. But **BASIC View** takes those lessons and graphically *shows* the program flow. And, with the various ways you can change values and peer into variables and memory locations, the code side of the program is brought into perspective, as well as what actually happens as a result of the coding.

If you're looking for another book to help you learn how to program, perhaps you should consider **BASIC View** instead. With a beginner's manual on BASIC, an Atari computer and this program, you'll be in good shape. At little more than the price of a programming book, **BASIC View** is a solid value.

Bob Curtin is a machinist who got into computing in 1982, when he bought an Atari 800. He uses it for writing, programming and telecommunications. He prefers the more cerebral computer games.

THE END USER

THIS MONTH:

Books for the Atari 8-bit user, print helpers, disk copiers and some trivia

by Arthur Leyenberger

The 8-bit Atari computers have been around now for about six years. In that time, thousands of users have learned there's a lot of computing power under the hood of the 400/800, XL and XE computers. These Atari computers were ahead of the pack when they were introduced—and still are, compared to the competition.

Although it seems fewer and fewer titles are being published for the 8-bit computers, the successful 1985 Christmas buying season has led some publishers to rethink their positions.

With more and more Atari computers being purchased, there are a greater number of potential software buyers. Moreover, a trend can be observed in the software becoming available. Programmers are pushing the envelope on the capabilities of the 6502 microprocessor, leading to better software for users.

One thing occasionally overlooked by many software publishers, users groups and, yes, even this column, is that there are new Atari users continually seeking information on their computers. These new users want to know what the good programs and useful books are, and, in general, how they can best learn about and enjoy their new trek: the Atari adventure.

With new users in mind, this month's **End User** is devoted entirely to the 8-bit Atari computers. I hope the information presented here helps you to get the most out of Atari computing.

The 8-bit Atari bookshelf.

Whether you're new to Atari computing or have been at it for a while, there are several books that have become classics in the Atari realm. Any or all of these books belong on your Atari bookshelf and will provide the information to make the most of your computer.

Your Atari Computer by Poole, McNiff and Cook (Osborne/McGraw-Hill, 2600 Tenth Street, Berkeley, CA 94710 $20) is the number one reference for Atari users. This invaluable guide provides information on hardware, peripherals and software, in an easy, readable format. There are chapters on graphics and sound capabilities, plus a BASIC tutorial. In addition, the reference section of the text is the most informative to be found anywhere.

The appendices alone are probably worth the price of the book. They include material on memory usage, error messages, functions, PEEK and POKE locations, and conversion tables. Numerous programs and examples abound to reinforce the written material.

The "Purple Book," as it's affectionately called, has recently been updated to include information on the XL line of computers. The Atari XEs are functionally equivalent to the XL machines, so that this book provides complete information for all Atari 8-bit models.

Arthur Leyenberger is a human factors psychologist and free-lance writer living in New Jersey. He has been an Atari enthusiast for four years. When not computing, he enjoys playing with robotic toys.

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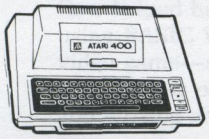

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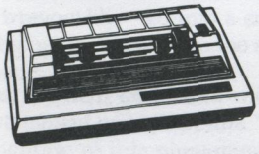

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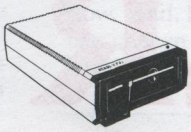

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Another Atari-specific book that's a "must have" reference is published by The Book Company. The Book Company was bought out by Arrays, then Haba took it over. Nevertheless, *The Atari User's Encyclopedia* by Gary Phillips and Jerry White is an up-to-date compilation of facts and information about the Atari 8-bits. Everything from BASIC to Action! is discussed in this reference work.

The *Encyclopedia* gives alphabetical entries by subject. These include descriptions of programming languages, one-paragraph summaries of software, and listings of publications and user groups. Since this book is about two years old, some user groups and publications may no longer exist.

There's also a BASIC tutorial at the beginning of the book, complete with program listings and explanations. Although Jerry White has not been prominent within the Atari community in the last couple years, he is/was considered one of the best Atari BASIC programmers.

The 267-page *Atari User's Encyclopedia* costs $20, from The Book Company, 11223 S. Hindry Avenue, Los Angeles, CA 90045. It's a valuable resource.

I've taught several courses in Atari BASIC over the years, using a variety of texts. The best Atari BASIC book I've found is *Basic Atari BASIC* by Jim Coan and Richard Kushner. This $15 book, published by Hayden Book Co., 10 Mulholland Drive, Hasbrouck Heights, NJ 07604, has been extensively rewritten to include Atari-specific information on such subjects as XL graphics modes 12 through 15, sound and player-missile graphics.

Richard Kushner, a long-time Atari user, is responsible for the detailed, highly accurate information contained in this book. If you want to learn Atari BASIC, this is the book to use.

The fourth book that belongs on every Atari user's bookshelf is a little more technical than those previously mentioned. *Mapping the Atari, Revised Edition* by Ian Chadwick (from COMPUTE! Books, P.O. Box 5406, Greensboro, NC 27403) is a reference you'll often use, but one you probably won't read from cover to cover.

It provides a complete and comprehensive guide to the memory locations in all of the Atari 8-bit computers. Although some of this information is available from other sources, no previous collection has provided complete cross references, detailed explanations *and* a tutorial approach to the topic.

The cross referencing alone is superb, and the amount of information contained in this volume is unbelievable. Three separate index are provided: by subject, label and XL/XE. In addition, DOS 2.5 is explained, a patch program is given to convert Basic Revision B to Revision C and XL/XE enhancements are described. Further, the XL/XE parallel bus is explained, complete with pinout descriptions, The XL/XE graphic modes are discussed and memory management on the 130XE is thoroughly analyzed.

There is no question about it, Ian Chadwick's *Mapping the Atari, Revised Edition* is well worth the price. Add it to your Atari 8-bit library and you'll use it for years to come.

There's another book that makes interesting reading, but is more on the philosophical than the technical side. *The Art of Computer Game Design* by Chris Crawford (Osborne/Mc-Graw Hill, 2600 Tenth Street, Berkeley, CA 94710, $20) is a work that will have you reaching for your thinking cap. In this book, Crawford emphasizes the artistic dimension of computer games. In this way, he reveals game design as a creative process, rather than merely a technical one.

If you're new to Atari computing, the name Chris Crawford may not mean much to you. Until about two years ago, he was Atari's chief game designer and manager of research. His major work, **Eastern Front** (1941), is an exceptionally complex war simulation of the German invasion of Russia. Not only is the game itself excellent, but Chris programmed a number of innovations into it, which were later widely imitated.

Art of Computer Games Design is must reading for anyone interested in war games specifically, or game design in general. Even if you just like to *play* games, this book reads more like a novel than non-fiction.

Print Shop delight.

There's no question that **The Print Shop** from Broderbund Software is an excellent program—and one of the hottest of the year. The way it takes you through the creation of greeting cards, signs, banners and whatnot exemplifies a friendly program. However, infrequently you'll wish it had just a few more features.

Because of the file format used by **The Print Shop** to store icons (graphics), there's no way you can access them from DOS. You can't list them, rename them or look at them in any way, unless you do it from within the program. Fortunately, a couple of utility programs to do this and more have been written by Tom Pazel of Rockaway, New Jersey.

The first program is the **Print Shop Graphics Library Utility**. It does four things that can't be done any other way. First, you can get a printed, alphabetic list of the graphic names on any disk. Second, you can rename any graphic on any disk.

Third, you can obtain a printout of the actual icons on a disk, twenty per page, alphabetized and with the name under each one. Fourth, you can selectively display any graphic.

Tom's other program is a utility to convert **Print Shop** graphic files to **Visualizer** (by Maximus) format files. Any **Print Shop** graphic can be placed anywhere on the screen, and saved to a **Visualizer** file.

Rather than sell these useful utility programs, Tom has placed them in his local user group's disk library. Both are obtained for $8.00 (postage included), by sending a check or money order to the Jersey Atari Computer Group, **Print Shop Utilities**, P.O. Box 356, White House Station, NJ 08889.

Tom Pazel's programs demonstrate several important things. The most important: belonging to a Atari user group is worthwhile. There's a lot of programming talent around—very knowledgeable people who have no aversion to writing a program to serve a particular need that isn't being met. Another important point is that Atari user group members *share*. They share knowledge, ideas, programs and good will.

Next to a subscription to **ANALOG Computing**, there's no better single way to get the most from your Atari computer. Join a user group and let the adventure continue.

I want to thank Bill Martin and the JACG for making these programs available to the readers of **ANALOG Computing**. Sharing information is what Atari computing and this column are all about.

How about you other user groups out there? Got any interesting home-grown software that does something useful? Something that no commercial product does well—or even at all? If you do, by all means let me know about it.

Trivial pursuit.

Atari has produced a number of computers since 1979, starting with the revolutionary 400 and 800, then the not-so-revolutionary 1200XL (almost followed by the 1450XLD), then the 800XL, 65XE and 130XE. During the course of the development of these, the machines were referred to by code names inside the company. Do you know what the code names where and what they were typically based on? The answers are at the end of this month's column.

Faster disk copies.

If you have an Atari 130XE, you can take advantage of the full 128K memory when making disk copies. Newell Industries, a name not unfamiliar to Atari users who've been around for a while, has a new sector copier program that will make a complete copy of the disk in one pass. Of course, if your disk has a larger capacity than 108K (more than a standard Atari disk), multiple passes will be required.

Called the **130XE Sector Copier**, this program was designed specifically for the 130XE. It supports both single- and double-density disk drives, up to 2880 sectors per disk. In addition to copying the disk, this program will automatically format it for you, if you'd like.

The **130XE Sector Copier** will work on one- or two-drive systems. It should be pointed out that this program will not copy disks that have been copy protected. This utility is meant primarily for copying DOS disks and making backups.

For information on the **Copier**, contact Newell Industries, 3340 Nothingham Lane, Plano, TX 75074, (214) 423-1781.

Errata Dept.

I pride myself on ensuring that the information appearing every month in **The End User** is as accurate as I can possibly make it. However, an occasional misstatement finds its way into print. When that happens, I try to get the correct information to you, as soon as possible.

Rick Detlefsen, Austin User Group newsletter editor, recently informed me of an oversight in the issue 35's **End User**.

Rick points out that I had incorrectly said that **SpartaDOS** was the only 8-bit DOS to allow subdirectories. **MYDOS**, from Wordmark Systems, has been around for several years and has also, for the last several months, supported subdirectories.

In addition, **MYDOS** works with high-capacity disks, 5-inch and 8-inch drives (with the ATR 8000), and the Axlon and XE ramdisks. For more information, send a stamped, self-addressed envelope to: MYDOS, 8207 Briarwood Lane, Austin, TX 78758. **MYDOS** sells for $18.00. Thanks for the information, Rick.

Also, I realized—too late—that **Regent Words**'s price was printed as $40 in the **ST-Log** article on word processors last month (issue 42 of **ANALOG Computing**, issue 2 of **ST-Log**). The program is actually selling for $50.

Trivial answers.

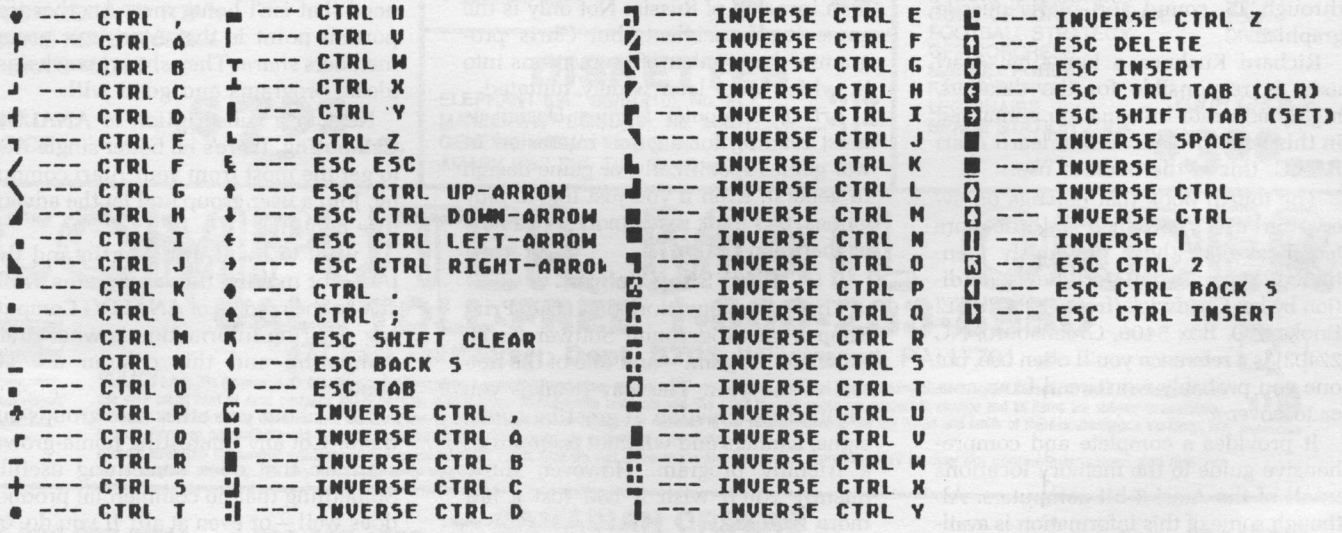
The engineers and designers working on the next generation Atari computers typically used the name of one of their secretaries as a machine's code name. The Atari 400 was nicknamed Candy, the 800 was codenamed Colleen, the ill-fated 1450 was dubbed Sweet 16, and the 800XL was called Sally. I don't know the names of the XE computers or the 1200XL.

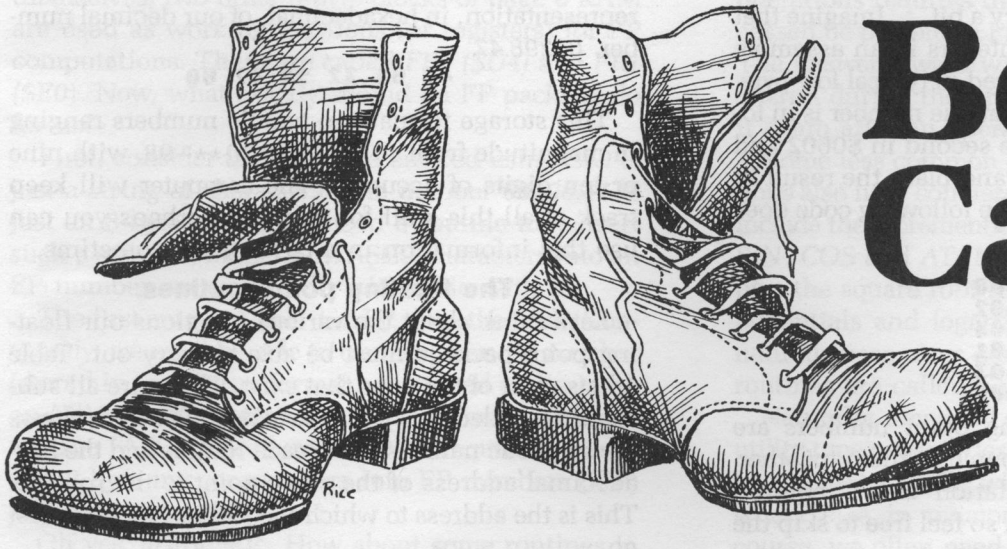
Also, a mysterious computer which was to have three processors (6502, Z80 and 8088) was nicknamed Sierra. This was the last machine under development by James Morgan, and was to run Atari, CP/M and MS-DOS programs. It never saw the light of day.

The End.

That's it for this month's **End User**. Next month, I'll have more 8-bit computer information, as well as some exciting news about products for the Atari ST. Until next month, stay loose.

Some program listings reproduced in **ANALOG Computing** may contain "strange" characters not shown on the keyboards of earlier Atari models. These are special characters which use the CTRL, ESC and "ATARI LOGO" (inverse) keys. Shown below is a list of these characters and the keystrokes used to get them.





Boot Camp

by Karl E. Wiegers

Several recent **Boot Camp** installments have explored the many useful functions performed by the 8-bit Atari's Central Input/Output (CIO) system. Most recently, we saw how to use CIO to create text and graphics displays on-screen.

In future issues, our discussion of graphics will continue in earnest. Look forward to explanations of how to: create mixed-mode graphics displays; use display list interrupts to get many colors on-screen at once; use player/missile graphics; move your players around the screen with a joystick; create scrolling displays; and perform other wondrous feats in assembly language programs.

This month's topic is a bit different. A little-known section of the Atari operating system (OS) is the floating point arithmetic package. It may be *terra incognita* to you, but you've taken advantage of its presence every time you added two numbers together in a BASIC program.

Integer vs. floating point.

The 6502 microprocessor in the Atari can perform numerical operations only on integers. For example, the instruction set for the 6502 contains op codes for integer addition (ADC) and subtraction (SBC). However, many numbers used in computing—and the rest of the world—contain decimal points. They're "floating point" (FP) numbers, rather than integers.

Since 1 byte of RAM can only contain values from *0* to *255*, we clearly need some special storage format to represent floating point numbers. Also, we require some special subroutines to execute mathematical operations with our FP numbers. These operations include both simple arithmetic (addition, subtraction, multiplication and division) and more complex functions like logarithms, exponentials and trigonometric functions.

Let's think about BASIC for a minute. Atari BASIC has only two kinds of variables: numeric and character. Many other versions of BASIC possess different types of numeric variables. One is integer; another is FP. The integer variables typically occupy 2 bytes of memory. This permits a range of unsigned values from *0* through *65535* or signed integers from *−32767* through *+32767*.

There is no integer data type in Atari BASIC. All numbers used by Atari BASIC are stored in a floating point representation requiring 6 bytes of storage per number. This means that even a simple constant like *1* takes up a full 6 bytes every time it appears in a program.

Not only does this eat up memory quickly, but the increased complexity of FP arithmetic takes much more execution time than do calculations with integers. This is one reason why the Atari has a reputation as a v-e-r-y s-l-o-w computer, when it comes to number crunching. However, we're stuck with the

design, so let's see how to work with it in assembly language programs.

Now to refresh your memory a bit. . . Imagine that we wish to add two 2-byte integers in an assembly program. The numbers are stored in typical low-byte, high-byte fashion. Suppose that one number is in locations $0600 and $0601, the second in $0602 and $0603. We wish to add these and place the result in locations $0604 and $0605. The following code does the job:

```
CLC
LDA $0600
ADC $0602
STA $0604
LDA $0601
ADC $0603
STA $0605
```

Now let's see how floating point numbers are stored—and how to add a couple of them together. The details of FP representation aren't required knowledge to do calculations, so feel free to skip the next section if it looks too unappetizing.

FP storage format.

I mentioned earlier that all numbers in Atari BASIC occupy 6 bytes of storage, in floating point form. We need to use this same format for all FP numbers we handle in assembly language.

As an example, consider how the number *63298.47* is stored in Atari FP representation. First, recall that any FP number can be depicted in "scientific notation." This involves writing the number with just one digit to the left of the decimal point and multiplying the result by 10 raised to a power equal to the number of places we had to shift the decimal point. Our candidate would thus be shown as *6.329847* 10**4*.

The Atari uses a slight twist on the scientific notation principle. You need to write your number with either one or two digits to the left of the decimal point, and multiply it by 100 (not 10) raised to the appropriate power. In our case, we're already set: *6.329847*100**2*.

Notice that our FP number now consists of two parts. The number itself, with the decimal point properly positioned, is called the "mantissa." The power to which 100 is raised is called the "exponent." The 6-byte FP representation uses the most significant byte for the exponent and the remaining 5 bytes for the mantissa.

The exponent byte is equal to *$40* plus the value of the exponent. In our case, *$40+$02=$42*. (It gets trickier for negative numbers, but I'll skip that aspect.) The 5 mantissa bytes contain the digits of the number stored as binary-coded decimal, two digits per byte. Think of the *6* before the decimal as an *06*, and we're all set. Here's the full Atari floating point representation, in hexadecimal, of our decimal number, *63298.47*.

```
42 06 32 98 47 00
```

This storage format can handle numbers ranging in magnitude from *10**-98* to *10**+98*, with nine or ten digits of accuracy. The computer will keep track of all this stuff for you, but perhaps you can use this information in a trivia game sometime.

The floating point routines.

Let's think about the various functions our floating point package must be able to carry out. Table 1 lists most of the ones that exist. These are all subroutines, called by a JSR instruction. The table shows the symbolic name given to each routine and the hexadecimal address of the entry point to the routine. This is the address to which the JSR instruction must go.

All these routines reside in the OS ROM, except for the functions *SIN*, *COS*, *ATAN* and *SQR*. These are located in Atari BASIC. BASIC must be available any time you want to access these functions; plug in your BASIC cartridge on the old 400 and 800 models.

FLOATING POINT ROUTINES IN THE ATARI OS

NAME	ADDRESS	FUNCTION PERFORMED
AFP	$D800	Convert ATASCII string in LBUFF to FP number in FR0
FASC	$D8E6	Convert FP number in FR0 to ATASCII string in LBUFF
IFP	$D9AA	Convert integer number in FR0 to FP number in FR0
FPI	$D9D2	Convert FP number in FR0 to integer number in FR0
FSUB	$DA60	FR0 = FR0 – FR1
FADD	$DA66	FR0 = FR0 + FR1
FMUL	$DADB	FR0 = FR0 * FR1
FDIV	$DB28	FR0 = FR0 / FR1
EXP	$DDC0	FR0 = e ** FR0
EXP10	$DDCC	FR0 = 10 ** FR0
LOG	$DECD	FR0 = natural (base e) logarithm of FR0
LOG10	$DED1	FR0 = common (base 10) logarithm of FR0
SIN	$BDA7	FR0 = SIN(FR0) (in BASIC)
COS	$BDB1	FR0 = COS(FR0) (in BASIC)
ATAN	$BE77	FR0 = ATAN(FR0) (in BASIC)
SQR	$BEE5	FR0 = SQR(FR0) (in BASIC)
FLD0R	$DD89	Load FR0 from memory using X and Y registers
FLD1R	$DD98	Load FR1 from memory using X and Y registers
FSTOR	$DDA7	Store value in FR0 from memory using X and Y registers
FMOVE	$DDB6	Move FP number from FR0 to FR1
ZFR0	$DA46	Set all 6 bytes of FR0 equal to 0

Table 1.

Besides these addresses for the FP subroutines themselves, two other 6-byte blocks of page 0 RAM are used as working locations (or registers) for FP computations. These are called *FR0 ($D4)* and *FR1 ($E0)*. Now, what exactly should an FP package do for us?

First, consider that any data entered using CIO is just a string of characters. The number *63298.47* is just an 8-byte string. We need a routine to convert such a string of numeric ATASCII characters into an FP number, so we can do arithmetic with it.

The first entry in Table 1, *AFP*, does the trick. Conversely, we must be able to transform an FP number (stored in the bizarre format I described earlier) into an ATASCII representation suitable for output. Hence, routine FASC. Procedures are also required to convert 2-byte integer numbers into FP numbers (IFP) and vice versa (FPI).

Oh yes, arithmetic. How about some routines to perform your basic floating point subtraction (FSUB), addition (FADD), multiplication (FMUL) and division (FDIV)? Notice from the table that each of these operations requires the two FP numbers being processed be present in FP work registers FR0 and FR1. The answer always winds up in FR0, but FR1 gets altered during the process, so don't ever try to use it again after an operation.

Some less common kinds of mathematical operations also have counterparts in the FP package. These include the aforementioned trigonometric procedures *SIN*, *COS* and *ATAN* (sine, cosine and arctangent), plus the square root function *SQR*. In addition, exponentials and logarithms can be taken, in either natural (base e) or common (base 10) form. These routines are called *EXP*, *EXP10*, *LOG*, and *LOG10*.

Naturally, any good software package needs some utility-type capabilities. The FP package has routines to load FR0 and FR1 with an FP number stored somewhere else in memory (FLD0R and FLD1R). Of course, we often need to move an FP number from register FR0 out to another 6-byte storage location in RAM, and FSTOR does the trick.

FMOVE copies the number in *FR0* into FR1. Finally, ZFR0 zeroes all 6 bytes of FR0 in one quick step. This is a good practice whenever you aren't quite sure what kind of junk is left over in FR0.

Example 1. — FP addition.

Think back to the example of adding a pair of 2-byte integers we saw a little earlier. It only took seven lines of assembly code to do the job. Listing 1 shows how we do the same sort of thing in floating point. It's a lot more work to set up, but the actual calculations fall into place pretty readily.

We begin with two integer numbers that we must convert into their FP representations, add, then store the result someplace convenient in RAM, where we can examine it using the debugger.

The numbers we wish to add together are called *NUM1* and *NUM2*. Lines 100-110 set these to decimal *372* and *145*, but you can try other values if you like. These numbers are stored in 2-byte locations labeled *INT1* and *INT2*. Lines 280-350 split our numbers into high- and low-byte portions, and store them safely away.

Step 2 is to zero the FP work register *FR0* with a call to subroutine ZFR0 in Line 360. Next, move one of our integers into the first 2 bytes of FR0, accomplished in Lines 370-400. The subroutine call in Line 410 to routine IFP converts this into an FP number, still in FR0.

Now move the result into the second FP work register, *FR1*, with the help of routine FMOVE (Line 420). After zeroing FR0 again, move the second integer into the first 2 bytes of FR0 (Lines 440-470).

Another call to IFP sets us up with FP numbers in both FR0 and FR1. A peek at Table 1 shows that we can add these two together and find the result in FR0 with a JSR FADD instruction (Line 490).

We really don't want the result to stay in FR0. I defined a place for it in Line 160, where FPANS is the first byte of a 6-byte block that can hold any FP number. To execute the transfer, load the 6502's X-register with the low byte of the destination address and load the Y-register with the high byte. Lines 500 and 510 accomplish this. Finally, a call to routine FSTOR moves all 6 bytes at once (Line 520), and we're done.

Enter Listing 1, assemble it, enter the debugger, and run the program with a G5000 command. To examine the results, display memory from $0600-060F. With the Atari Assembler-Editor cartridge, a D600,60F command puts the following display on the screen:

```
0600  74 01 91 00 00 00 00 00
0608  41 05 17 00 00 00 00 00
```

Bytes $0600-$0601 contain the hexadecimal value of NUM1 in low-byte, high-byte form. That is, decimal *372* equals hex *$0174*. Similarly, decimal *145* (hex *$0091*) is stored in bytes $0602-$0603. As it happens, *372+145=517*.

The floating point representation of decimal 517 is located in bytes $0608-$060D. Can you predict the contents of these bytes from the discussion of FP storage format above?

Example 2. — Loan payment calculations.

Once upon a time, I wrote a BASIC program to calculate the monthly payment required to amortize a loan with a given initial principal, annual percentage rate of interest and term in months. It then occurred to me that the steps involved in this calculation provided an excellent illustration of many of the floating point routines listed in Table 1.

The BASIC statements you would use to calculate the monthly payment for a loan are:

```
10 IAPR=APR/1200
20 PAY=(PRIN*IAPR)/(1-(IAPR+1)**(-TERM
))
```

where APR is the annual percentage rate of interest (for eleven percent, enter *11*, not *0.11*), *PRIN* is the principal, *TERM* is the duration of the loan in months, and *PAY* is the monthly payment.

Listing 2 performs these computations in assembly language. It will prompt you to enter the initial principal of the loan, the APR, and the term. Make all entries as just numeric digits with a decimal point, if needed. The monthly payment is calculated and displayed in dollars and cents (two decimal places). Then, you can press RETURN to try another calculation. To stop execution of the program, press the BREAK key several times in rapid succession, or press RESET.

The equates list in Listing 2 contains: entries for CIO command operations (Lines 130-140); some constants used by the program (Lines 150-170); some addresses needed by the FP routines (Lines 180-290); four 6-byte storage locations for the FP representations of numbers used in the calculations (Lines 300-330); CIO addresses for screen I/O (Lines 370-420); and entry points for the FP routines used by the program (Lines 460-590).

The biggest nuisance about assembly language programming is that you have to keep track of everything yourself. In BASIC, we could just create variables like *PRIN*, *IAPR*, *DENOM* and *PAY* out of thin air and think about them no further.

When doing FP calculations in assembly, we need to consciously set aside a 6-byte block of RAM for

every number we wish to store. I've put mine in the ever-popular page 6, but you can put them in any safe place you like.

BASIC has another talent we take for granted: the ability to decipher complex mathematical expressions and calculate the result. Since our available FP routines only handle simple operations like division, we must first dissect a complex equation into a series of elementary steps.

It helps your planning to remember that the result of an operation winds up in register FR0, where it's ready for the next step immediately. I kept this in mind as I broke apart the equations needed to calculate a monthly payment. Now, let's walk through Listing 2 and see how it works.

Lines 660-710 set up to print a prompt message for the user to enter the initial principal. The subroutine called *WRITE* is found in Lines 2150-2240. It completes the CIO PUTREC operation and displays the line on-screen.

Line 720 calls subroutine INPUT, which resides in Lines 2460-2630. It uses the CIO GETREC command to read a string of ATASCII characters from the keyboard and place them into a buffer called *LBUFF*.

Line 730, since we can't do arithmetic with these characters, calls yet another subroutine, MAKEFP (Lines 2650-2800). MAKEFP converts the characters in LBUFF into a floating point number in FR0, using the AFP function in the FP package.

If an error occurs during the conversion to FP, the carry flag in the 6502 status register is set. This would happen if, for example, you had a letter as the first character in LBUFF. (If the first character is numeric, then the AFP routine works until it encounters a character that cannot be part of an FP number, then it quits.) Hence, the BCS instruction in Line 2790 transfers control to the routine labelled *AFPERR* (Lines 2840-2920) to tell the user about the problem, accept another input line and try again.

Now that we have the loan principal stored in FP form in FR0, we need to stash it safely in the 6-byte storage location labelled *PRIN*. **Lines 740-760** do the trick, using routine FSTOR to execute the move (really, it's a copy; FR0 does not change).

Lines 770-940 are equivalent to the simple BASIC expression shown in statement 10 a few paragraphs back. First, load the decimal integer *1200* into the first 2 bytes of FR0, then call IFP to transform it to FP and, finally, call FMOVE to move the result into FR1.

Next, input the value for APR just as we did for PRIN (Lines 840-890). We now have *FR0=APR* and *FR1=1200*, so a call to FDIV (Line 900) will give us the result we seek in FR0. **Lines 920-940** store this result in IAPR.

Some of the FP subroutines set the carry flag if a mathematical error occurs, such as division by zero.

Line 910 illustrates the trap I set after many of the numerical FP operations for such errors. Because of the length of this program, I had to use a two-stage branch to get to the actual error-handling routine. The first branch is always to MTHERR (Line 1320), which forwards control on to routine BADMTH at Line 1730. An error message is printed, and you have to start the entire calculation over again.

I won't explain every single statement in Listing 2. By now, you see what I'm up to: input the necessary data and store in FP form; break the complex expression into bite-sized (no pun intended) pieces that can be processed by the available FP routines; transfer numbers among FR0, FR1 and memory as necessary with the utility subroutines FMOVE, FSTOR, FLD0R and FLD1R, until the entire calculation is complete.

There are a couple of tricks I should explain. First, the denominator of the equation shown in BASIC statement 20 above is fairly complex. I decided to store the result of this calculation in an intermediate FP variable called *DENOM*, rather than trying to keep track of everything in FR0 and FR1.

Second, there's no FP routine to directly perform the *(IAPR+1)**(-TERM)* operation, an exponentiation. I used a mathematical trick. We take the logarithm of *(IAPR+1)*, multiply it times *(-TERM)* and take the antilogarithm of the result, using the EXP10 routine. Most of the calculations you're likely to do won't require getting this creative.

By the time we reach Line 1570, the monthly payment has been calculated and stored in PAY. To show it on the screen, we need to do a little more work. Line 1620 calls subroutine OUTPUT, which wraps it all up in Lines 1820-2240.

OUTPUT first converts the FP number in FR0 (the payment) into an ATASCII string in LBUFF, using routine FASC. But LBUFF is 128 characters long, and we only want to show the characters up to the decimal point, plus two to the right of the decimal. The final interesting character in LBUFF from the FASC

conversion has the most significant bit (bit 7) set, so at least we can deduce where the resulting string terminates.

Subroutine ADDEOL (Lines 2260-2440) scans through the characters in LBUFF until it finds one that's negative (bit 7 set). This is our final byte. The routine then clears bit 7 of that final byte, advances 1 more byte, and adds an ATASCII EOL (carriage return) character, so that printing with the CIO PUTREC command will stop at that point.

Going back to Line 1890, the next few lines scan through LBUFF until a decimal point is located. Then it skips over the next 2 bytes, since we want to keep two places past the decimal (the cents part of the monthly payment). Any remaining characters in LBUFF up to the EOL character are set to ATASCII blanks (decimal *32*, hex *$20*), so they aren't printed. Finally, the answer is displayed on-screen in Lines 2100-2240.

Conclusion.

This has been a pretty heavy session, but now you know a lot about a part of the Atari OS you may never have heard of before. Next time, we'll get back to something a little less somber—the famous Atari graphics.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor*, page 21.

Listing 1.
BASIC listing.

```
10 ;Listing 1 for floating point
20 ;operations in assembly language
30 ;
40 ;convert two integers to FP
50 ;and add them together
60 ;
70       .OPT NO LIST
80 ;
90 ;
0100 NUM1 =  372      ;add these two
0110 NUM2 =  145      ;numbers together
0120 FR0 =   $D4      ;2 floating point
0130 FR1 =   $E0      ;work registers
0140 INT1 =  $0600    ;store one int.
0150 INT2 =  $0602    ;and the other
0160 FPAN5 = $0608    ;store FP answer
0170 IFP =   $D9AA    ;integer to FP
0180 FADD =  $DA66    ;add 2 FP numbers
0190 FSTOR = $DDA7    ;move FR0
0200 FMOVE = $DDB6    ;move FR0 to FR1
0210 ZFR0 =  $DA44    ;zero FR0
0220 ;
0230 ;set starting address
0240 ;
0250     *=  $5000
0260 ;
0270     CLD          ;binary mode!
0280     LDA #NUM1&255 ;put the two
0290     STA INT1     ;nums we want to
0300     LDA #NUM1/256 ;add into their
0310     STA INT1+1   ;integer storage
0320     LDA #NUM2&255 ;locations
0330     STA INT2
0340     LDA #NUM2/256
0350     STA INT2+1
0360     JSR ZFR0     ;set FR0=0
0370     LDA INT1     ;move 1st number
0380     STA FR0      ;into first two
0390     LDA INT1+1   ;bytes of FR0
0400     STA FR0+1
0410     JSR IFP      ;convert to FP
0420     JSR FMOVE    ;move it to FR1
0430     JSR ZFR0     ;set FR0=0
0440     LDA INT2     ;move second
0450     STA FR0      ;number into FR0
0460     LDA INT2+1
0470     STA FR0+1
0480     JSR IFP      ;convert to FP
0490     JSR FADD     ;+ to one in FR1
0500     LDX #FPAN5&255 ;store result,
0510     LDY #FPAN5/256 ;FR0
0520     JSR FSTOR    ;in FPAN5
0530     BRK          ;all done
```

Listing 2.
Assembly listing.

```
10 ;Listing 2 for floating point
20 ;operations in assembly language
30 ;
40 ;This program allows you to input
50 ;an initial principal, annual
60 ;percentage rate, and term in
70 ;months for a loan.  It then
80 ;calculates the monthly payment
90 ;needed to amortize the loan.
0100 ;
0110     .OPT NO LIST
0120 ;
0130 GETREC = $05     ;equates for CIO
0140 PUTREC = $09     ;operations
0150 BLANK = $20      ;ATASCII blank
0160 DECIMAL = $2E    ;ATASCII period
0170 EOL =   $9B      ;carriage return
0180 LENGTH = $CB     ;temp. variable
0190 FR0 =   $D4      ;the two FP work
0200 FR1 =   $E0      ;registers
0210 CIX =   $F2      ;offset pntr to
0220 ;               character of LBUFF
0230 ;               for AFP routine
0240 INBUFF = $F3     ;2-byte pntr to
0250 ;               text buffer used by
0260 ;               FASC and AFP subs.
0270 LBUFF = $0580    ;128-byte buffer
0280 ;               for FASC (output)
0290 ;               and AFP (input)
0300 PRIN =  $0600    ;RAM loc. for
0310 IAPR =  $0606    ;FP variables,
0320 DENOM = $060C    ;six bytes each
0330 PAY =   $0612
0340 ;
0350 ;CIO addresses for IOCB #0
0360 ;
0370 ICCOM = $0342    ;command byte
0380 ICBAL = $0344    ;buffer address,
0390 ICBAH = $0345    ;lo and hi bytes
0400 ICBLL = $0348    ;buffer length,
0410 ICBLH = $0349    ;lo and hi bytes
0420 CIOV =  $E456    ;CIO entry point
0430 ;
```

```
0440 ;equates for FP routines
0450 ;
0460 AFP =    $D800    ;ATASCII to FP
0470 FASC =   $D8E6    ;FP to ATASCII
0480 IFP =    $D9AA    ;integer to FP
0490 FSUB =   $DA60    ;subtraction
0500 FADD =   $DA66    ;addition
0510 FMUL =   $DADB    ;multiplication
0520 FDIV =   $DB28    ;division
0530 FLD0R =  $DD89    ;load FR0
0540 FLD1R =  $DD98    ;load FR1
0550 FSTOR =  $DDA7    ;store FR0
0560 FMOVE =  $DDB6    ;move FR0 to FR1
0570 EXP10 =  $DDCC    ;FR0 = 10**FR0
0580 LOG10 =  $DED1    ;common log, FR0
0590 ZFR0 =   $DA44    ;zero FR0
0600 ;
0610 ;Set starting address
0620 ;
0630     *=  $5000
0640 ;
0650     CLD           ;binary mode!
0660 START
0670     LDX #0        ;use IOCB #0
0680     LDA #LINE1&255 ;prompt
0690     STA ICBAL,X ;using WRITE sub
0700     LDA #LINE1/256 ;for CIO
0710     JSR WRITE     ;output
0720     JSR INPUT     ;input PRIN,
0730     JSR MAKEFP    ;convert to FP
0740     LDX #PRIN&255 ;lo byte in X
0750     LDY #PRIN/256 ;hi byte in Y
0760     JSR FSTOR     ;store FR0 in RAM
0770     LDA #1200&255 ;store decimal
0780     STA FR0       ;integer 1200
0790     LDA #1200/256 ;in FR0
0800     STA FR0+1     ;and FR0+1
0810     JSR IFP       ;convert to FP
0820     JSR FMOVE     ;transfer to FR1
0830     LDX #0        ;use IOCB #0
0840     LDA #LINE2&255 ;prompt, APR
0850     STA ICBAL,X
0860     LDA #LINE2/256
0870     JSR WRITE
0880     JSR INPUT     ;input APR into
0890     JSR MAKEFP    ;FR0
0900     JSR FDIV      ;FR0=APR/1200
0910     BCS MTHERR    ;math error?
0920     LDX #IAPR&255 ;move result to
0930     LDY #IAPR/256 ;IAPR(6-byte FP
0940     JSR FSTOR     ;storage in RAM)
0950     JSR FMOVE     ;transfer to FR1
0960     JSR ZFR0      ;set FR0=0
0970     LDA #1        ;store 1 in FR0
0980     STA FR0
0990     JSR IFP       ;convert to FP
1000     JSR FADD      ;FR0=IAPR+1
1010     BCS MTHERR    ;math error?
1020     JSR LOG10     ;FR0=LOG(IAPR+1)
1030     BCS MTHERR    ;math error?
1040     JSR FMOVE     ;transfer to FR1
1050     LDX #0        ;use IOCB #0
1060     LDA #LINE3&255 ;prompt, TERM
1070     STA ICBAL,X
1080     LDA #LINE3/256
1090     JSR WRITE
1100     JSR INPUT     ;input TERM
1110     JSR MAKEFP    ;convert to FP
1120     JSR FMUL      ;FR0=TERM*
1130 ;                   LOG(IAPR+1)
1140     BCS MTHERR    ;math error?
1150     JSR FMOVE     ;transfer to FR1
1160     JSR ZFR0      ;set FR0=0
1170     JSR FSUB      ;FR0=-TERM*
1180 ;                   LOG(IAPR+1)
1190     BCS MTHERR    ;math error?
1200     JSR EXP10     ;FR0=(IAPR+1)**
1210 ;                   (-TERM)
1220     BCS MTHERR    ;math error?
1230     JSR FMOVE     ;transfer to FR1
1240     JSR ZFR0      ;set FR0=0
1250     LDA #1        ;store 1 in FR0
1260     STA FR0
1270     JSR IFP       ;convert to FP
1280     JSR FSUB      ;FR0=1-(IAPR+1)**
1290 ;                   (-TERM)
1300     BCS MTHERR    ;math error?
1310     BCC GOON      ;no, keep going
1320 MTHERR
1330     BCS BADMTH    ;2-step branch
1340 GOON
1350     LDX #DENOM&255 ;move result
1360     LDY #DENOM/256 ;to DENOM for
1370     JSR FSTOR     ;moment or two
1380     JSR ZFR0      ;set FR0=0
1390     LDX #IAPR&255 ;load IAPR into
1400     LDY #IAPR/256 ;FR0 using X-
1410     JSR FLD0R     ;and Y-registers
1420     LDX #PRIN&255 ;load PRIN into
1430     LDY #PRIN/256 ;FR1 using X-
1440     JSR FLD1R     ;and Y-registers
1450     JSR FMUL      ;FR0=IAPR*PRIN
1460     BCS MTHERR    ;math error?
1470     LDX #DENOM&255 ;DENOM into
1480     LDY #DENOM/256 ;FR1 as usual
1490     JSR FLD1R     ;FR1=DENOM
1500     JSR FDIV      ;FR0=IAPR*PRIN/
1510 ;                   (1-(IAPR+1)**
1520 ;                   (-TERM))
1530     BCS MTHERR    ;math error?
1540     LDX #PAY&255 ;store answer in
1550     LDY #PAY/256 ;in PAY
1560     JSR FSTOR
1570     LDX #0        ;use IOCB #0
1580     LDA #LINE4&255 ; "MONTHLY
1590     STA ICBAL,X ;"PAYMENT IS:"
1600     LDA #LINE4/256
1610     JSR WRITE
1620     JSR OUTPUT    ;show payment
1630 RESTRT
1640     LDA #LINE5&255 ;show prompt
1650     STA ICBAL,X ;to go on
1660     LDA #LINE5/256
1670     JSR WRITE
1680     JSR INPUT     ;get any input
1690     JMP START     ;do it all again
1700 ;
1710 ;routine to handle FP math errors
1720 ;
1730 BADMTH
1740     LDX #0        ;use IOCB #0
1750     LDA #ERMSG1&255 ;show message
1760     STA ICBAL,X ;on screen
1770     LDA #ERMSG1/256
1780     JSR WRITE
1790     CLC
1800     BCC RESTRT    ;start all over
1810 ;
1820 ;subroutine to output the answer
1830 ;first convert FP number in FR0
1840 ;to ATASCII string in LBUFF
1850 ;
1860 OUTPUT
1870     JSR FASC
1880     JSR ADDEOL    ;add EOL to end
1890     STY LENGTH    ;Y=bytes in LBUFF
1900     LDY #255      ;scan LBUFF to
1910 ;                   find a decimal
1920 LOOP1
1930     CPY LENGTH    ;at end of LBUFF?
1940     BEQ SHOWIT    ;yes,print answer
1950     INY           ;no,keep going
1960     LDA (INBUFF),Y ;get next byte
1970     CMP #DECIMAL ;decimal point?
```

```
1980      BNE LOOP1    ;no, go on
1990      INY          ;yes, skip next 2
2000      INY          ;bytes to keep 2
2010 ;                  decimal places
2020 LOOP2
2030      INY          ;keep going
2040      CPY #LENGTH  ;at end of LBUFF?
2050      BEQ SHOWIT   ;yes,print answer
2060      LDA #BLANK   ;no, replace byte
2070      STA (INBUFF),Y ;in LBUFF with
2080 ;                  a blank
2090      BNE LOOP2    ;go on
2100 SHOWIT
2110      LDX #0       ;use IOCB #0
2120      LDA INBUFF   ;tell CIO where
2130      STA ICBAL,X  ;to find the
2140      LDA INBUFF+1 ;answer string
2150 WRITE
2160      STA ICBAH,X  ;output routine
2170      LDA #PUTREC  ;using CIO
2180      STA ICCOM,X  ;PUTREC function
2190      LDA #40      ;max output line
2200      STA ICBLL,X  ;length = 40
2210      LDA #0
2220      STA ICBLH,X
2230      JSR CIOV     ;go do it
2240      RTS
2250 ;
2260 ;subroutine to find last
2270 ;character in LBUFF (has bit 7
2280 ;set), clear bit 7, and add a
2290 ;carriage return to the
2300 ;following byte so we can print
2310 ;the line using CIO
2320 ;
2330 ADDEOL
2340      LDY #255     ;start at byte 0
2350 LOOP3
2360      INY          ;point to next
2370      LDA (INBUFF),Y ;byte, get it
2380      BPL LOOP3    ;if >0, go on
2390      AND #127     ;if <0, keep the
2400      STA (INBUFF),Y ;lowest 7 bits
2410      INY          ;go one more byte
2420      LDA #EOL     ;put a carriage
2430      STA (INBUFF),Y ;return there
2440      RTS          ;all done
2450 ;
2460 ;subroutine to input ATASCII
2470 ;string into LBUFF and convert
2480 ;it to floating point in FR0
2490 ;
2500 INPUT
2510      LDX #0       ;use IOCB #0
2520      LDA #GETREC  ;input a record
2530      STA ICCOM,X
2540      LDA #LBUFF&255 ;rec will go
2550      STA ICBAL,X  ;into buffer at
2560      LDA #LBUFF/256 ;address LBUFF
2570      STA ICBAH,X
2580      LDA #40      ;max length of
2590      STA ICBLL,X  ;input buffer is
2600      LDA #0       ;40 bytes
2610      STA ICBLH,X
2620      JSR CIOV     ;go do it
2630      RTS          ;all done
2640 ;
2650 ;subroutine to convert data in
2660 ;input buffer LBUFF to FP number
2670 ;in FR0
2680 ;
2690 MAKEFP
2700      LDA #LBUFF&255 ;load addr of
2710      STA INBUFF   ;LBUFF into
2720      LDA #LBUFF/256 ;INBUFF (lo)
2730      STA INBUFF+1 ;and INBUFF+1
2740      LDA #0       ;offset into this
2750      STA CIX      ;buffer is zero
2760      JSR AFP      ;convert number
2770 ;                   in LBUFF to FP
2780 ;                   number in FR0
2790      BCS AFPERR   ;conversion err?
2800      RTS          ;all done
2810 ;
2820 ;AFP conversion error
2830 ;
2840 AFPERR
2850      LDX #0       ;use IOCB #0
2860      LDA #ERM5G2&255 ;show message
2870      STA ICBAL,X ;on screen
2880      LDA #ERM5G2/256
2890      JSR WRITE
2900      JSR INPUT    ;get another
2910      CLC          ;input record
2920      BCC MAKEFP   ;and try again
2930 ;
2940 ;Text lines to be printed
2950 ;
2960 LINE1
2970      .BYTE 125,"Enter the "
2975      .BYTE "initial "
2980      .BYTE "principal:",EOL
2990 LINE2
3000      .BYTE "Enter the APR:",EOL
3010 LINE3
3020      .BYTE "Enter the term:",EOL
3030 LINE4
3040      .BYTE "Monthly Payment ",EOL
3045      .BYTE "is:",EOL
3050 LINE5
3060      .BYTE "Press "
3070      .BYTE 210,197,212,213,210,206
3080      .BYTE " to go on",EOL
3090 ERM5G1
3100      .BYTE "A MATHEMATICAL ERROR "
3110      .BYTE "HAS OCCURRED.",EOL
3120 ERM5G2
3130      .BYTE "CAN'T CONVERT TO FP; "
3140      .BYTE "PLEASE TRY AGAIN",EOL
```

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THE Calendar Printer

by David Plotkin

When issue 35 of **ANALOG Computing** (October 1985) arrived, it was with much delight that I created the AUTORUN.SYS file for **G:**, the graphics driver. If you own a printer and missed this astoundingly useful utility, go punch it in *right now.* It'll be worthwhile. . . and you'll need it for this program.

By the way, although not mentioned in the article, **G:** also works with Action! To get an exact listing of your Action! program, use SHIFT-CTRL-W and answer the prompt with *G:*. The graphics driver doesn't seem to interfere with Action! programs.

The **Calendar Printer** is a BASIC program, which will print a calendar of any month specified. Now, that may not seem earth-shaking to you. However, it will print any graphics 8, graphics 7.5, or "MicroIllustrator" screen above the actual calendar, giving quite a nice effect. And it will even handle MicroIllustrator screens in their compacted format; you don't need to "uncompact" them.

To use the **Calendar Printer**, you must boot up with a disk containing the AUTORUN.SYS file created by **G:**. I keep my **Calendar Printer** on the same disk with this AUTORUN.SYS file, so there's no problem.

While a printer driver could have been added to **Calendar Printer** so it wouldn't be dependent on **G:**, this would have added considerably to the length of the program—which is really quite short.

After booting up and running the program, you will be instructed to insert your picture program into disk 1 and press RETURN, giving you a directory. The name of the file which contains the picture will be requested. The *D:* is not required, although it won't hurt to add it. You must use *D2:* if you want to retrieve your file from drive number 2.

You'll be asked whether the picture is in MicroPainter (uncompressed) or MicroIllustrator (compressed) format. If in MicroIllustrator, the picture will be loaded (and automatically uncompacted), and printing will begin. . . be sure your printer's ready!

If the picture is in MicroPainter format, then you'll be asked if it's in graphics 8 or 7.5. The **Calendar** doesn't really care, but different screen colors are used, depending on the choice, to make it easier to see the picture on-screen while it's being printed.

Calendar Printer *continued*

After the picture's been dumped to the printer, the month and year for which the calendar is to be generated will be requested. Use one or two digits for the month, and make sure to use *all four* digits for the year if it has four (just typing *86* instead of *1986* will generate the calendar for the appropriate month in the year 86 A.D.—not particularly useful). The calendar for the requested month will be dumped to the printer on the same page as the picture.

Program explanation.

Lines 40-50 print the disk directory.

Lines 60-70 request the name of the file for the picture.

Lines 80-140 request the type of picture and set graphics 8 mode.

Line 150 sets up ANTIC mode E (graphics 7.5) if the picture is in either MicroIllustrator or MicroPainter format.

Lines 160-200 choose the appropriate colors and load either a MicroPainter picture (346) or MicroIllustrator picture (350).

Line 210 dumps the picture to the printer, using **G:**.

Lines 220-400 request the month and year, then set up the calendar. The conversion of X- and Y-coordinates to ZX and ZY, and equating of the various strings to ZA$ is so that the subroutine at Line 930 can be used. This subroutine plots what would normally be graphics 0 onto a graphics 8 screen. Although the **G:** graphics driver is capable of doing a graphics 0 screen dump, the graphics 8 dump is far more versatile, with a multitude of heights and widths, so that the picture and calendar together fill the page very nicely.

Line 410 dumps the calendar to the printer.

Lines 430-460 form the error trap routine.

Lines 480-920 will set up and dimension the strings. LOD$ is the CIO call to load a standard (MicroPainter) file to the screen. MA$ sets up an ANTIC Mode E screen (graphics 7.5). MAIN$ is the uncompacting routine for MicroIllustrator files. PRINT$ is the routine to plot graphics 0 characters on the graphics 8 screen. The rest of the strings are used to set up the calendar graphics.

Lines 930-940 call PRINT$ to plot on the graphics 8 screen.

Now you're ready to print out a monthly calendar for whatever point in time you wish. It can be a great help in getting organized.

David Plotkin, with his Master's degree in Chemical Engineering, is a Project Engineer for Chevron U.S.A. He purchased his Atari in 1980 and is interested in programming and game design, as well as word processing.

The two-letter checksum code preceding the line numbers here is *not* a part of the BASIC program. For further information, see the *BASIC Editor*, page 21.

Listing 1.
BASIC listing.

```
HX 10 GOSUB 480:REM INITIALIZE STRINGS
MG 20 REM GET DIRECTORY
LR 30 GRAPHICS 0
KO 40 CLOSE #1:? "■":POKE 710,0:POKE 709,
   40:? "INSERT DISK DRIVE #1, PRESS RETU
   RN":INPUT J$:OPEN #1,6,0,"D:*.*"
IM 50 ? "■":TRAP 60:FOR N=0 TO 63:INPUT #
   1,FILE$:POSITION 2+19*((N/2)=INT(N/2))
   ,INT(N/2):? FILE$;:NEXT N
FV 60 POP :CLOSE #1:? :? "ENTER FILENAME"
   ;:INPUT FILE$
TD 70 IF FILE$(1,2)<>"D:" AND FILE$(1,3)<
   >"D1:" AND FILE$(1,3)<>"D2:" THEN J$=F
   ILE$:FILE$(1,2)="D:":FILE$(3)=J$
NF 80 TRAP 80:? CHR$(125):POSITION 2,10:?
    "IS THIS PICTURE FILE "
AB 90 POSITION 2,11:? "■)MICROPAINTER TYP
   E (UNCOMPRESSED) OR";
JL 100 POSITION 2,12:? "■)MICROILLUSTRATO
   R (COMPRESSED)";:INPUT PICTYPE
CB 110 IF PICTYPE=2 THEN GOTO 140
YO 120 TRAP 120:POSITION 2,14:? "IS THE P
   ICTURE"
UK 130 POSITION 2,15:? "■)GRAPHICS 8 OR":
   POSITION 2,16:? "■)GRAPHICS 7.5";:INPU
   T GRMODE:IF GRMODE>2 THEN 130
MT 140 GRAPHICS 8+16:IF (PICTYPE=1 AND GR
   MODE=1) THEN GOTO 160
WP 150 N=USR(ADR(MA$)):REM ANTIC E
NX 160 TRAP 430:CLOSE #1:OPEN #1,4,0,FILE
   $:SLOC=PEEK(88)+PEEK(89)*256
OM 170 IF PICTYPE=1 AND GRMODE=1 THEN POK
   E 710,15:POKE 709,0
SU 180 IF PICTYPE=1 AND GRMODE=2 THEN POK
   E 708,50:POKE 709,100:POKE 710,12:POKE
    712,0
RJ 190 IF PICTYPE=1 THEN X=USR(ADR(LOD$),
   SLOC,7680):CLOSE #1
OR 200 IF PICTYPE=2 THEN X=USR(ADR(MAIN$)
   ):CLOSE #1:REM LOAD MICILLUSTRATOR
AW 210 XIO 64,#1,3,0,"G3:"
SL 220 GRAPHICS 0
FP 230 TRAP 230:POSITION 3,5:? "INPUT MON
   TH(XX)";:INPUT M:POSITION 3,6:? "INPUT
    YEAR(XXXX)";:INPUT Y:D=1
AL 240 IF M>12 OR M<1 OR Y<0 THEN 230
RY 250 IF M<3 THEN M=M+12:Y=Y-1
YB 260 N=2*M+INT(0.6*(M+1))+Y+INT(Y/4)-IN
   T(Y/100)+INT(Y/400)+3
AL 270 N=INT((N/7-INT(N/7))*7+0.05):Q=N:G
   RAPHICS 8+16
TF 280 POKE 752,1:ZX=2:ZY=0:ZA$=D$:GOSUB
   930:ZY=1:ZA$=TOP$:GOSUB 930
IS 290 FOR X=1 TO 5:FOR N=1 TO 2:ZA$=VID$
   :ZY=(1+N+(X-1)*3):GOSUB 930:NEXT N
ZZ 300 ZY=ZY+1:ZA$=MID$:GOSUB 930:NEXT X
RU 310 FOR N=1 TO 2:ZA$=VID$:ZY=(16+N):GO
   SUB 930:NEXT N
RW 320 ZA$=BOT$:ZY=19:GOSUB 930
DG 330 IF M>12 THEN M=M-12:Y=Y+1
PC 340 ZX=16:ZY=22:ZA$=M$(M*3-2,M*3):ZA$(
   4,4)=" ":ZA$(5)=STR$(Y):GOSUB 930
```

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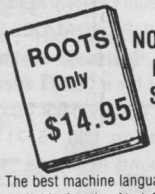

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Calendar Printer *continued*

```
KX 350 DY=VAL(DY$(M*2-1,M*2)):IF M=2 THEN
    IF (Y/4=INT(Y/4) AND Y/100<>INT(Y/100
   )) OR Y/400=INT(Y/400) THEN DY=DY+1
DL 360 IF Q=0 THEN Q=7
OI 370 Q=3+(Q-1)*5:X=Q:Y=3:D=1
EY 380 ZX=X:ZY=Y:ZA$=STR$(D):GOSUB 930:IF
    D=DY THEN 410
MZ 390 D=D+1:X=X+5:IF X>33 THEN X=3:Y=Y+3
PN 400 GOTO 380
AY 410 XIO 64,#1,3,0,"G3:"
QD 420 GOTO 30
EG 430 GRAPHICS 0:POSITION 3,10:? "CAN'T
   FIND THIS FILE!!!":CLOSE #1
JL 440 POSITION 3,11:? "PRESS RETURN TO C
   ONTINUE":POKE 764,255
LM 450 IF PEEK(764)<>255 THEN 20
PC 460 GOTO 450
OH 470 END
AL 480 GRAPHICS 0:POKE 710,0:? "Initializ
   ing..."
QW 490 DIM LOD$(28),J$(18),FILE$(18),ZA$(
   40),PRINT$(167)
WH 500 DIM MAIN$(342),PIC$(15),MA$(55)
VH 510 DIM DAY$(21),BOT$(40),TOP$(40),MID
   $(40),VID$(40),D$(40),M$(40),DY$(24)
DJ 520 FOR X=1 TO 28:READ A:LOD$(X)=CHR$(
   A):NEXT X
ME 530 DATA 104,169,7,141,82,3,104,141,85
   ,3,104,141,84,3,104,141,89,3,104,141,8
   8,3,162,16,32,86,228,96
BU 540 FOR X=1 TO 55:READ A:MA$(X)=CHR$(A
   ):NEXT X
XW 550 DATA 104,173,48,2,133,0,173,49,2,1
   33,1,160,199,177,0,170,41,15,201,15,20
   8,4,202,138
UY 560 DATA 145,0,136,192,255,208,238,165
   ,88,24,105,1,133,0,165,89,105,30,133,1
   ,160,3,177,0,153,196,2,136,16,248,96
CV 570 FOR A=1536 TO 1556:READ B:POKE A,B
   :NEXT A
HG 580 DATA 162,16,169,1,157,72,3,169,0,1
   57,73,3,32,86,228,48,1,96,104,104,96
BL 590 FOR X=1 TO 342:READ A:MAIN$(X)=CHR
   $(A):NEXT X
YY 600 DATA 104,162,16,169,7,157,66,3,169
   ,232,157,68,3,169,0,157,69,3,169,1,157
   ,72,3,169,0
IU 610 DATA 157,73,3,169,0,133,224,32,0,6
   ,165,224,201,7,240,13,201,13,240,16,20
   1,26,240,60,230
QM 620 DATA 224,24,144,234,165,232,133,23
   4,24,144,244,165,232,141,196,2,230,224
   ,32,0,6,165,232,141,197
SY 630 DATA 2,230,224,32,0,6,165,232,141,
   198,2,230,224,32,0,6,165,232,141,199,2
   ,230,224,32,0
EL 640 DATA 6,165,232,141,200,2,24,144,19
   6,169,0,133,236,133,230,165,88,133,224
   ,133,228,165,89,133,225
EK 650 DATA 133,229,32,0,6,192,136,240,94
   ,169,0,133,227,165,232,41,128,133,235,
   165,232,41,127,133,226
OD 660 DATA 208,14,32,0,6,165,232,133,227
   ,32,0,6,165,232,133,226,198,226,165,23
   5,208,28,32,0,6
QZ 670 DATA 165,232,133,233,24,144,47,198
   ,226,169,255,197,226,208,245,198,227,1
   69,255,197,227,208,237,240,183
YI 680 DATA 32,0,6,165,232,133,233,24,144
   ,19,198,226,169,255,197,226,208,238,19
   8,227,169,255,197,227,208
JI 690 DATA 230,240,155,96,169,2,197,234,
   240,82,240,201,165,233,160,0,145,224,2
   4,169,80,101,224,133,224
TQ 700 DATA 169,0,101,225,133,225,230,230
   ,169,96,197,230,208,47,169,1,197,236,2
   08,24,24,169,1,101,228
WH 710 DATA 133,228,133,224,169,0,133,236
   ,133,230,101,229,133,229,133,225,24,14
   4,17,230,236,24,169,40,101
TS 720 DATA 228,133,224,169,0,133,230,101
   ,229,133,225,165,235,240,176,208,149,1
   65,233,160,0,145,224,24,169
WZ 730 DATA 1,101,224,133,224,169,0,101,2
   25,133,225,165,235,240,151,208,229
TM 740 BOT$="└──┴──┴──┴──┴──┴──┴──┘"
AH 750 MID$="├──┼──┼──┼──┼──┼──┼──┤"
KI 760 D$=" sun  mon  tue  wed  thu  fri
    sat "
PG 770 TOP$="┌──┬──┬──┬──┬──┬──┬──┐"
IW 780 VID$="│  │  │  │  │  │  │  │"
ST 790 DAY$="SATSUNMONTUEWEDTHUFRI"
MV 800 M$="JANFEBMARAPRMAYJUNJULAUGSEPOCT
   NOVDEC"
HX 810 DY$="312831303130313130313031"
NA 820 FOR I=1 TO 167:READ A:LET PRINT$(I
   )=CHR$(A):NEXT I
VZ 830 DATA 104,201,4,240,9,170,240,5,104
   ,104,202,208,251,96,104,133,215,104
VJ 840 DATA 133,214,104,104,168,104,133,2
   17,104,133,216,104,104,240,236,133,212
   ,24
UE 850 DATA 165,214,101,88,133,214,165,89
   ,101,215,133,215,152,240,15,165,214,10
   5
QP 860 DATA 64,133,214,165,215,105,1,133,
   215,136,208,241,132,221,160,0,132,220
GG 870 DATA 177,216,160,0,170,16,1,136,13
   2,213,138,41,96,208,4,169,64,16
QO 880 DATA 14,201,32,208,4,169,0,16,6,20
   1,64,208,2,169,32,133,218,138
FW 890 DATA 41,31,5,218,133,218,169,0,162
   ,3,6,218,42,202,208,250,109,244
SC 900 DATA 2,133,219,164,221,177,218,69,
   213,164,220,145,214,200,132,220,196,21
   2
JK 910 DATA 208,182,24,165,214,105,40,133
   ,214,144,2,230,215,230,221,169,8,197,2
   21,208,159,96,207,96
ZJ 920 RETURN
UU 930 AAA=USR(ADR(PRINT$),ZX,ZY,ADR(ZA$)
   ,LEN(ZA$))
ZN 940 RETURN
```

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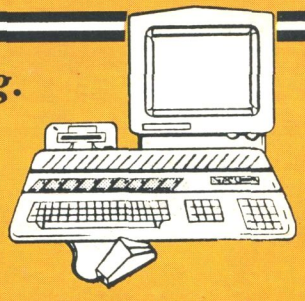

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