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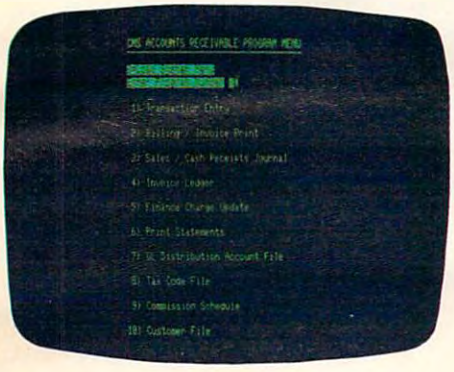

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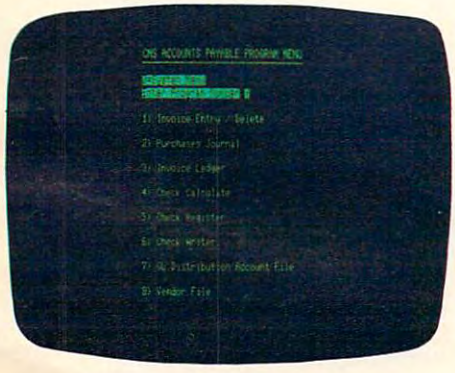

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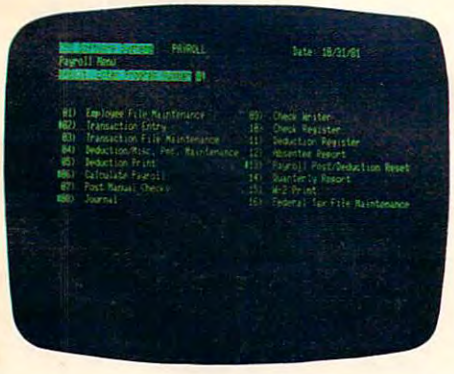

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AP = Apple, **AT** = Atari, **P** = PET/CBM, **V** = VIC-20, **O** = OSI, **C** = Radio Shack Color Computer, * = All or several of the above.

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The Editor's notes...

Robert C. Lock
Publisher/Editor

Commodore Announces A New "Generation" Of PET/CBM Computers With CP/M Compatibility

Between various press releases, the Hanover Fair in Germany, and a few of Dr. Chip's old friends, we've pieced together the major components of Commodore's new series of personal computers. There are three primary machines:

"PET II" has the capability of full color (you provide the monitor). The 40 column computer comes with 128K. Its microprocessor is the new 6509. Suggested retail, while unannounced, is thought to be less than $1,000.

"CBM II" is an 80 column unit with integral monitor, 128K RAM, and built-in dual floppy disk drives with 340K (total) of storage capacity. Again, this computer uses Commodore's new 6509. The suggested retail is unknown at press time, but the unit will certainly be targeted for a middle point between the PET II and the high end computer described below.

Both units are expected to have IEEE-488 and RS-232 ports. Both are said to be capable of accepting an add-on Z80 chip *or* a 16 bit 8088, thus opening up the world of CP/M software to the Commodore units, just as the Small Systems Engineering Hardbox has done for the current Commodore units.

The third unit appears to be directly targeted at the IBM-type personal computer. This *multiprocessor* computer uses both the 6509 and an 8088 16-bit microprocessor. The 80 column computer has attached monitor, 256K RAM, and dual disk drives with a capacity of 680K bytes. This unit, rumor has it, will be priced below $2500.

All three computers will be displayed at the National Computer conference in Houston in June. They were first shown at the Hanover Fair in Germany in mid-May.

COMPUTE! Grows On

We are quite pleased to announce the addition of Mr. Tom Halfhill to our Editorial Staff. Tom, formerly an Associate Editor with Cleveland Magazine, is a journalist by training and an Atari 800 owner by avocation. He'll add needed support to our staff as Features Editor, and will greatly help us in bringing you information about new products such as those from Commodore mentioned above.

A Note To Readers And Advertisers

We've had several complaints recently from readers having problems with a very small number of mail order advertisers. While we have yet to find any evidence of fraud, we have found some clear problems in terms of delivery, etc. We offer the following suggestions to our readers, suggestions you advertisers should be aware of:

1. When you're buying more expensive products, especially hardware, know who you're doing business with. If you can't get references, a contact name, etc., be careful. If your check gets cashed, and your order delayed for some reason, you'll have just as much trouble tracking it down. Get your names and contacts first, don't just send a check blind.

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3. Keep copies of all of your correspondence with a company, including the name of whoever you've talked to there. You might need it later.

4. Our screening of advertisers has been significantly expanded because of these recent questions. Our screening however, is not absolutely fail-safe. We cannot, for example, screen in advance the customer service philosophies of new advertisers. Thus we make the above suggestions.

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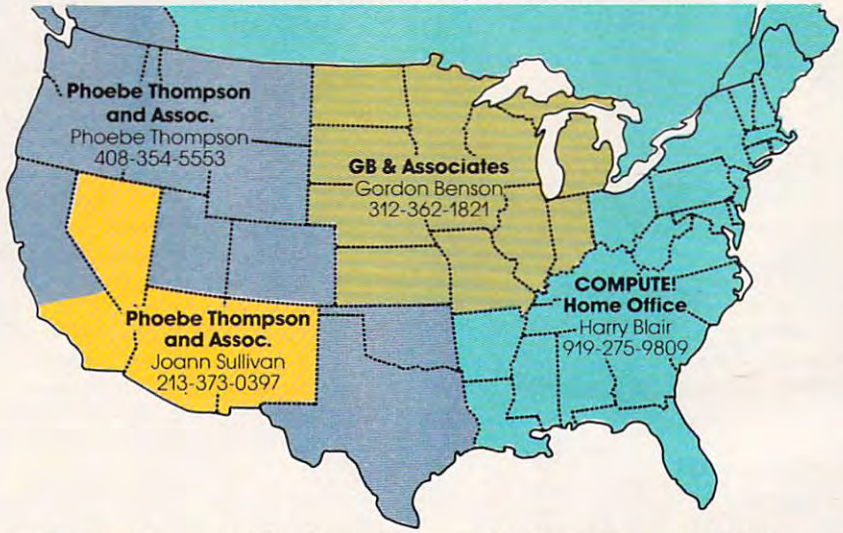

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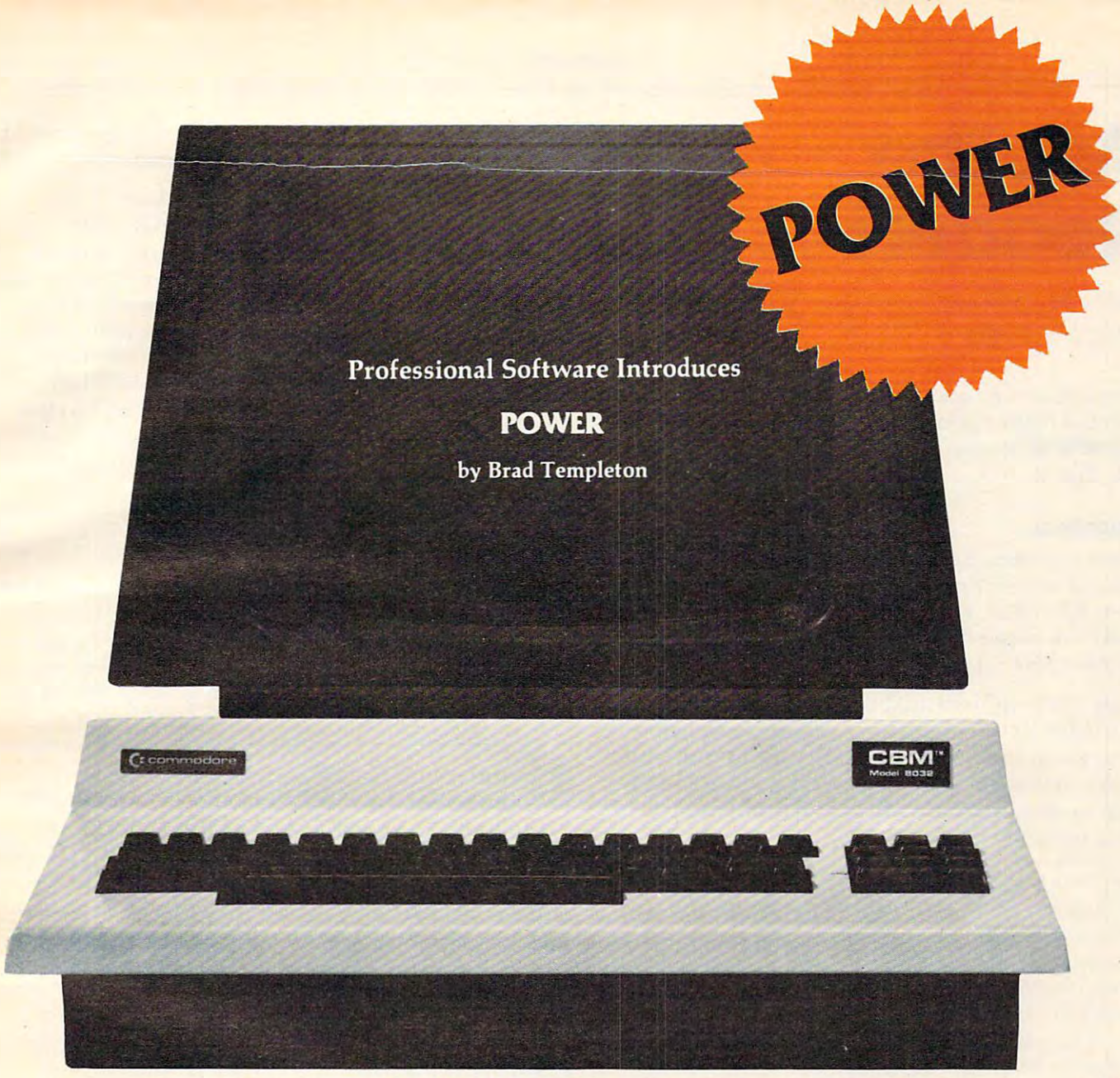

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Ask The Readers

Robert Lock, Richard Mansfield
And Readers

If you have any questions (or answers to questions printed below) please write to: Ask The Readers, **COMPUTE!** Magazine, P.O. Box 5406, Greensboro, NC 27403.

Questions

I have a question. Sometimes, after I type in a long program and run it a few times, my keyboard locks up (after you press RETURN, you can't do anything else). Is there any way I can unlock it – besides powering down? Oh, I have an Atari 800. Jon Chow

This "lock-up" is caused by a bug in the BASIC cartridge. It can occur when editing or deleting long program lines. There is no way to "un-crash" other than turning the power off and back on. It's best to save programs often, and avoid using very long program lines.

I picked up my first **COMPUTE!** *Magazine the other day* [February, 1982] *and found a fascinating article by Mike Smith, your whizz Canadian Apple contributor. My interest in named GOSUB with variable passing stems from a baptism in ALGOL when I was studying (law!) at the University of Virginia in 1969.*

I note that he is planning on being able to pass integer parameters soon. What I am looking forward to being able to do is to be able to use Boolean procedure calls, such as:

```
IF NILGRAVITY THEN JUMP
```

What about it, Mike? Sean Overend

Has anyone started a VIC-20 user club anywhere and, if so, how can I get in touch with them? If not, why don't we get one started?

Fred S. Dart
P.O. Box 525
Salem, UT 84653

Does anyone have a routine in BASIC [for PET] *so that, with the auto line feed on in the Epson, my printer will only print single line feeds, instead of double line feeds? I want to do it in the programs, instead of using the dip switch inside the Epson. Wordpro does it in machine language, so there must be a routine I could use in BASIC.* Hank Roth

---

The Atari has preset tabs on the video screen. How can I move or delete them? M. Sean Kilpatrick

There are three tab-related control keys: TAB, SET TAB (SHIFT-TAB), and CLEAR TAB (CTRL-TAB). To clear a tab, move the cursor to the tab stop and press CTRL-CLR (on TAB key). To set a tab at the cursor position, press SHIFT-TAB. Setting and clearing tabs from within a program involves PRINTing a series of TAB commands. PRINT"[TAB][TAB CLR][TAB][TAB CLR]" would clear the first two tab stops. To clear all tabs, use a series of [TAB][TAB CLR]'s. Then just PRINT [TAB SET]'s where you want to set tabs.

Answers

[In **COMPUTE!**, April, 1982, #23, pg. 181, reviewer Eric Giguere challenged anyone to beat his eight-second score on Vixel's "Fire" game.] *We have a VIC "20" and Feb., 6, 1982, I put out the fire in seven seconds, so I have the record. Will be waiting to hear from you.* Mary Payne

---

[In this column in the March, 1982, issue R. D. Young asked some questions about the **COMPUTE!** program "Keyword" (October, 1981) for PET/CBM. Liz Deal replies:] *Yes, indeed, there is a 15-character limit on file names. It can get as short as 12 bytes if you use replace (@) command and drive #, as in .S "@1:PROG",08,XXXX,XXXX. The conspiracy is coded at $FF41 in Upgrade PET.*

Keyword is IRQ driven, hence, any time you press shifted key, a keyword will appear, unless the program senses that you're running a BASIC program. Thing to do is turn it off (or get Power). Liz Deal

---

For all of you people who are completely stumped on how "TWENTY QUESTIONS" figures out whether to say "Yes" or "No," look at line 310. You will notice that it is looking at the last character in your inputted question and only the last character! What it is looking for is a vowel, if it finds one then the answer is "YES"; however, if it does not find a vowel the answer is "NO."

Another thing, on the Apple when you attempt to enter line number 350 you will get the following:

```
350 IF NOT HEN PRINT "NO"
```

to fix this problem you will have to enter:

```
350 IF NO = 1 THEN PRINT "NO"
```

you may wish to do this for YES (the variable) also.

One other thing, you might wish to change line number 340 to read as follows:

```
340 IF YES = 1 THEN PRINT "YES":GOTO 390
```

Clyde Bott

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MULTI-LABEL - Prints multiple labels per record with up to 2 lines for messages and consecutive numbering. Produce inventory, caution labels, bulk mail labels, etc.

MATHPACK - global calculator/editor +, −, *, /, by another field or constant; null (remove contents) of a field or replace contents of a field with any word, number or phrase. Sum multiple fields in each record or running sum of single field in all records. Extract information or effect permanent change. Replace in the same field or place in a waiting field.

DESCRIPTIVE STATPACK - Determine MEAN, MEDIAN, MODE, STANDARD DEVIATION, VARIANCE, RANGE. Generate HISTOGRAMS from 1 to 25 steps, and produce Z-SCORE reports.

ADVANCED STATPACK - (You must also acquire DESCRIPTIVE STATPACK) Generate one, two or three way CROSSTABS (number of occurance) CHI SQUARE, LINEAR REGRESSION, with graphic representation and prediction, LINEAR CORRELATION and SIMPLE ANALYSIS OF VARIANCE.

CALCPACK - 2 way interface to VisiCalc or any user program. It lets you use VisiCalc for complex manipulation, editing, placing results in JINSAM for sorting, storing or moving data to WordPro as well as giving the ability for exchange with your own applications.

INTERAC - Interface which can read VisiCalc files, WordPro files and almost any sequential files to build JINSAM databases automatically. For example: You could "download" information on holerith cards to sequential files and INTERAC would place them into JINSAM files.

All accessories are accessed thru the JINSAM menu and require security password to gain entrance.

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[In reference to] *Mr. R. O. Danver's request* [**COMPUTE!** April, 1982, #23, pg. 14] *for VIC-TTY interface, here are the hardware and software required to* [connect] *an ASR-33 TTY to a VIC: the attached interface will allow the VIC-20 to interface an ASR-33 Teletype with a two way communication capability.*

The ASR-33 is assumed to have a Call Unit #6 as Teletype calls it. This model has a nine pin terminal strip on the rear for connection to the interface. Also Jack #2 also can be used as per the attached diagram.

The ASR-33 must be wired for 20ma. and full duplex. These adjustments can be done inside the unit with the service manual. Also the assumed baud rate is 110. This may be different for a model 35.

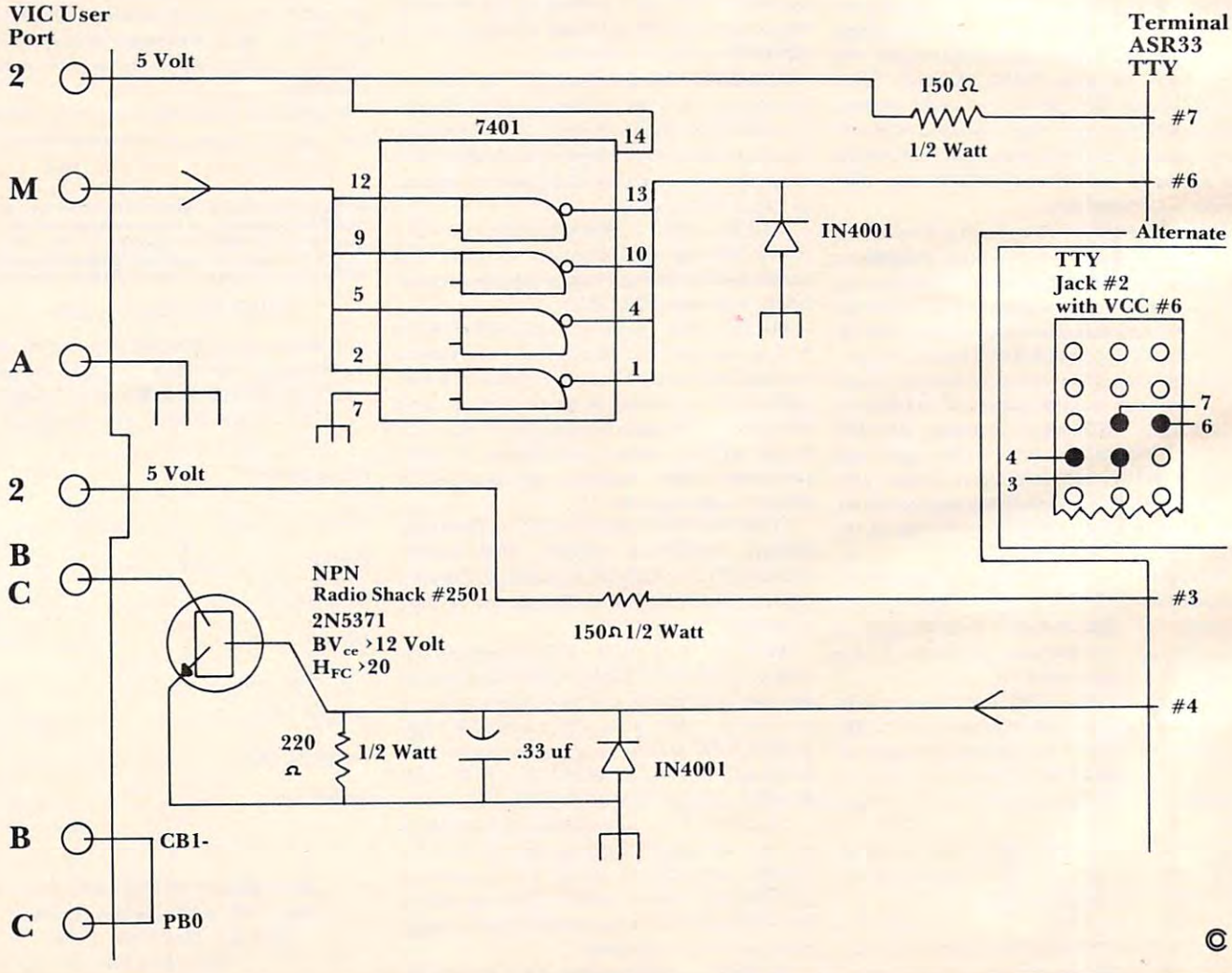
The VIC internal ACIA is set up for full duplex, 7 data bits, a space parity bit, 110 baud and two stop bits. This is more or less the standard configuration.

The interface itself is powered from the user port of the VIC and it can both send and receive. The short program is used as a demonstration to show how to use the VIC's serial capability. Kenneth Finn

Program 1.

***Note: Strap keyboard on ASR-33 for space parity.**

```
10 REM ASR 33 TTY
15 REM FILE # > 128 FOR CR WITH LF
20 REM 163=2 STOP,7ASCII, 110 BAUD
30 REM 224=SPACE PARITY, FULL DUPLEX
100 OPEN129,2,3,CHR$(163)+CHR$(224)
110 GET#129,A$
200 REM MAIN LOOP
210 :GET B$
220 IFB$<>""THENIFB$=CHR$(13)THENPRINT#
    129,B$;CHR$(0);CHR$(0);CHR$(0);:GOTO230
225 :IF B$<>""THENPRINT#129,B$;
230 :GET#129,C$:IFC$<>""THEN PRINT#129,C$
    REM ECHO
240 :PRINT B$;C$;
250 SR=ST: IFSR=0 THEN200
300 REM ERRORS
310 PRINT"ERROR";
320 IFSR AND 1 THEN PRINT"PARITY"
330 IFSR AND 2 THEN PRINT"FRAME"
340 IFSR AND 4 THEN PRINT"RCVR BUF FULL"
350 IFSR AND 8 THEN PRINT"BREAK"
360 IF (PEEK(37151)AND 64)=1 THEN 360
370 CLOSE129:END
READY.
```



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Computers And Society

David D. Thornburg
Los Altos, CA

Piracy Revisited...

My February "interview" with the software pirate Long John Silicon generated quite a bit of mail. Because of the sensitive and complex nature of the software copyright issue, I decided to share a reader's response with you and to elaborate a bit on my concerns.

Chris Crawford (Atari software expert *par excellance*) wrote as follows:

> Dave,
>
> I saw your column on piracy in **COMPUTE!** I believe that your logic is imprecise. You imply that effort is the proper index of rightful ownership of designs. While I agree that toil ennobles, I reject your implication that effort confers license. The thief who steals the jewels by dint of vast cleverness and painful effort is still a thief. And no matter how wealthy the owner, how wanton his wastefulness, it is still unethical to steal.
>
> Ethics is no place for sloppy logic. Think it through again – carefully.
>
> Chris Crawford

I agree that ethics is no place for sloppy logic. I am also concerned with Chris's analogy. There is a great deal of difference between stealing the Hope diamond and cutting a new diamond which looks somewhat similar. Nowhere did I condone the idea that it was acceptable for someone to steal a software product, marketing it at the expense of its rightful owner. I think that people who make carbon copies of other people's software and then sell these copies are doing a great disservice to the computer industry, and are breaking the law as well.

I am against true piracy – the copying of existing software for other than personal backup use by one who has purchased the product. This industry will collapse if talented authors aren't guaranteed protection for their effort. The basis of any protective law is that it protects everyone – designer and customer alike. The designer benefits by receiving appropriate compensation for his or her effort and the user benefits by the encouragement this reward provides to developers of new and better software. The best way to drive good designers out of software is to deprive them of their income for their effort. Software copiers might think they are getting something for nothing, but in reality they are damaging the industry.

But this type of copying is not what I had in mind when I wrote my editorial. The question I raised was concerned with the propriety of someone who makes a totally new and improved product which had its genesis in another product.

Software copiers might think they are getting something for nothing, but in reality they are damaging the industry.

In the hypothetical game "Tooth Fairy," Long John Silicon had taken the basic idea behind the arcade game and improved it during its conversion to run on a home computer system. It was not his goal to replicate the original game in every detail. Is he to be denied the right to do this?

What if no new word processor programs could be developed because the authors of the first antiquated teletype-based versions declared broad sweeping rights to the generic field? Who would benefit? The public wouldn't, because the existing software wouldn't be sophisticated enough for their needs, and the original developers wouldn't because their market would dry up.

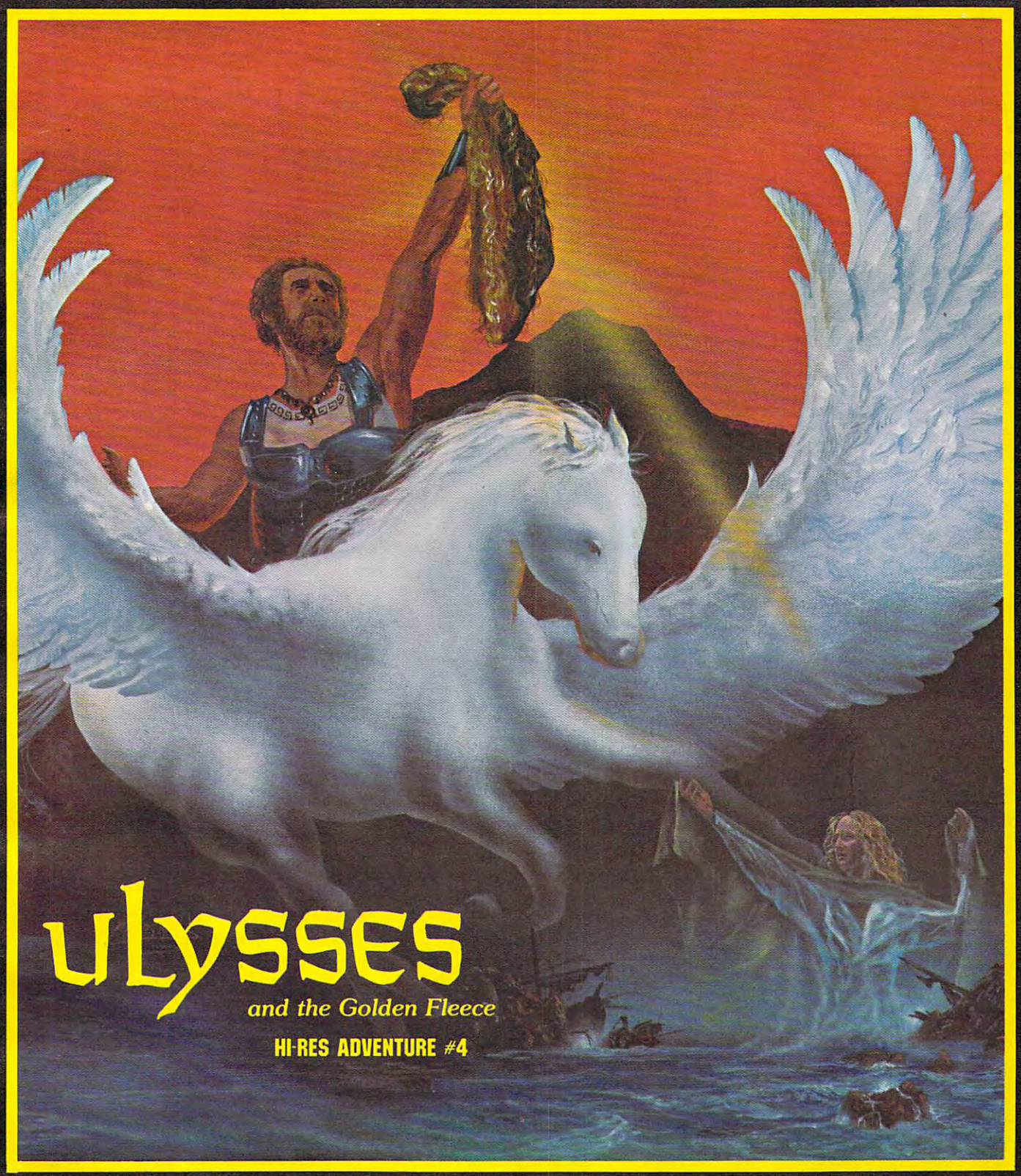
In the game area one might ask if software developers are to be forbidden from improving existing game concepts by adding a tutor mode, by providing dynamic handicapping, by converting a single player game into a multi player game, by modifying the playfield, etc. I may be too dense to follow Chris's logic, but I fail to see how developments along these lines are analogous to "stealing jewels by dint of vast cleverness."

I guess that the use of words like piracy, stealing, etc. to describe activities which, in the area of hardware, are called "patentable differences," really bothers me. Simplistic slogans regarding thievery and piracy bother me when they are applied to issues as complex as those I described.

Are you an accessory to a crime? Have you seen *My Fair Lady*, knowing full well that the authors blatantly made a musical from George Bernard Shaw's play *Pygmalion?* Have you engaged in the criminal act of watching *West Side Story*, knowing that the vicious criminal, Leonard Bernstein, stole the story line from Shakespeare?

Shame on us all.

Imagine how much better off the world would



Bob Davis, Co-ordinator for TIME ZONE, the "ultimate" HI-RES Adventure project, has teamed up with Ken Williams to bring the high adventure of ancient mythology to your home computer. "Cast-off" with ON-LINE SYSTEMS and ULYSSES and see if you can find the GOLDEN FLEECE.

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be if we didn't have "piracy" rampant in the arts – if Archibald MacLeish were thrown behind bars for basing his play *J. B.* on the *Book of Job.* Copying from the Bible, no less – how criminal can one get?

Well, excuse me folks, but to say that one idea is so pristine, so pure, and so complete that it cannot and should not be improved upon is sheer stupidity. It is a concept which hurts designers and users alike. Just as designers must be protected from those who make outright copies of their work, so must they be granted the protection and right to benefit from their significant improvements on existing ideas.

How different is different? This question has plagued philosophers back to the time of Socrates. There are no easy answers.

What I do know is that there is much to be gained from a careful analysis of the problem and little to be gained from righteous finger pointing and sloganeering.

What do *you* think?

Let me know.

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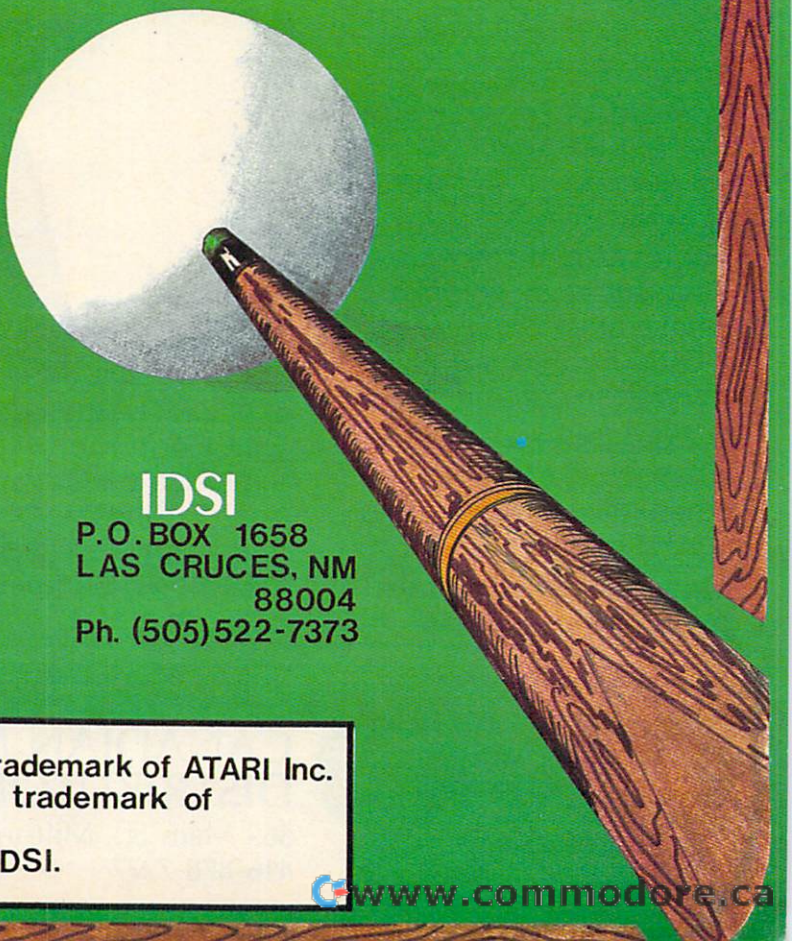

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See the notes for using this program on OSI, Apple, Commodore, and Atari computers.

Income Property Report

Roger T. Christensen
Racine, WI

I wrote this program because I needed a fast way to prepare information from my income property for yearly taxes.

The information input into this program is taken off the year-to-date total from my general ledger.

The information given from this report can be enclosed with your federal and state tax returns, also you can keep a copy for yourself. I found there is no reason to save this information so there is no save routine within this program.

I also set this program up to give a general monthly cash flow, profit/loss report on the CRT. This will very quickly give you an idea of what position you are in.

Line 680 is set at 21 cents per mile and can be changed.

Nine inputs can be made under other expenses and other repairs.

Three inputs can be made under other income.

The items listed from line 1320 to line 1350 can be changed.

```
TAXPAYERS NAME:  JOE SMITH
SOCIAL SECURITY NUMBER:  222-22-2111
  TYPE OF PROPERTY:  4-FAMILY FRAME
PROPERTY ADDRESS:  1000 MAIN ST
              CITY:  OURTOWN
             STATE:  WI.
               ZIP:  53000

INCOME
RENTAL INCOME      $9800.00
ESCROW             $ 400.00
                   TOTAL INCOME= $ 10200

EXPENSES
GAS                $3200.00
ELECTRIC           $ 542.00
WATER              $ 125.00
CLEANING           $  25.00
TAXES              $ 875.00
INSURANCE          $ 211.00
GARDENING          $  20.00
RUBBISH            $  50.00
PEST CONTROL       $  24.00
PAINT              $  75.00
PLASTER            $  10.00
NAILS              $   5.00
COMMISSION         $ 150.00

REPAIRS
CARPENTRY          $ 510.00
ELECTRICAL         $  50.00
PLUMBING           $ 100.00
ROOFINNG           $ 500.00
HARDWARE           $ 231.00
MISC.              $  12.00
DOOR               $ 100.00
WATER HEATER       $ 125.00
FURNACE            $ 525.00

TOTAL EXPENSES= $ 7465

MILEAGE & TRAVEL
1025 MILES @ .21   $ 215.25
OTHER TRAVEL EXP   $  50.00
```

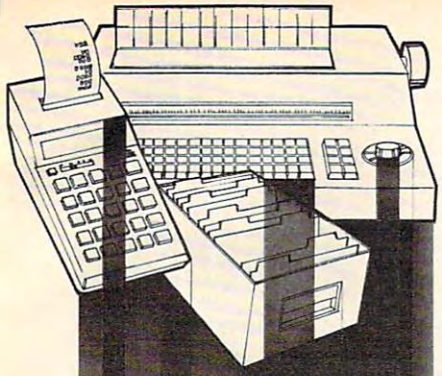
Notes On Using These Programs

Program 1 is written in Microsoft BASIC for the PET, so only minor changes are necessary to convert it to Apple, OSI, or any other BASIC. First of all, follow the suggestions given in COMPUTE's Listing Conventions. The yearly report given from lines 1810 and up are for hardcopy to the Commodore 2022 printer, which supports automatic paging (CHR$(147) sets Top Of Form, CHR$(19) performs forced paging) and formatting commands (similar to PRINT USING).

If your printer has any special features, such as horizontal tabs, you may want to use the approach in the Atari version of this program. It only outputs to the screen, and is not as rigidly formatted. It just TABs from the item field to the numeric field by using a POKE 85,33 statement. You'll want to use HTAB 31 or PRINT TAB(31). You can still have printer output by using PR# (on the Apple) or changing the PRINT statements to LPRINT

Program 1: Microsoft Version

```
10 REM  PROPERTY REPORT BY
20 REM (ROGER T CHRISTENSEN)
30 REM    1006 HAGERER ST
40 REM    RACINE WI 53403
50 REM    (414) 632-6922
60 REM ********9/28/81************
70 REM ***PROGRAM STARTS AT 90 ***
80 REM ***************************
90 DIMP$(10),I(10),Y(100)
100 POKE59468,14
```



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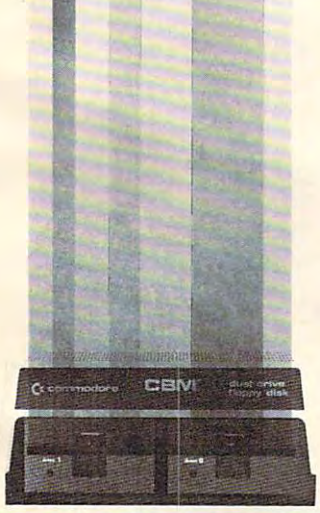

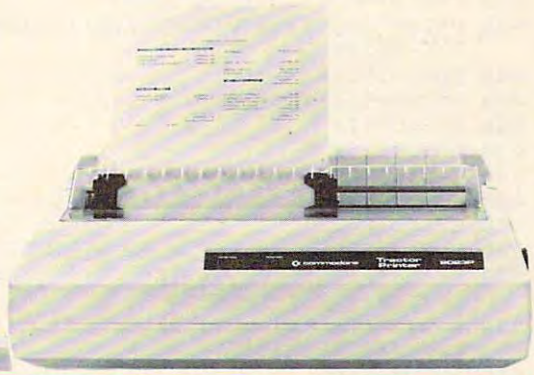

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```
110 PRINT"{CLEAR}{02 DOWN}{11 RIGHT}{REV}INCOME PROPERTY"
120 PRINT"{DOWN} THIS PROGRAM CAN BE USED FOR A MONTHLY"
130 PRINT"{DOWN}CASHFLOW REPORT GIVEN ON THE {REV}CRT{OFF} OR"
140 PRINT"{DOWN}A YEAR END REPORT ON INCOME AND EXPENCES";
150 PRINT"{DOWN}FOR TAXES IN A HARD COPY."
160 PRINT"{DOWN}{REV}ENTER{OFF} '1' FOR A MONTHLY REPORT"
170 PRINT"{DOWN}{REV}ENTER{OFF} '2' FOR A YEARLY REPORT"
180 PRINT"{02 DOWN}A MONTHLY REPORT {REV}DOES NOT REQUIRE{OFF} "
190 PRINT"{DOWN}INFORMATION THAT YEARLY REPORTS REQUIRE{DOWN}"
200 FORAA=1TO1500:NEXT
210 INPUT"NUMBER  1{03 LEFT}";MY
220 IFMY=1THEN410
230 IFMY=2THEN250
240 PRINT"{UP}{REV}INCORRECT DATA":GOSUB1350:PRINT"{UP}                {UP}":GOTO200
250 PRINT"{CLEAR}{02 DOWN}{11 RIGHT}{REV}INCOME PROPERTY"
260 REM   *****GENERAL INPUT*****
270 PRINT"{DOWN}{REV}ENTER{OFF} SCHEDULE NUMBER"
280 INPUTSN
290 PRINT"{DOWN}{REV}ENTER{OFF} YEAR"
300 INPUTDDD
310 PRINT"{DOWN}{REV}ENTER{OFF} TAXPAYER'S NAME"
320 INPUTTN$
330 PRINT"{DOWN}{REV}ENTER{OFF} SOC. SEC. NUMBER"
340 INPUTSSN$
350 PRINT"{DOWN}{REV}ENTER{OFF} TYPE OF PROPERTY"
360 INPUT OP$
370 PRINT"{DOWN}{REV}ENTER{OFF} PROPERTY ADDRESS"
380 INPUTPA$
390 PRINT"{DOWN}{REV}ENTER{OFF} CITY, STATE, ZIP"
400 INPUTC$,S$,ZP
410 POKE59468,12:GOSUB1340:GOSUB1290
420 REM*****UTILITY INPUT*****
430 PRINT"{DOWN}{REV}ENTER{OFF} EXPENSES FOR:":PRINT
440 FORI=1TO10
450 PRINTP$(I)TAB(15);
460 INPUTN(I)
470 GOSUB1360
480 T=T+N(I)
490 NEXTI
500 GOSUB1340
510 REM****PROGRAM INPUT FOR REPAIRS****
520 PRINT"{DOWN}{REV}ENTER{OFF} EXPENCE'S FOR REPAIRS:":PRINT
530 FORK=1TO6
540 PRINTA$(K)TAB(15);
550 INPUT E(K)
560 GOSUB1360
570 U=U+E(K)
580 NEXTK
590 IFMY=1THENGOTO660
600 REM*****MILEAGE & TRAVEL INPUT*****
610 GOSUB1340:PRINT"{03 DOWN}ENTER MILEAGE";
620 INPUTM
630 GOSUB1360:PRINT"{02 DOWN}ENTER OTHER TRAVEL EXPENSES";
640 INPUTET
650 MM=M*.21
660 REM****USER INPUT FOR EXPENSES****
670 GOSUB1340:PRINT"{DOWN}{REV}ENTER{OFF} OTHER EXPENSES (9)"
680 PRINT"{DOWN}ENTER ITEM ',' AMOUNT"
690 PRINT"{DOWN}{REV}ENTER{OFF} 0,0 {REV}TO {OFF} {REV}END{OFF}":PRINT
700 FORL=1TO9
710 INPUTII$(L),A(L)
720 IFA(L)=0THEN760
730 GOSUB1360
740 TA=TA+A(L)
750 NEXTL
760 GOSUB1360:GOSUB1350:GOSUB1340
770 REM****USER INPUT FOR REPAIRS****
780 PRINT"{DOWN}{REV}ENTER OTHER REPAIRS (9)"
790 PRINT"{DOWN}ENTER ITEM ',' AMOUNT"
800 PRINT"{DOWN}ENTER 0,0 TO END":PRINT
810 FORC=1TO9
820 INPUTRA$(C),R(C)
830 IFR(C)=0THEN870
840 GOSUB1360
850 TT=TT+R(C)
860 NEXTC
870 GOSUB1360:GOSUB1350:GOSUB1340
880 REM   *****USER INCOME INPUT*****
890 IFMY=2THENGOTO910
900 GOTO920
910 PRINT"{DOWN}{REV}ENTER{OFF} {REV}TOTAL{OFF} YEARLY INCOME FOR EACH UNIT"
920 PRINT"{DOWN}HOW MANY RENTAL {REV}UNITS{OFF} ":PRINT
930 IFMY=1THENGOTO950
940 PRINT"FOR ";PA$
950 INPUTQ
960 GOSUB1340
970 IFMY=2THENPRINT"{DOWN}{REV}ENTER{OFF} YEARLY RENT":PRINT:GOTO990
980 PRINT"{DOWN}{REV}ENTER{OFF} MONTHLY RENT":PRINT
990 FORY=1TOQ
1000 PRINT"RENT FROM UNIT ";Y;
1010 INPUTZ(Y)
1020 GOSUB1360
1030 V=V+Z(Y)
1040 NEXTY
1050 GOSUB1350:GOSUB1340
1060 IFMY=1THEN1170
1070 PRINT"{02 DOWN}OTHER INCOME"
1080 PRINT"{DOWN}{REV}ENTER{OFF} ITEM,AMOUNT (3)"
1090 PRINT"{DOWN}ENTER 0,0 TO END":PRINT
1100 FORH=1TO3
1110 INPUTT$(H),EM(H)
1120 GOSUB1360
1130 IFEM(H)=0THEN1160
1140 BB=BB+EM(H)
1150 NEXTH
1160 GOSUB1350:GOSUB1340
1170 REM*****OUTPUT AREA**************
1180 PRINT"     {DOWN}{REV}ENTER{OFF}"
1190 IFMY=1THEN1210
1200 PRINT"{DOWN}'1' FOR PRINTER"
1210 PRINT"{DOWN}'2' FOR SCREEN":PRINT"{DOWN DOWN}'3' TO END":PRINT
1220 INPUT"NUMBER  2{03 LEFT}";H
1230 IFMY=1THEN1250
1240 IFH=1THEN1810
```

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I plan to add a hard disk system to my Atari: ☐ yes ☐ no.

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```
1250 IFH=2THEN1400
1260 IFH=3THEN1730
1270 PRINT"{UP}{REV}INCORRECT DATA":GOSUB135
     0:PRINT"{UP}                    {UP}
     ":GOTO1220
1280 REM*****ITEMS CAN BE CHANGED*****
1290 P$(1)="GAS":P$(2)="ELECTRIC":P$(3)="WAT
     ER":P$(4)="OIL":P$(5)="CLEANING"
1300 P$(6)="TAXES":P$(7)="INSURANCE":P$(8)="
     GARDENING":P$(9)="RUBBISH"
1310 P$(10)="PEST CONTROL":A$(1)="CARPENTRY"
     :A$(2)="ELECTRICAL"
1320 A$(3)="PLUMBING":A$(4)="ROOFING":A$(5)=
     "HARDWARE":A$(6)="MISC.":RETURN
1330 REM*****GOSUB ROUTINES*****
1340 PRINT"{CLEAR}{02 DOWN}{11 RIGHT}{REV}IN
     COME PROPERTY"
1350 FORAA=1TO700:NEXTAA:RETURN
1360 PRINT"{UP}''''''''''''''''''''''''''''
     '''":RETURN
1370 PRINT"{CLEAR}{HOME}":RETURN
1380 F=T+U+TA+TT:RETURN
1390 REM*****SCREEN PRINTOUT*****
1400 GOSUB1350:GOSUB1340
1410 Q1$="UTILITIES":Q2$="REPAIRS":Q3$="OTHE
     R EXPENSES":Q4$="OTHER REPAIRS"
1420 Q5$="TOTAL INCOME = $":Q6$="TOTAL EXPEN
     CES = $"
1430 Y=10:VA=V+BB:YY=18
1440 GOSUB1380
1450 F$=STR$(F)
1460 T$=STR$(T):U$=STR$(U):TA$=STR$(TA):TT$=
     STR$(TT):VV$=STR$(VA)
1470 PRINT:PRINT
1480 IFMID$(T$,7,1)<=""THENT$=T$+".00"
1490 PRINTSPC(YY-LEN(Q1$));Q1$;SPC(Y-LEN(T$)
     );T$
1500 PRINT
1510 IFMID$(U$,7,1)<=""THENU$=U$+".00"
1520 PRINTSPC(YY-LEN(Q2$));Q2$;SPC(Y-LEN(U$)
     );U$
1530 PRINT
1540 IFMID$(TA$,7,1)<=""THENTA$=TA$+".00"
1550 PRINTSPC(YY-LEN(Q3$));Q3$;SPC(Y-LEN(TA$
     ));TA$
1560 PRINT
1570 IFMID$(TT$,7,1)<=""THENTT$=TT$+".00"
1580 PRINTSPC(YY-LEN(Q4$));Q4$;SPC(Y-LEN(TT$
     ));TT$
1590 PRINT"##############################":GOS
     UB1350
1600 IFMID$(F$,7,1)<=""THENF$=F$+".00"
1610 PRINTSPC(YY-LEN(Q6$));Q6$;SPC(Y-LEN(F$)
     );F$
1620 IFMID$(VV$,7,1)<=""THENVV$=VV$+".00"
1630 PRINT:PRINTSPC(YY-LEN(Q5$));Q5$;SPC(Y-L
     EN(VV$));VV$
1640 S=V-F
1650 SP$=STR$(S)
1660 IFMID$(SP$,7,1)<=""THENSP$=SP$+".00"
1670 PRINTTAB(20);"########"
1680 IFV>FTHEN1700
1690 IFV<FTHEN1720
1700 PRINT:PRINT"{REV}PROFIT{OFF} >>>>>>>>> ~
     $";SPC(Y-LEN(SP$));SP$
1710 GOTO1740
1720 PRINT:PRINT"{REV}\\\{OFF}  LOSS  {REV}\
     \\{OFF} > $";SPC(Y-LEN(SP$));SP$
1730 GOSUB1350
1740 PRINT"{DOWN}DO YOU WANT ANOTHER REPORT"
1750 PRINT"{DOWN}{REV}Y{OFF}ES OR {REV}N{OFF
     OFF}O";
1760 GETSS$:IFSS$=""THEN1760
1770 IFSS$="Y"THENPRINT"{CLEAR}{04 DOWN}":GO
     SUB1370:GOSUB1340:CLR:POKE59468,14
     :GOTO160
1780 IFSS$="N"THEN1800
1790 PRINT"{CLEAR}{06 DOWN}":GOTO1740
1800 PRINT"{CLEAR}{HOME}":END
1810 REM*****PRINTER PRINT-OUT*****
1820 PRINT"{CLEAR}{HOME}{03 DOWN}POSITION PA
     PER AND HIT {REV}RETURN{OFF}"
1830 GETVV$:IFVV$=""THEN1830
1840 GOSUB1380
1850 OPEN1,4:OPEN2,4,1:OPEN3,4,2:OPEN4,4,4
1860 PRINT#4
1870 PRINT#1,CHR$(147)
1880 PRINT#1,TAB(30);"INCOME PROPERTY REPORT
              SCHEDULE #: ";SN
1890 PRINT#1,TAB(36);"FOR ";DDD
1900 PRINT#1
1910 PRINT#1,"TAXPAYER'S NAME: ";TN$
1920 PRINT#1,"SOCIAL SECURITY NUMBER: ";SSN$
1930 PRINT#1
1940 PRINT#1,"TYPE OF PROPERTY: ";OP$
1950 PRINT#1
1960 PRINT#1,"PROPERTY ADDRESS: ";PA$
1970 PRINT#1,TAB(10);"  CITY: ";C$
1980 PRINT#1,TAB(10);" STATE: ";S$
1990 PRINT#1,TAB(10);"   ZIP:";ZP
2000 PRINT#1
2010 G$="       AAAAAAAAAAAAAAAA   $9999.99"
2020 PRINT#3,G$
2030 PRINT#1,TAB(10)"INCOME"
2040 PRINT#1,TAB(10);"########"
2050 PRINT#1
2060 PRINT#2,"RENTAL INCOME",CHR$(29),V
2070 PRINT#1
2080 FORH=1TO3
2090 IFEM(H)=0THEN2110
2100 PRINT#2,T$(H),CHR$(29),EM(H)
2110 NEXTH
2120 PRINT#1
2130 PRINT#1,TAB(40);"TOTAL INCOME = $";V+BB
2140 PRINT#1
2150 PRINT#1,TAB(10)"EXPENSES"
2160 PRINT#1,TAB(10)"########"
2170 PRINT#1
2180 FORI=1TO10
2190 IFN(I)=0THEN2210
2200 PRINT#2,P$(I),CHR$(29),N(I)
2210 NEXTI
2220 FORL=1TO9
2230 IFA(L)=0THEN2250
2240 PRINT#2,II$(L),CHR$(29),A(L)
2250 NEXTL
2260 PRINT#1
2270 PRINT#1,TAB(10);"REPAIRS"
2280 PRINT#1,TAB(10);"########"
2290 PRINT#1
2300 FORK=1TO6
2310 IFE(K)=0THEN2330
2320 PRINT#2,A$(K),CHR$(29),E(K)
2330 NEXTK
2340 FORC=1TO9
2350 IFR(C)=0THEN2370
2360 PRINT#2,RA$(C),CHR$(29),R(C)
2370 NEXTC
2380 PRINT#1
2390 PRINT#1,TAB(40);"TOTAL EXPENSES = $";F
2400 PRINT#1
2410 PRINT#1,TAB(10);"MILEAGE & TRAVEL"
```

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```
2420 PRINT#1,TAB(10);"################"
2430 PRINT#1
2440 REM******MILAGE COST AT LINE 650****"
2450 PRINT#2,M;" MILES @ .21",CHR$(29),MM
2460 PRINT#1
2470 PRINT#2,"OTHER TRAVEL EXPENSE";CHR$(29)
    ,ET
2480 PRINT#1,CHR$(19)
2490 PRINT#1
2500 CLOSE1,4
2510 PRINT"{02 DOWN}DO YOU WANT ANOTHER HARD
     COPY"
2520 PRINT"{DOWN}{REV}ENTER{OFF} 'Y' IF YOU ~
    DO OTHERWISE 'N'"
2530 GETSS$:IFSS$=""THEN2530
2540 IFSS$="Y"THEN1820
2550 GOTO1160
2560 END
```

Atari Notes

The Atari version has no provision for hardcopy (output to printer). One reason hardcopy is not included is because the type of printer used by Atari owners may vary from a 40-column printer such as the 820 or 822, to an 80-column one such as the 825 or the MX-80. To serve the greatest number of users (including the many who don't own a printer), the yearly report in lines 1810-2510 is written for screen output. Some changes would be necessary to route the output to the printer (like changing PRINT to LPRINT).

Program 2: Atari Version

```
90 DIM P$(10%15),I(10),Y(100),TN$(30),SS
N$(12),PA$(30),C$(15),S$(2),A$(6%15),II$
(30%9),IILN(9),T$(30)
95 DIM A(9),RA$(9%30),RALN(9),TT$(3%30),
TTLN(3),EM(3),N(10),E(6),R(9)
96 DIM Z(10),OP$(20)
100 P$=" ":P$(150)=" ":P$(2)=P$:A$=P$
105 OPEN #1,4,0,"K"
107 FOR I=0 TO 9:A(I)=0:N(I)=0:R(I)=0:Z(
I)=0:NEXT I:Z(10)=0:N(10)=0:FOR I=0 TO 3
:EM(I)=0:NEXT I
108 FOR I=0 TO 6:E(I)=0:NEXT I
110 GRAPHICS 0:POSITION 13,0:? "|INCOME
PROPERTY|"
120 ? "{DOWN}This program can be used fo
r a"
130 ? "{DOWN}monthly cashflow report or"

140 ? "{DOWN}a year end report for incom
e and"
150 ? "{DOWN}expenses for taxes."
160 ? "{DOWN}Enter |1| for a monthly rep
ort"
170 ? "{DOWN}Enter |2| for a yearly repo
rt"
180 ? "{2 DOWN}A monthly report does not
 require"
190 ? "{DOWN}information that yearly rep
orts{DOWN}       require.":?
200 ? "Number?1{2 LEFT}";:INPUT MY
220 IF MY=1 THEN 410
230 IF MY=2 THEN 250
240 ? "{UP}|INCORRECT DATA|{BELL}":? "{U
P}                    {UP}":GOTO 200
250 GRAPHICS 0:POSITION 13,0:? "|INCOME
PROPERTY|"
260 REM %%%% GENERAL INPUT %%%%
270 ? "{DOWN}|ENTER| Schedule number"
280 INPUT SN
290 ? "{DOWN}|ENTER| Year"
300 INPUT DDD
310 ? "{DOWN}|ENTER| Taxpayer's name"
320 INPUT TN$
330 ? "{DOWN}|ENTER| Social Security Num
ber"
340 INPUT SSN$
350 ? "{DOWN}|ENTER| Type of property"
360 INPUT OP$
370 ? "{DOWN}|ENTER| Property address"
380 INPUT PA$
390 ? "{DOWN}|ENTER| City":INPUT C$:? "|
ENTER| State (two letter)":INPUT S$
400 ? "|ENTER| ZIP CODE":INPUT ZIP
410 GOSUB 1340:GOSUB 1290
430 ? "{DOWN}|ENTER| Expenses for repair
s:":?
440 FOR I=1 TO 10
450 ? P$(I%15-14,I%15);
460 INPUT T:N(I)=T
470 GOSUB 1360
480 NEXT I
500 GOSUB 1340
510 REM %%%% PROGRAM INPUT FOR REPAIRS %
%%
520 ? "{DOWN}|ENTER| Expenses for repair
s:":?
530 FOR K=1 TO 6
540 ? A$(K%15-14,K%15);
550 INPUT T:E(K)=T
560 U=U+E(K)
570 NEXT K
590 IF MY=1 THEN 660
600 REM %%% MILEAGE & TRAVEL INPUT %%%
610 GOSUB 1340:? "{3 DOWN}ENTER Milease"
;
620 INPUT M
630 GOSUB 1360:? "{2 DOWN}ENTER other tr
avel expenses";
640 INPUT ET
650 MM=M%0.21
660 REM %%% USER INPUT FOR EXPENSES %%%
670 GOSUB 1340:? "{DOWN}|ENTER| other ex
```

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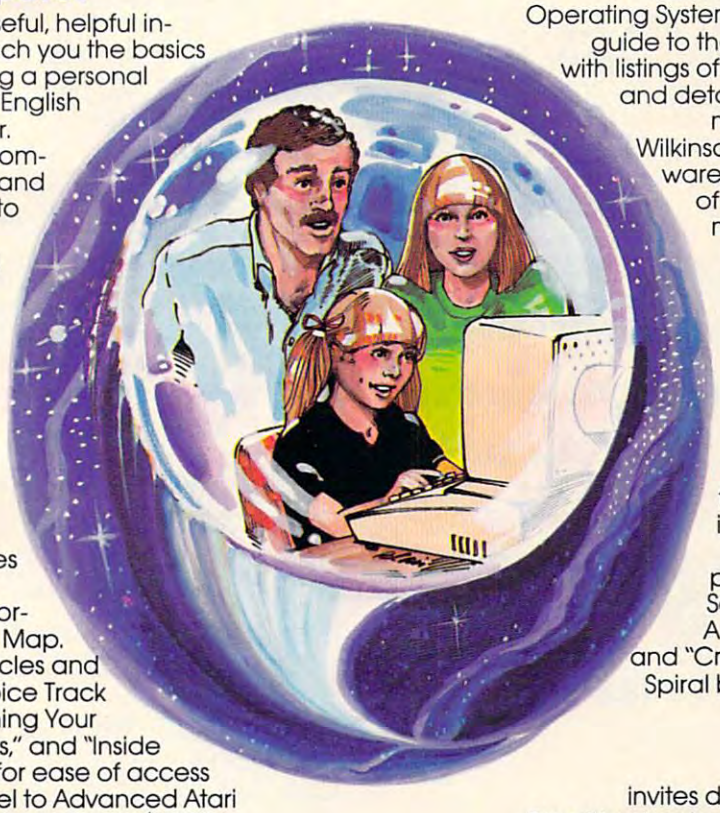

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```
penses":? "{TAB}(Up to nine)"
680 ? "{DOWN}ENTER ITEM <RETURN> AMOUNT
<RETURN>"
690 ? "{DOWN}|ENTER| <RETURN> when done"

700 FOR L=1 TO 9
705 ? "ITEM";
710 INPUT T$:IF LEN(T$) THEN II$(L%30-29
,(L-1)%30+LEN(T$))=T$:IILN(L)=LEN(T$)
711 IF LEN(T$)=0 THEN 760
715 ? "AMOUNT";
720 INPUT T:A(L)=T:IF T=0 THEN 760
730 GOSUB 1360
740 TA=TA+A(L)
750 NEXT L
760 GOSUB 1360:GOSUB 1350:GOSUB 1340
770 REM *** USER INPUT FOR REPAIRS ***
780 ? "{DOWN}|ENTER OTHER REPAIRS| (Up t
o 9)"
790 ? "{DOWN}ENTER ITEM <RETURN> AMOUNT
<RETURN>"
800 ? "{DOWN}|ENTER| <RETURN> when done"
810 FOR C=1 TO 9
815 ? "ITEM";
820 INPUT T$:IF LEN(T$) THEN RA$(C%30-29
,(C-1)%30+LEN(T$))=T$:RALN(C)=LEN(T$)
822 IF LEN(T$)=0 THEN 760
825 ? "AMOUNT";
830 INPUT T:R(C)=T:IF T=0 THEN 870
840 GOSUB 1360
850 TT=TT+R(C)
860 NEXT C
870 GOSUB 1360:GOSUB 1350:GOSUB 1340
880 REM *** USER INCOME INPUT ***
890 IF MY=2 THEN 910
900 GOTO 920
910 ? "{DOWN}|ENTER| |Total| Yearly inco
me for each    unit"
920 ? "{DOWN}How many rental |units|":?

930 IF MY=1 THEN 950
940 ? "For ";PA$
950 INPUT QQ
960 GOSUB 1340
970 IF MY=2 THEN ? "{DOWN}|ENTER| Yearly
 rent":? :GOTO 990
980 ? "{DOWN}|ENTER| monthly rent":?
990 FOR Y=1 TO QQ
1000 ? "Rent from unit ";Y;
1010 INPUT T:Z(Y)=T
1020 GOSUB 1360
1030 U=U+Z(Y)
1040 NEXT Y
1050 GOSUB 1350:GOSUB 1340
1060 IF MY=1 THEN 1170
1070 ? "{2 DOWN}Other income"
1080 ? "{DOWN}|ENTER| ITEM <RETURN> AMOU
NT <RETURN>":? "(Up to 3)"
1090 ? "{DOWN}|ENTER| <RETURN> when done
"
1100 FOR H=1 TO 3
1105 ? "ITEM";
1110 INPUT T$:IF LEN(T$) THEN TT$(H%30-2
9,(H-1)%30+LEN(T$))=T$:TTLN(H)=LEN(T$)
1111 IF LEN(T$)=0 THEN 1160
1115 ? "AMOUNT";
1120 INPUT T:EM(H)=T:GOSUB 1360
1130 IF EM(H)=0 THEN 1160
1140 BB=BB+EM(H)
1150 NEXT H
1160 GOSUB 1350:GOSUB 1340
1170 REM **** OUTPUT AREA ***
1180 ? "{DOWN}                    |ENTER|"
1200 ? "{DOWN}|1| for screen output"
1210 ? "{DOWN}|2| to end":?
1220 ? "Number?1{2 LEFT}";:INPUT H
1240 IF H=1 AND MY=1 THEN 1400
1245 IF H=1 AND MY=2 THEN 1810
1250 IF H=2 THEN 1800
1270 ? "{UP}|INCORRECT DATA|{BELL}":? "{
UP}                    {UP}":GOTO 1220
1280 REM ITEMS CAN BE CHANGED
1290 DATA GAS,ELECTRIC,WATER,OIL,CLEANIN
G,TAXES,INSURANCE,GARDENING

1300 DATA RUBBISH,PEST CONTROL,CARPENTRY
,ELECTRICAL,PLUMBING,ROOFING,HARDWARE,MI
SC.
1310 RESTORE 1290:FOR I=1 TO 10:READ T$:
P$(I%15-14,(I-1)%15+LEN(T$))=T$:NEXT I
1320 FOR I=1 TO 6:READ T$:A$(I%15-14,(I-
1)%15+LEN(T$))=T$:NEXT I
1330 REM *** SUBROUTINES ***
1340 GRAPHICS 0:POSITION 13,0:? "|INCOME
 PROPERTY|":RETURN
1350 FOR AA=1 TO 100:NEXT AA:RETURN
1360 RETURN
1370 ? "{CLEAR}";:RETURN
1380 F=T2+U+TA+TT:RETURN
1390 REM **** SCREEN PRINTOUT ***
1400 GOSUB 1350:GOSUB 1340
1430 Y=10:UA=U+BB:YY=18
1440 GOSUB 1380
1470 ? :?
1490 ? "UTILITIES: ",T2
1520 ? "REPAIRS:   ",U
1530 ?
1540 ? "OTHER EXPENSES:",TA
1550 ? "OTHER REPAIRS:",TT
1590 ? "|
     |":GOSUB 1350
1600 ? "TOTAL EXPENSES =$",F
1630 ? "TOTAL INCOME =$",UA
1640 S=U-F
1670 ?
1680 IF U>F THEN 1700
1690 IF U<F THEN 1720
```

```
1700 ? "PROFIT >>>>>>>> $";S
1710 GOTO 1740
1720 ? "LOSS >>>>>>>>> $";S
1730 GOSUB 1350
1740 ? "Do you want another report"
1750 ? "|Yles or |Nlo?";:POKE 764,255
1760 K=PEEK(764):IF K=255 THEN 1760
1765 POKE 764,255
1770 IF K=43 THEN ? "{CLEAR}{4 DOWN}":GO
SUB 1370:GOSUB 1340:GOTO 160
1780 IF K=35 THEN 1800
1790 ? "{CLEAR}{6 DOWN}":GOTO 1740
1800 GRAPHICS 0:END
1810 REM *** YEARLY REPORT ***
1820 ? "{CLEAR}       INCOME PROPERTY RE
PORT"
1830 ? "                Schedule#";SN:?
1840 ? "Taxpayer's name:  ";TN$
1850 ? "Social Security # ";SSN$:?
1860 ? "Type of property: ";OP$:?
1870 ? "Property Address: ";PA$
1880 ? "           CITY : ";C$
1890 ? "          STATE : ";S$
1900 ? "            ZIP : ";ZIP
2000 ?
2020 POKE 85,17:? "|INCOME|"
2030 ? :?
2040 ? "Rental Income";:POKE 85,32:? "$"
;V
2050 FOR H=1 TO 3
2060 IF EM(H)=0 THEN 2110
2100 ? TT$(H*30-29,(H-1)*30+TTLN(H));:PO
KE 85,33:? "$";EM(H)
2110 NEXT H
2120 ?
2130 ? "TOTAL INCOME = $";V+BB
2140 ? :? "| PRESS ANY KEY TO CONTINUE|"
;:GET #1,A:? "{CLEAR}"
2150 POKE 85,16:? "|EXPENSES|"
2170 ?
2180 FOR I=1 TO 10
2190 IF N(I)=0 THEN 2210
2200 ? P$(I*15-14,I*15);:POKE 85,33:? "$
";N(I)
2210 NEXT I
2220 FOR L=1 TO 9
2230 IF A(L)=0 THEN 2250
2240 ? II$(L*30-29,(L-1)*30+IILN(L));:PO
KE 85,33:? "$";A(L)
2250 NEXT L
2260 ? :? "| PRESS ANY KEY TO CONTINUE|"
;:GET #1,A
2270 ? "{CLEAR}";:POKE 85,16:? "|REPAIRS
|"
2290 ?
2300 FOR K=1 TO 6
2310 IF E(K)=0 THEN 2330
2320 ? A$(K*15-14,K*15);:POKE 85,33:? "$
";E(K)
2330 NEXT K
2340 FOR C=1 TO 9
2350 IF R(C)=0 THEN 2370
2360 ? RA$(C*30-29,(C-1)*30+RALN(C));:PO
KE 85,33:? "$";R(C)
2370 NEXT C
2380 ?
2390 ? "TOTAL EXPENSES = $";F
2400 ? :? "| PRESS ANY KEY TO CONTINUE|"
;:GET #1,A
2410 ? "{CLEAR}":POKE 85,11:? "Milease a
nd Travel"
2420 ?
2440 REM *** MILEAGE COST AT LINE 650 **
*
2450 ? M;" Miles @ .21 : $";MM
2460 ?
2470 ? "Other travel expense: $";ET
2480 ? :?
2490 ? :? "| PRESS ANY KEY TO CONTINUE|"
;:GET #1,A
2510 GOTO 1160
```

©

Using *your* computer in an interesting application? Write it up for other **COMPUTE!** readers to use.

This strategy game will run as presented on any Commodore computer. A version for the Atari is included separately. The Commodore version will also run on an Apple with the changes noted at the end of the article. Originally written for the VIC, it has no sound effects (to save memory). These were added to the Atari Version.

Outpost

Tim Parker
Kanata, Ontario

The object of Outpost is to survive. You are placed in an immovable outpost, armed with torpedoes, main and secondary energy armaments, and a targeting computer. Your opponents come in three sizes, labelled SML (small), MDM (medium) and HVY (heavy). Their objective is to overrun you, or destroy you by knocking out your armaments, computer, or energy supply.

When RUN, the screen gives you quite a lot of information. Your status is displayed to the right center, where values for ENGY (energy), COMP (computer), MAIN (main armament), SECN (secondary armament), TORP (torpedoes), and VP (victory points) are displayed. Energy is rated from zero to ninety-nine. If the energy drops to zero, you lose the game. Computer efficiency, and both main and secondary armaments, are rated as a percentage of capability. Ninety-nine is maximum.

If the computer falls to zero, you have lost all defensive capabilities, and lose the game. If either or both armaments fall to zero, they cannot be fired until recharged by a supply ship. Five torpedoes are supplied at the beginning of the game. A maximum of nine can be stored in the outpost at any time. Victory Points is your score. For each light enemy ship destroyed, one victory point is awarded; similarly, two for medium, and three for heavy ships.

The top of the screen shows the enemy. Up to four are active at a time. Each enemy ship is referenced by a number on the "radar screen" at center left. The index above gives the DIST (distance), PROB (hit probability), and ENGY (energy) of the enemy. The hit probability is a function of both enemy distance and your computer efficiency. If enemy energy falls to zero it is destroyed, and victory points are awarded.

When playing, the computer will give you a "Weapon" prompt. This requires an input of T(orpedo), M(ain), or S(econdary) for the different weapons. C can be entered to recharge your batteries, and the energy of the outpost will increase when employed, to a maximum of 99. If a weapon is being fired, the prompt "TARGET NO" appears, requiring a value of one to four, depending on the enemy number.

After your turn, the computer will move some of the enemy ships, and some will fire at you. They have a hit probability that is a function of their energy. Damage to energy, computer, or armaments may result.

Occasionally, a supply ship wanders onto the screen. This is shown by a white "S". If it reaches you successfully, it recharges energy, main and secondary armaments to full power, and adds up to five torpedoes. Since a maximum of nine can be held at one time, any extras are lost. Note that the supply ship does not recharge your computer. The supply ships can be destroyed if an enemy lands on top of them.

As might be expected, a hit on an enemy ship will decrease its energy. The amount of damage done is proportional to the type of enemy ship; the heavy ships are harder to destroy than mediums and lights. The type of weapon fired also affects damage. On an efficiency scale, torpedoes, main and secondary armament are approximately 9:6:4 in damage ratios. A few trial games quickly gives a feel for this.

High scores are not always easy to get. If a score of twenty is achieved, you are very good. Forty is excellent. Sixty is almost impossible, unless you're extremely lucky.

Strategy

The light ships are the most easily destroyed, but they do the least damage to you. If a heavy ship appears, try to get it fast. If an enemy gets within two moves of you, hit it hard. If it lands on you, you are destroyed. Also, protect your supply ships. They are needed and they are easily destroyed by the enemy.

As the computer efficiency rating drops, the hit probability also drops. With low computer values, you'll find that you have to wait for the enemy to get close before wasting shots. Torpedoes shouldn't be wasted, especially on low probability shots. If you get a few enemy ships on the screen at once, pick them off one at a time if possible to try and avoid concentrated fire. If you have four heavy ships bearing down on you, it's wisest to panic. If no enemy ships are on the screen, charge your batteries.

The Program

The program is divided into several blocks:

lines		
	0-999	Control section
	1000-1999	Screen display
	2000-2999	Refuel routine
	3000-3999	Enemy movement

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4000-4999	**Enemy fire**
5000-5999	**Enemy ship & Supply ship appearances**
6000-6999	**Weapons and firing routine**
9500-9999	**Destroyed routine.**

When RUN, the program loops through each section, beginning with your fire routine, enemy fire and movement, new ships, and the screen routine. This is controlled by line 500.

The odds of a ship appearing are given in lines 5005 and 5010. The four ships are listed as subscripts of ET(x), with a value of one for light, two for medium, and three for heavy ships. ET(5) is the supply ship, and has a value of five if one is on the screen, and zero otherwise. EH(x) is the ship's hit probability, given by line 40, and ED(x) is the distance, given in line 30. To change the difficulty level of the game, change the values of the number following "FNA(x)" in lines 5005 and 5010. If a ship is scheduled to appear, line 5110 chooses the type. Light are the most probable.

The "radar screen" is generated by section 1500-1700 using an individual coordinate system. EX(x) and EY(x) define each enemy ship location. This is a slow method for generating the display, but offers the best memory saving.

GET statements are used throughout to avoid the inevitable RETURN hit.

If you wish to avoid wearing your fingers to the bone, I will be glad to duplicate the Commodore version of the program if you send $3.00, a blank tape, and an addressed mailer (no stamps) to:

Tim Parker
66 McKitrick Dr.
Kanata, ONT, Canada K2L1T7

Notes For Apple Owners:

Outpost is not too hard to adapt to the Apple since it is primarily a straightforward text display. The only problems are in the formatting of the display. Follow the suggestions given in **COMPUTE!**'s Listing Conventions, e.g. replace [CLEAR] with 'HOME', [LEFT] with CHR$(8), etc. Ignore all the VIC color controls such as WHT, CYN, BLK, etc. You may want to replace lines like 1690:

1690 PRINT "[HOME][6 DOWN]"

with

1690 VTAB 6

In line 1305, the underlined D's represent dashes, and the underlined Q in line 1630 is a "ball character." You can put whatever you like there, perhaps an asterisk.

Program 1: Commodore Version

```
10 PRINT"{CLEAR}":POKE36879,76
20 DEFFNA(X)=INT(RND(1)*X+1)
30 DEFFNB(Z)=INT(SQR((EX(G)-6)^2+(EY(G)-6)
   ^2))
40 DEFFNC(Z)=INT(1/(ED(G))*100+(C/2))
50 C=99:G=1:GOSUB5110:GOSUB2000
200 GOSUB5000:GOSUB1000:GOSUB6000:GOSUB3000
    :GOSUB4000
210 GOTO200
1000 PRINT"{HOME}{DOWN}{BLK}ENEMY 1   2   3 ~
      4"
1020 PRINT"{WHT}TYPE ";
1030 FORG=1TO4
1040 IFET(G)=0THENPRINT"--- ";
1050 IFET(G)=1THENPRINT"LGT ";
1060 IFET(G)=2THENPRINT"MDM ";
1070 IFET(G)=3THENPRINT"HVY ";
1080 NEXT
1100 PRINT:PRINT"DIST":PRINT"PROB          ~
        ":PRINT"ENGY                "

1120 FORG=1TO4
1122 X=1+G*4
1124 PRINT"{04 UP}"
1126 PRINTSPC(X)ED(G)
1128 PRINTSPC(X)EH(G)
1130 PRINTSPC(X)EE(G)
1140 NEXTG
1300 PRINT:PRINTSPC(12);" {BLU}STATUS"
1305 PRINTSPC(12)" DDDDDD"
1310 PRINTSPC(11)" {CYN}ENGY:   {03 LEFT}";E

1320 PRINTSPC(11)"{YEL} COMP:   {03 LEFT}";C

1330 PRINTSPC(11)"{CYN} MAIN:   {03 LEFT}";M

1340 PRINTSPC(11)" SECN:   {03 LEFT}";S
1350 PRINTSPC(11)" TORP:";T
1360 PRINTSPC(11)"  VP :";VP
1400 PRINT:PRINTSPC(11);" {RED}C=CHARGE":PRI
    NT:PRINT
1500 PRINT"{HOME}{06 DOWN}"
1510 A=0
1520 FORY=1TO11
1530 FORX=1TO11
1540 FORG=1TO5
1550 IFY<>EY(G)THEN1620
1560 IFX<>EX(G)THEN1620
1570 A=1:IFG=1THENPRINT"{BLK}1";
1580 IFG=2THENPRINT"{BLK}2";
1590 IFG=3THENPRINT"{BLK}3";
1600 IFG=4THENPRINT"{BLK}4";
1610 IFG=5THENPRINT"{WHT}S";
1620 NEXTG
1630 IFX=6ANDY=6THENPRINT"{GRN}Q";:A=1
1640 IFA=1THENA=0:GOTO1660
1650 PRINT"{GRN}+";
1660 NEXTX
1670 PRINT
1680 NEXTY
1690 PRINT"{HOME}{06 DOWN}"
1700 FORA=1TO11
1710 PRINTSPC(11)" "
1720 NEXT
1990 PRINT:RETURN
2000 ET(5)=0:EX(5)=0:EY(5)=0
2010 E=99:M=99:S=99
2020 T=T+5:IFT>9THENT=9
2030 RETURN
3000 FORG=1TO5:IFET(G)>0THEN3100
```

```
3010 NEXTG:RETURN
3100 IFG<5ANDFNA(9)>5THEN3010
3200 IF EX(G)>6THENEX(G)=EX(G)-1
3210 IF EX(G)<6THENEX(G)=EX(G)+1
3220 IFEY(G)<6THENEY(G)=EY(G)+1
3230 IFEY(G)>6THENEY(G)=EY(G)-1
3240 IFET(5)=5ANDEY(5)=6ANDEX(5)=6THENGOSUB2
    000
3250 IFEY(G)=6ANDEX(G)=6THEN9500
3265 IFG<5ANDEX(G)=EX(5)ANDEY(G)=EY(5)THENET
    (5)=0:EX(5)=0:EY(5)=0
3300 ED(G)=FNB(1)
3330 EH(G)=FNC(0):IFEH(G)>99THENEH(G)=99
3400 GOTO3010
4000 PRINT"{UP}ENEMY FIRING & MOVING"
4010 FORG=1TO4:IFET(G)<>0THEN4100
4020 NEXTG:RETURN
4100 IFFNA(99)>(EE(G)+FNA(30))OREE(G)<10THEN
    4020
4110 E=E-FNA(5)*ET(G)
4150 EE(G)=EE(G)-FNA(10)
4160 IFFNA(10)=1THENC=C-FNA(25):IFC<1THEN950
    0
4170 IFFNA(10)=1THENM=M-FNA(25):IFM<0THENM=0

4180 IFFNA(10)=1THENS=S-FNA(25):IFS<0THENS=0

4200 IFE<0THEN9500
4210 GOTO4020
5000 G=FNA(5)
5005 IFG=5ANDET(5)=0ANDFNA(4)>1THENET(5)=5:G
    OTO5160
5010 IFG=5ORET(G)<>0ORFNA(9)>4THEN5400
5110 A=4-INT(LOG(FNA(50)+2))
5120 ET(G)=A:EE(G)=99
5160 EX(G)=FNA(11)
5170 EY(G)=FNA(11)
5180 A=FNA(4):IFA=1THENEY(G)=1
5190 IFA=2THENEY(G)=11
5200 IFA=3THENEX(G)=11
5210 IFA=4THENEX(G)=1
5300 ED(G)=FNB(1)
5320 EH(G)=FNC(0):IFEH(G)>99THENEH(G)=99
5400 RETURN
6000 PRINT"{BLK}WEAPON:                    "
6010 GETA$:IFA$=""THEN6010
6020 IFA$="M"ANDM>0THENA=6:M=M-FNA(5):IFM<0T
    HENM=0
6025 IFA$="C"THENE=E+FNA(20):IFE>99THENE=99
6030 IFA$="C"THENRETURN
6035 IFA$="S"ANDS>0THENA=4:S=S-FNA(5):IFS<0T
    HENS=0
6040 IFA$="T"ANDT>0THENA=9:T=T-1
6060 IFA<3THENPRINT"{UP}BAD INPUT! WEAPON:":
    GOTO6010
6100 PRINT"{UP}TARGET NO:                  "
6120 GET B$:IFB$=""THEN6120
6125 B=VAL(B$)
6130 IFET(B)=0THENPRINT"{UP}BAD DATA! TARGET
    :":GOTO6120
6200 IFFNA(99)>EH(B)THENPRINT"{UP}MISSED!
        ":FORZ=1TO1000:NEXT:RETURN
6210 EE(B)=INT(EE(B)-((A*FNA(15))/ET(B)))
6215 PRINT"{UP}{WHT}TARGET HIT       ":FORZ=1
    TO1000:NEXT
6220 IFEE(B)<1THEN6500
6230 E=E-FNA(5)
6300 RETURN
6500 VP=VP+ET(B)
6505 EX(B)=0:EY(B)=0
6510 ET(B)=0:EH(B)=0:ED(B)=0:EE(B)=0
6570 PRINT"{UP}{BLU}{REV}  TARGET DESTROYED!
     "
6575 FORA=1TO1000:NEXT
6580 RETURN
9500 POKE36879,110
9510 PRINT"{CLEAR}{WHT}{03 DOWN}     DESTROYE
    D!!!!!"
9550 PRINT"{04 DOWN}      SCORE= ";VP:PRINT:P
    RINT
9560 IFVP>HSTHENHS=VP
9580 PRINT"{02 DOWN} {GRN} ****************
    "
9590 PRINT" {GRN}  HIGH SCORE= ";HS
9600 PRINT" {GRN} ****************"
9605 PRINT"{04 DOWN}  {WHT}  ANOTHER GAME?"
9610 GETA$:IFA$=""THEN9610
9620 IFA$="Y"THENRUN
9630 STOP
```

Program 2: Atari Version

The game has changed very little in conversion to the Atari. Several sound effects were added to increase the excitement of the game. Also notice that the "radar screen" is set off in a green box by using player/missile graphics. If you have 8K of memory, you might want to delete lines 7000-7060 and just use:

```
7000 RETURN
```

```
10 GRAPHICS 0:POKE 752,1:GOTO 50
20 X=INT(RND(0)*X+1):RETURN
30 Z=INT(SQR((EX(G)-6)^2+(EY(G)-6)^2)):R
ETURN
40 Z=INT(1/(ED(G))*100+(C/2)):RETURN
50 DIM S$(11),R$(40):OPEN #1,4,0,"K":G=1

51 DIM ET(5),EH(5),EX(5),EE(5),EY(5),ED(
5)
52 R$="{RIGHT}":R$(40)="{RIGHT}":R$(2)=R
$
53 S$=R$(1,11):REM 11 SPACES
55 C=99:G=1:GOSUB 8000:GOSUB 5110:GOSUB
2000:GOSUB 7000
200 GOSUB 5000:GOSUB 1000:GOSUB 6000:GOS
UB 3000:GOSUB 4000
210 GOTO 200
1000 POSITION 2,1:? "|ENEMY|       1
  2       3       4"
1020 ? "TYPE     ";
1030 FOR G=1 TO 4
1040 IF ET(G)=0 THEN ? " ------";
1050 IF ET(G)=1 THEN ? " LIGHT ";
1060 IF ET(G)=2 THEN ? " MEDIUM";
1070 IF ET(G)=3 THEN ? " HEAVY ";
1080 NEXT G
1100 ? :? "Distance":? "Prob.
       ":? "Energy
     "
1120 FOR G=1 TO 4
1122 X=G*7+5
1124 ? "{4 UP}"
1126 ? R$(1,X);ED(G);" "
1128 ? R$(1,X);EH(G);" "
1130 ? R$(1,X);EE(G);" "
```

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```
1140 NEXT G:? :POKE 201,11
1150 FOR I=8 TO 19:POSITION 2,I:? ,:NEXT
 I:POSITION 2,8
1300 ? S$;" ISTATUSI"
1305 ? S$;" (6 R)":?
1310 ? S$;" ENERGY       (3 LEFT)";E
1320 ? S$;" COMPUTER     (3 LEFT)";C
1330 ? S$;" MAIN         (3 LEFT)";M
1340 ? S$;" SECONDARY    (3 LEFT)";S
1350 ? S$;" TORPS        (3 LEFT)";T
1360 ? S$;" V.P.         (3 LEFT)";VP
1400 ? :? S$;" C=CHARGE":? :?
1500 POSITION 2,8
1510 A=0
1520 FOR Y=1 TO 11
1530 FOR X=1 TO 11
1540 FOR G=1 TO 5
1550 IF Y<>EY(G) THEN 1620
1560 IF X<>EX(G) THEN 1620
1570 A=1:IF G<>5 THEN ? G;:FOR W=150 TO
0 STEP -10:SOUND 0,W,12,W:NEXT W
1610 IF G=5 THEN ? "IS!";:FOR W=150 TO 0
 STEP -10:SOUND 0,I,10,W/10:NEXT W
1620 NEXT G
1630 IF X=6 AND Y=6 THEN ? "(T)";:A=1
1640 IF A=1 THEN A=0:GOTO 1660
1650 ? "+";:POKE 53279,0
1660 SOUND 0,0,0,0:NEXT X
1670 ?
1680 NEXT Y
1690 POSITION 2,6
1700 FOR A=1 TO 11
1710 ? R$(1,11);" "
1720 NEXT A
1990 ? :RETURN
2000 ET(5)=0:EX(5)=0:EY(5)=0
2010 E=99:M=99:S=99
2020 T=T+5:IF T>9 THEN T=9
2030 RETURN
3000 FOR G=1 TO 5:IF ET(G)>0 THEN 3100
3010 NEXT G:RETURN
3100 IF G<5 AND INT(9*RND(0)+1)>5 THEN 3
010
3200 IF EX(G)>6 THEN EX(G)=EX(G)-1
3210 IF EX(G)<6 THEN EX(G)=EX(G)+1
3220 IF EY(G)<6 THEN EY(G)=EY(G)+1
3230 IF EY(G)>6 THEN EY(G)=EY(G)-1
3240 IF ET(5)=5 AND EY(5)=6 AND EX(5)=6
THEN GOSUB 2000
3250 IF EY(G)=6 AND EX(G)=6 THEN 9500
3265 IF G<5 AND EX(G)=EX(5) AND EY(G)=EY
(5) THEN ET(5)=0:EX(5)=0:EY(5)=0
3300 GOSUB 30:ED(G)=Z
3330 GOSUB 40:EH(G)=Z:IF EH(G)>99 THEN E
H(G)=99
3400 GOTO 3010
4000 ? "(UP)ENEMY FIRING & MOVING"
4010 FOR G=1 TO 4:IF ET(G)<>0 THEN 4100
4020 NEXT G:RETURN
4100 IF INT(99*RND(0)+1)>(EE(G)+INT(30*R
ND(0)+1)) OR EE(G)<10 THEN 4020
4110 E=E-INT(5*RND(0)+1)*ET(G)
4150 EE(G)=EE(G)-INT(10*RND(0)+1)
4160 IF RND(1)<0.1 THEN C=C-INT(25*RND(0
)+1):IF C<1 THEN 9500
4170 IF RND(1)<0.1 THEN M=M-INT(25*RND(0
)+1):IF M<0 THEN M=0
4180 IF RND(1)<0.1 THEN S=S-INT(25*RND(0
)+1):IF S<0 THEN S=0
4200 IF E<0 THEN 9500
4210 GOTO 4020
5000 G=INT(5*RND(0)+1)
5005 IF G=5 AND ET(5)=0 AND INT(4*RND(0)
+1)>1 THEN ET(5)=5:GOTO 5160
5010 IF G=5 OR ET(G)<>0 OR INT(9*RND(0)+
1)>6 THEN 5400
5110 A=4-INT(LOG(INT(50*RND(0)+1)+2))
5120 ET(G)=A:EE(G)=99
5160 EX(G)=INT(11*RND(0)+1)
5170 EY(G)=INT(11*RND(0)+1)
5180 A=INT(4*RND(0)+1):IF A=1 THEN EY(G)
=1
5190 IF A=2 THEN EY(G)=11
5200 IF A=3 THEN EX(G)=11
5210 IF A=4 THEN EX(G)=1
5300 GOSUB 30:ED(G)=Z
5320 GOSUB 40:EH(G)=Z:IF EH(G)>99 THEN E
H(G)=99
5400 RETURN
6000 ? :? :? "WEAPON:                ":A=
0
6010 TRAP 6010:GET #1,K:TRAP 40000
6020 IF K=ASC("M") AND M>0 THEN A=6:M=M-
INT(5*RND(0)+1):IF M<0 THEN M=0
6025 IF K=ASC("C") THEN E=E+INT(20*RND(0
)+1):GOSUB 10800:IF E>99 THEN E=99
6030 IF K=ASC("C") THEN RETURN
6035 IF K=ASC("S") AND S>0 THEN A=4:S=S-
INT(5*RND(0)+1):IF S<0 THEN S=0
6040 IF K=ASC("T") AND T>0 THEN A=9:T=T-
1
6060 IF A<3 THEN ? "(UP)(BELL)BAD INPUT!
 WEAPON:":GOTO 6010
6100 ? "(UP)TARGET NO:          "
6120 TRAP 6120:GET #1,K:TRAP 40000
6125 B=K-48:B=B*(B>=1 AND B<=4)
6130 IF ET(B)=0 THEN ? "(UP)(BELL)BAD DA
TA! TARGET: ":GOTO 6120
6140 IF A=6 THEN GOSUB 10600
6150 IF A=4 THEN GOSUB 10500
6160 IF A=9 THEN GOSUB 10400
6200 IF INT(99*RND(0)+1)>EH(B) THEN ? "(
UP)MISSED!                ":GOSUB 10100:
RETURN
6210 EE(B)=INT(EE(B)-((A*INT(15*RND(0)+1
))/ET(B)))
```

```
6215 ? "{UP}TARGET !HIT!                ":GOSU
B 10200
6220 IF EE(B)<1 THEN 6500
6230 E=E-INT(5*RND(0)+1)
6300 RETURN
6500 UP=UP+ET(B)
6505 EX(B)=0:EY(B)=0
6510 ET(B)=0:EH(B)=0:ED(B)=0:EE(B)=0
6570 ? "{UP}!  TARGET DESTROYED!  !":GOS
UB 10300
6580 RETURN
7000 REM LINES 7000-7060 ARE P/M GRAPHIC
S. DELETE FOR 8K MEMORY
7005 POKE 559,46:PMB=PEEK(106)-16:POKE 5
4279,PMB:PMB=PMB*256+512
7010 POKE 53248,0:POKE 53249,0
7020 POKE 704,192:POKE 705,192:P=47
7030 POKE 53256,3:POKE 53257,3
7035 FOR I=0 TO 63:POKE PMB+I,0:POKE PMB
+64+I,0:POKE PMB+128+I,0:POKE PMB+192+I,
0:NEXT I
7040 FOR I=0 TO 44:POKE PMB+P+I,255:POKE
 PMB+128+P+I,255:NEXT I
7050 POKE 53277,3:POKE 53248,55:POKE 532
49,68
7060 RETURN
8000 FOR I=0 TO 5:ET(I)=0:EH(I)=0:EX(I)=
0:EY(I)=0:ED(I)=0:EE(I)=0:NEXT I:RETURN

9500 GOSUB 10700
9510 ? "{CLEAR}{3 DOWN}You have been !DE
STROYED!!"
9520 POKE 53248,0:POKE 53249,0
9530 POKE 53277,0:POKE 559,34
9550 ? "{4 DOWN  SCORE=";UP:? :?
9560 IF UP>HS THEN HS=UP
9580 ? "{2 DOWN}**********************"

9590 ? "  High Score= ";HS
9600 ? "**********************"
9605 ? "{4 DOWN} Another Game? ";
9630 TRAP 9630:GET #1,K:TRAP 40000
9640 IF K=ASC("Y") THEN RUN
9650 END
10000 REM SOUND SUBROUTINES
10100 REM MISSED!
10110 FOR W=100 TO 200 STEP 2:SOUND 0,W,
10,4:NEXT W:SOUND 0,0,0,0:RETURN
10200 REM HIT!
10210 FOR W=0 TO 30:SOUND 0,W*8,8,15-W/2
:SOUND 1,W*8,16,15-W/2:POKE 712,PEEK(537
70):NEXT W
10220 POKE 712,0:RETURN
10300 REM ENEMY DESTROYED!
10310 FOR W=0 TO 255 STEP 10
10320 POKE 704,PEEK(53770):POKE 705,PEEK
(704)
10330 SOUND 0,W,8,W/15:SOUND 1,PEEK(5377
0),0,15*RND(1)
10340 NEXT W:SOUND 0,0,0,0:SOUND 1,0,0,0

10350 POKE 704,192:POKE 705,192
10360 RETURN
10400 REM PHOTON TORPEDO
10410 FOR W=200 TO 100 STEP -2:SOUND 0,W
,2,4:NEXT W:FOR W=0 TO 100 STEP 6:SOUND
0,W,2,8:NEXT W
10420 SOUND 0,0,0,0:RETURN
10500 REM SECONDARY FIRE
10510 FOR I=1 TO 10:FOR W=0 TO 3:SOUND 0
,W,2,8:NEXT W:NEXT I:SOUND 0,0,0,0:RETUR
N
10600 REM MAIN FIRE
10610 FOR I=1 TO 10:FOR W=0 TO 3:SOUND 0
,W,2,8:SOUND 1,W*3,2,8:NEXT W:NEXT I:SOU
ND 0,0,0,0:SOUND 1,0,0,0:RETURN
10700 REM !YOUR! DEATH KNELL
10710 FOR W=0 TO 255 STEP 10
10720 POKE 710,PEEK(53770):POKE 712,PEEK
(53770)
10730 SOUND 0,W,0,15-W/17:SOUND 1,128+W/
2,8,8+7*RND(1)
10740 NEXT W:FOR W=0 TO 10:POKE 710,68:F
OR I=0 TO 5:NEXT I:POKE 710,0:NEXT W
10780 SOUND 0,0,0,0:SOUND 1,0,0,0
10790 SETCOLOR 2,9,4:SETCOLOR 4,0,0:RETU
RN
10800 REM RECHARGE
10810 FOR W=1 TO 20:SOUND 0,5+5*RND(0),1
0,8:NEXT W
10820 SOUND 0,0,0,0:RETURN                ©
```

This issue we feature two articles on the increasingly popular "computer camp."

For a list of upcoming computer camps, see "Learning With Computers" elsewhere in this issue.

Guest Commentary:

Computer Camp

G. R. Boynton
University of Iowa
Iowa City, IO

It was the last day of our four weeks, and I had saved my sure winner for this day. It is a capital A which goes skipping across the screen from right to left. As soon as he saw it, Steve knew what he wanted and, with a little help, he produced a "banner" program which printed

››››STEVE ON THE GO›››

across the screen a thousand times. It is a relatively simple program, but Steve is only eleven. More important than how difficult or easy the program is what it says about Steve.

Last summer the Laboratory for Political Research at the University of Iowa ran a computer camp for four groups of seven junior high school students and a few, like Steve, who were younger and one or two who were in high school. For two years we have been busy installing microcomputers in the Lab and the department of political science. In the process we have purchased seven Commodore 2001s and 37 Commodore 8037s. The 2001s were used for program development before the 8032s were available and, when we got the 8032s the 2001s became surplus. I had never had a chance to work with junior high school students, and I wanted to see what that enthusiasm and energy was like. Hence, the computer camps.

Each group met for three hours a day for four weeks. My plan was very simple. Show them a lot of tricks that one can do with a PET. Have a lot of games that they can play. And get out of their way; turn them loose with a computer and see what happens. Cursor [*the monthly tape of programs from The Code Works*] very graciously permitted me to use their games (I received as a subscriber) in the computer camp on an experimental basis. I helped the campers write programs for between 30 minutes and an hour each day. We concentrated on relatively simple graphics programs because that is what they really liked. And then they were free to do what they wanted to do for the remainder of their three hours.

Literacy At A Low Price

Simple graphics programming has two advantages when working with junior high students. First, it motivates. They like making graphic displays, and that can be done rather easily on Commodore computers. Second, it eases the introduction to what are otherwise rather arcane subjects.

You have to learn something about variables and constants, strings and numbers, loops and conditionals to do any programming. But, if you are going to program graphics you also have to learn something about the difference between printing and POKEing to the screen. And this involves learning something about ASCII values for representing characters. And that this is only useful if you understand something about memory where the numbers are stored. This, in turn, leads immediately to a discussion of the memory map of the PET, keyboard buffers, and other esoterica. All these topics follow naturally, in the process of learning to put graphics displays on the screen and move them around. It's computer literacy at a very low price.

By the end of four weeks, most of the students had learned enough so that they could put ideas to work. That final program which Steve responded to is a simple idea. You print something, erase it, move, and print it again. There were also several rather nice applications of this idea. Josh produced a rocket which zoomed up the screen and then came down, landing on the moon. Gus printed his goodbye to his classmates by writing each line in a fancy box on the screen, erasing it, and then writing the next line.

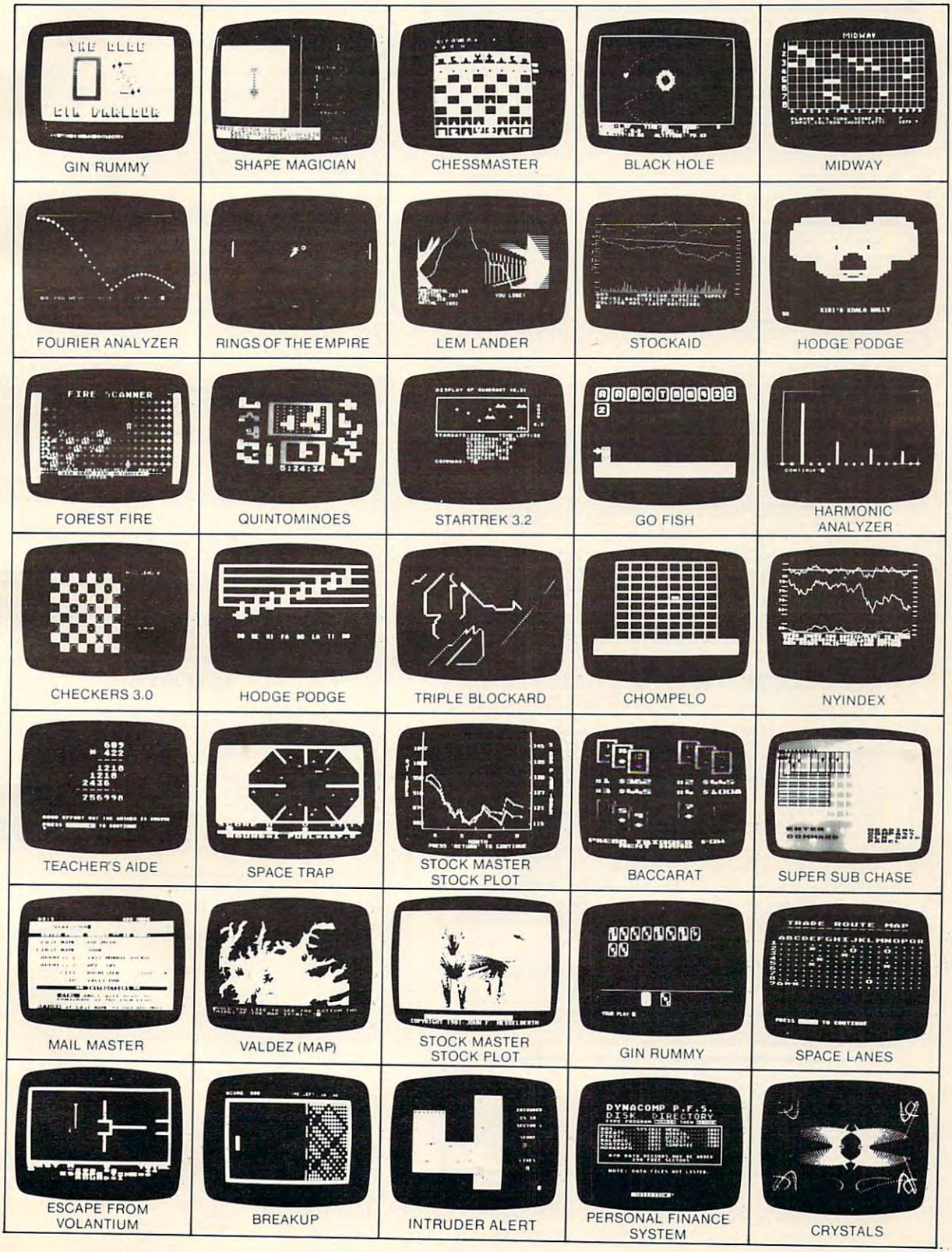
We did some other programming as well. We spent about a week building and using a subroutine that would break up a string into its constituent words. A fortune telling program resulted from that. And another program used the same subroutine to test knowledge of US and European capitols.

Programming is okay, but much of the appeal of the camp was the games. Cursor is a good collection of games of the most diverse types. Each student spent many hours playing these games. Fast action games were the most popular, but treasure hunt games, gambling games, and strategy games were popular as well.

My friends were having fun playing games and learning to write programs. And I learned some things about them.

One characteristic is that a majority of them charge ahead. Don't bother to read instructions.

It's hard to picture all of DYNACOMP's *software*



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DYNACOMP

Quality software for:*

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CARD GAMES

NEW **BRIDGE MASTER (North Star only)** **Price: $21.95 Diskette**
If you liked DYNACOMP'S BRIDGE 2.0, you will absolutely love BRIDGE MASTER. BRIDGE MASTER is a comprehensive bridge program designed to provide hours of challenging competition. Bidding features include the Blackwood convention, Stayman convention, pre-emptive openings, and recognition of demand bids and jump-shift responses. After playing a specific hand, you may replay the same hand, with the option of switching cards with your computer opponents. This feature allows you to compare your bidding and playing skills to BRIDGE MASTER. Bonuses for game contracts and slams are awarded as in duplicate bridge. Doubled contracts are scored based upon a computer assigned vulnerability. A score card is displayed at the conclusion of each hand. The score card displays a summary of total hands played, total points scored, number of contracts made and set, and % bids made. BRIDGE MASTER is clearly the best computer bridge program available.
DYNACOMP'S previous BRIDGE 2.0 customers may upgrade to BRIDGE MASTER for a nominal charge of $5.00 plus postage and handling (see ordering information box).

NEW **BACCARAT (Atari only)** **Price: $18.95 Cassette/$22.95 Diskette**
This is the European card game which is the favorite of the Monte Carlo jet set. Imagine yourself at the gaming table with 007 to your left and Goldfinger to your right. Learn and play BACCARAT at your leisure on the Atari. Contains full high resolution color graphics and matching sound. Runs in 16K. Requires one joystick.

NEW **GIN RUMMY (Apple diskette only)** **Price: $22.95 Diskette**
This is the best micro computer implementation of GIN RUMMY existing. The computer plays exceptionally well, and the HIRES graphics are superb. What else can be said?

NEW **POKER PARTY (Available for all computers)** **Price: $17.95 Cassette/$21.95 Diskette**
POKER PARTY is a draw poker simulation based on the book, POKER, by Oswald Jacoby. This is the most comprehensive version available for microcomputers. The party consists of yourself and six other (computer) players. Each of these players (you will get to know them) has a different personality in the form of a varying propensity to bluff or fold under pressure. Practice with POKER PARTY before going to that expensive game tonight! Apple cassette and diskette versions require a 32 K (or larger) Apple II.

NEW **GO FISH (Available for all computers)** **Price: $14.95 Cassette/$18.95 Diskette**
GO FISH is a classic children's card game. The opponent is a friendly computer with user inputs that are simple enough for small children to easily master. The Apple and Atari versions employ high resolution graphics for the display of hands. A must for children!

NEW **BLACKJACK COACH (32K TRS-80 only)** **Price $29.95 Cassette/$33.95 Diskette**
BLAGKJACK COACH is both a game and an educational tool. With this program you may quantitatively test-standard and special playing and betting methods, including the several card count schemes. You can simply play, play with the computer as a coach, or statistically test your method under long run automatic play. All the standard player choices are included: insurance, splitting pairs, double downs and surrender (optional). The computer analyzes the technique and provides detailed summary reports which statistically pinpoint the strengths and weaknesses of your play. Don't risk your money at the tables until you have practiced with BLACKJACK COACH!

THOUGHT PROVOKERS

MANAGEMENT SIMULATOR (Atari, North Star, OSBORNE and CP/M only) **Price: $19.95 Cassette $23.95 Diskette**
This program is both an excellent teaching tool as well as a stimulating intellectual game. Based upon similar games played at graduate business schools, each player or team controls a company which manufacturers three products. Each player attempts to outperform his competitors by setting selling prices, production volumes, marketing and design expenditures etc. The most successful firm is the one with the highest stock price when the simulation ends.

FLIGHT SIMULATOR (Available for all computers) **Price: $17.95 Cassette/$21.95 Diskette**
A realistic and extensive mathematical simulation of take-off, flight and landing. The program utilizes aerodynamic equations and the characteristics of a real airfoil. You can practice instrument approaches and navigation using radials and compass headings. The more advanced flyer can also perform loops, half-rolls and similar aerobatic maneuvers. Although this program does not employ graphics, it is exciting and very addictive. See the software review in COMPUTRONICS. Runs in 16K Atari.

VALDEZ (Available for all computers) **Price: $15.95 Cassette/$19.95 Diskette**
VALDEZ is a computer simulation of supertanker navigation in the Prince William Sound/Valdez Narrows region of Alaska. Included in this simulation is a realistic and extensive 256 × 256 element map, portions of which may be viewed using the ship's alphanumeric radar display. The motion of the ship itself is accurately modelled mathematically. The simulation also contains a model for the tidal patterns in the region, as well as other traffic (outgoing tankers and drifting icebergs). Chart your course from the Gulf of Alaska to Valdez Harbor! See the software reviews in 80 Software Critique and Personal Computing.

BACKGAMMON 2.0 (Atari, North Star, OSBORNE and CP/M only) **Price: $14.95 Cassette/$18.95 Diskette**
This program tests your backgammon skills and will also improve your game. A human can compete against a computer or against another human. The computer can even play against itself. Either the human or the computer can double or generate dice rolls. Board positions can be created or saved for replay. BACKGAMMON 2.0 plays in accordance with the official rules of backgammon and is sure to provide many fascinating sessions of backgammon play.

CHESS MASTER (North Star and TRS-80 only) **Price: $19.95 Cassette/$23.95 Diskette**
This complete and very powerful program provides five levels of play. It includes castling, en passant captures and the promotion of pawns. Additionally, the board may be preset before the start of play, permitting the examination of "book" plays. To maximize execution speed, the program is written in assembly language (by SOFTWARE SPECIALISTS of California). Full graphics are employed in the TRS-80 version, and two widths of alphanumeric display are provided to accommodate North Star users. See review in onComputing.

FOREST FIRE! (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
Using excellent graphics and sound effects, this simulation puts you in the middle of a forest fire. Your job is to direct operations to put out the fire while compensating for changes in wind, weather and terrain. Not protecting valuable structures can result in startling penalties. Life-like variables are provided to make FOREST FIRE! very suspenseful and challenging. No two games have the same setting and there are 3 levels of difficulty.

BLACK HOLE (Apple only) **Price: $14.95 Cassette/$18.95 Diskette**
This is an exciting graphical simulation of the problems involved in closely observing a black hole with a space probe. The object is to enter and maintain, for a prescribed time, an orbit close to a small black hole. This is to be achieved without coming so near the anomaly that the tidal stress destroys the probe. Control of the craft is realistically simulated using side jets for rotation and main thrusters for acceleration. This program employs Hi-Res graphics and is educational as well as challenging.

NEW **SPACE EVACUATION! (Apple, Atari and TRS-80 only)** **Price: $15.95 Cassette/$19.95 Diskette**
Can you colonize the galaxy and evacuate the Earth before the sun explodes? Your computer becomes the ship's computer as you explore the universe to relocate millions of people. This simulation is particularly interesting as it combines many of the exciting elements of classic space games with the mystery challenge of ADVENTURE.

MONARCH (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
MONARCH is a fascinating economic simulation requiring you to survive an 8-year term as your nation's leader. You determine the amount of acreage devoted to industrial and agricultural use, how much food to distribute to the populace and how much should be spent on pollution control. You will find that all decisions involve a compromise and that it is not easy to make everyone happy. Runs in 16K Atari.

CHOMPELO (Atari only) **Price: $11.95 Cassette/$15.95 Diskette**
CHOMPELO is really two challenging games in one. One is similar to NIM; you must bite off part of a cookie, but avoid taking the poisoned portion. The other game is the popular board game REVERSI. It fully uses the Atari's graphics capability, and is hard to beat. This package will run on a 16K system.

AVAILABILITY

DYNACOMP software is supplied with complete documentation containing clear explanations and examples. Unless otherwise specified, all programs will run within 16K program memory space (ATARI requires 24K). Except where noted, programs are available on ATARI, PET, TRS-80 (Level II) and Apple (Applesoft) cassette and diskette as well as North Star single density (double density compatible) diskette. Additionally, most programs can be obtained on standard (IBM 3740 single density/double density compatible format) 8" CP/M floppy disks for systems running under MBASIC or CBASIC (for example, Altos, Xerox 820 and many others). 5¼" CP/M diskettes are available for the North Star and Osborne computer systems.

**ATARI, PET/CBM, NORTH STAR, CP/M, IBM, OSBORNE, SUPERBRAIN and XEROX are registered tradenames and/or trade marks.*

***Except where noted, all TRS-80 Model I software is available on cassette (only) for the TRS-80 Model III. Exceptions: VALDEZ, CRIBBAGE, GRAFIX, CHESSMASTER. TRS-80 diskettes are not supplied with either DOS or BASIC.*

****For most North Star disk-based systems. DYNACOMP presently does not support the new North Star Advantage.*

*****For Altair systems having Microsoft BASIC.*

******For SUPERBRAIN systems running under MBASIC or CBASIC (state which).*

AND MORE...

STARTREK 3.2 (Available for all computers) **Price: $11.95 Cassette/$15.95 Diskette**
This is the classic Startrek simulation, but with several new features. For example, the Klingons now shoot at the Enterprise without warning while also attacking starbases in other quadrants. The Klingons also attack with both light and heavy cruisers and move when shot at! The situation is hectic when the Enterprise is besieged by three heavy cruisers and a starbase S.O.S. is received! The Klingons get even! See the software reviews in A.N.A.L.O.G., 80 Software Critique and Game Merchandising.

NEW **LIL' MEN FROM MARS (Atari only)** **Price: $19.95 Cassette/$23.95 Diskette**
Defend yourself! The little men from Mars are out to get you if you don't get them first. This is a hilarious high resolution animated graphics (arcade) game which exercises much of the Atari's power. Requires one joystick.

NEW **SPACE TILT (Apple and Atari only)** **Price: $10.95 Cassette/$14.95 Diskette**
Use the game paddles to tilt the plane of the TV screen to "roll" a ball into a hole in the screen. Sound simple? Not when the hole gets smaller and smaller! A built-in timer allows you to measure your skill against others in this habit-forming action game.

NEW **ESCAPE FROM VOLANTIUM (Atari only)** **Price: $15.95 Cassette/$19.95 Diskette**
Bring the action and excitement of an arcade into your home with ESCAPE FROM VOLANTIUM! To escape you must maneuver your space ship around obstacles and laser blast the dragon (without being eaten). If he is killed with a direct shot (not just a leg lopped off), a door opens to the outside. However, the door does not stay open indefinitely. If you fail to escape in time, the door closes and a new dragon appears. Sometimes you can smash through the door by repeatedly chipping away at it. Other times it is impervious. At the higher levels of play more obstacles and dragons appear, adding to the excitement. Uses high resolution graphics and sound. Runs in 16K.

ALPHA FIGHTER (Atari only) **Price: $12.95 Cassette/$16.95 Diskette**
Two excellent graphics and action programs in one! ALPHA FIGHTER requires you to destroy the alien starships passing through your sector of the galaxy. ALPHA BASE is in the path of an alien UFO invasion; let five UFO's get by and the game ends. Both games require the joystick and get progressively more difficult the higher you score! ALPHA FIGHTER will run on 16K systems.

THE RINGS OF THE EMPIRE (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
The empire has developed a new battle station protected by rotating rings of energy. Each time you blast through the rings and destroy the station, the empire develops a new station with more protective rings. This exciting game runs on 16K systems, employs extensive graphics and sound and can be played by one or two players.

INTRUDER ALERT (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
This is a fast paced graphics game which places you in the middle of the "Dreadstar" having just stolen its plans. The droids have been alerted and are directed to destroy you at all costs. You must find and enter your ship to escape with the plans. Five levels of difficulty are provided. INTRUDER ALERT requires a joystick and will run on 16K systems.

NEW **MIDWAY (Atari only)** **Price: $14.95 Cassette/$18.95 Diskette**
MIDWAY is an exciting extension of the game of Battleship. It mixes the challenges of strategy and chance. Your opponent can be another human or the computer. Color graphics and sound are both included. Runs in 16K.

TRIPLE BLOCKADE (Atari only) **Price: $14.95 Cassette/$18.95 Diskette**
TRIPLE BLOCKADE is a two-to-three player graphics and sound action game. It is based on the classic video arcade game which millions have enjoyed. Using the Atari joysticks, the object is to direct your blockading line around the screen without running into your opponent(s). Although the concept is simple, the combined graphics and sound effect lead to "high anxiety".

GAMES PACK I (Available for all computers) **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK I contains the classic computer games of BLACKJACK, LUNAR LANDER, CRAPS, HORSERACE, SWITCH and more. These games have been combined into one large program for ease in loading. They are individually accessed by a convenient menu. This collection is worth the price just for the DYNACOMP version of BLACKJACK.

GAMES PACK II (Available for all computers) **Price: $10.95 Cassette/$14.95 Diskette**
GAMES PACK II includes the games CRAZY EIGHTS, JOTTO, ACEY-DUCEY, LIFE, WUMPUS and others. As with GAMES PACK I, all the games are loaded as one program and are called from a menu. You will particularly enjoy DYNACOMP's version of CRAZY EIGHTS.

Why pay $7.95 or more per program when you can buy a DYNACOMP collection for just $10.95?

MOON PROBE (Atari and North Star only) **Price: $11.95 Cassette/$15.95 Diskette**
This is an extremely challenging "lunar lander" program. The user must drop from orbit to land at a predetermined target on the moon's surface. You control the thrust and orientation of your craft plus direct the rate of descent and approach angle. Runs in 16K Atari.

SPACE TRAP (Atari only, 16K) **Price: $14.95 Cassette/$18.95 Diskette**
This galactic "shoot'em up" arcade game places you near a black hole. You control your spacecraft using the joystick and attempt to blast as many of the alien ships as possible before the black hole closes about you.

NEW **CHIRP INVADERS (PET/CBM only)** **Price: $14.95 Cassette/$18.95 Diskette**
CHIRP INVADERS is an addictive game using action graphics. A Federation space station must be reached before the Chirps conquer the Earth. Stationary obstacles, moving meteors, and the attacking Chirps must all be avoided for a successful journey. Good luck.

NEW **SUPER SUB CHASE (Atari only)** **Price: $19.95 Cassette/$23.95 Diskette**
SUPER SUB CHASE simulates a search and destroy mission. Set your course and keep an eye on the sonar readings as you hunt for the hidden submarine. Set the depth charge explosion depth and watch them sink towards the sub. This is an addictive game which takes advantage of the Atari's graphics and sound capabilities. One or two players. Joystick(s) required.

ADVENTURE

CRANSTON MANOR ADVENTURE (North Star and CP/M only) **Price: $19.95 Diskette**
At last! A comprehensive Adventure game for North Star and CP/M systems. CRANSTON MANOR ADVENTURE takes you into mysterious CRANSTON MANOR where you attempt to gather fabulous treasures. Lurking in the manor are wild animals and robots who will not give up the treasures without a fight. The number of rooms is greater and the associated descriptions are much more elaborate than the current popular series of Adventure programs, making this game the top in its class. Play can be stopped at any time and the status stored on diskette. Not available in 5¼" CP/M format.

GUMBALL RALLY ADVENTURE (North Star only, 48K) **Price: $21.95 Diskette**
Take part in this outlaw race from the east coast to the west coast. The goal is to find your way to the finish line while maintaining the highest possible speed. You may choose one of five cars available at the garage. The choice will affect your speed and range. Remember to take spare parts and don't get caught speeding!

NEW **UNCLE HARRY'S WILL (North Star only, 40K)** **Price: $24.95 Diskette**
Uncle Harry has died and has left you everything. However, he has neglected to mention where everything is! Instead, his will consists of a poem which contains clues. You will have to travel all over the United States both by car and on foot to solve the puzzle, and there are over 300 locations to probe. Be careful and watch out for red herrings!

SPEECH SYNTHESIS

DYNACOMP is now distributing the new and revolutionary TYPE-'N-TALK™ (TNT) speech synthesizer from Votrax. Simply connect TNT to your computer's serial interface, enter text from the keyboard and hear the words spoken. TNT is the easiest-to-program speech synthesizer on the market. It uses the least amount of memory and provides the most flexible vocabulary available anywhere!

TYPE-'N'-TALK List price $375. DYNACOMP'S price $319.95 plus $5.00 for shipping and handling.

TALK TO ME (T'N'T Atari only, 24K) **Price: $14.95 Cassette/$18.95 Diskette**
This program presents a superb tutorial on speech synthesis using the Atari 800 and TYPE-'N-TALK™. TALK TO ME will illustrate normal word generation as well as phoneme generation. The documentation includes many helpful programming tips. TALK TO ME has been demonstrated on network (CBS) TV!

MISCELLANEOUS

CRYSTALS (Atari only) **Price: $ 9.95 Cassette/$13.95 Diskette**
A unique algorithm randomly produces fascinating graphics displays accompanied with tones which vary as the patterns are built. No two patterns are the same, and the combined effect of the sound and graphics are mesmerizing. CRYSTALS has been used in local stores to demonstrate the sound and color features of the Atari. Runs in 16K Atari.

NORTH STAR SOFTWARE EXCHANGE (NSSE) LIBRARY
DYNACOMP now distributes the 23 volume NSSE library. These diskettes each contain many programs and offer an outstanding value for the purchase price. They should be part of every North Star user's collection. Call or write DYNACOMP for details regarding the contents of the NSSE collection.
Price: $9.95 each/$7.95 each (4 or more)
The complete collection may be purchased for $149.95

NEW **5¼" DISKETTES (soft sectored/ten sectored)** **Price: $39.95/20 Diskettes**
As you might imagine, DYNACOMP purchases diskettes in large quantities and at wholesale prices. We want to pass the savings along to you!

BUSINESS and UTILITIES

NEW **MAILMASTER (Atari diskette only)** — **Price: $39.95 Diskette**
MAILMASTER is a very versatile software package for managing and manipulating mail lists and mini data bases. Each disk can hold over 600 customer entries containing name, address, 38 letter key words and a phone number. The display is marked so that entries may be made and edited with ease. The status (e.g., disk space left, options, etc.) is shown at all times. Labels may be printed 1,2 or 3 up, and all sorting (zip code and alphabetic) is performed by a fast machine language program.

PERSONAL FINANCE SYSTEM (Atari and North Star only) — **Price: $39.95 Diskette**
PFS is a single diskette, menu-oriented system composed of ten different programs. Besides recording your expenses and tax deductible items, PFS will sort and summarize expenses by payee, and display information on expenditures by any of 26 user defined codes by month or by payee. PFS will even produce monthly bar graphs of your expenses by category! This powerful package requires only one disk drive, minimal memory (24K Atari, 32K North Star) and will store up to 600 records per disk (and over 1000 records per disk by making a few simple changes to the programs). You can record checks plus cash expenses so that you can finally see where your money goes and eliminate guesswork and tedious hand calculations. Contains high speed machine language sort. PFS has been demonstrated on network (CBS) TV!

FAMILY BUDGET (Apple and Atari only) — **Price: $34.95 Diskette**
FAMILY BUDGET is a very convenient financial record-keeping program. You will be able to keep track of cash and credit expenditures as well as income on a daily basis. You can record tax deductible items and charitable donations. FAMILY BUDGET also provides a continuous record of all credit transactions. You can make daily cash and charge entries to any of 21 different expense accounts as well as to 5 payroll and tax accounts. Data are easily retrieved giving the user complete control over an otherwise complicated (and unorganized!) subject.

INTELINK (Atari only) — **Price: $49.95 Diskette**
This software package contains a menu-driven collection of programs for facilitating efficient two-way communications through a full duplex modem (required for use). In one mode of operation you may connect to a data service (e.g., The SOURCE or MicroNet) and quickly load data such as stock quotations onto your diskette for later viewing. This greatly reduces "connect time" and thus the service charge. You may also record the complete contents of a communications session. Additionally, programs written in BASIC, FORTRAN, etc. may be built off-line using the support text editor and later "uploaded" to another computer, making the Atari a very smart terminal. Even Atari BASIC programs may be uploaded. Further, a command file may be built off-line and used later as controlling input for a time-share system. That is, you can set up your sequence of time-share commands and programs, and the Atari will transmit them as needed; batch processing. All this adds up to saving both connect time and your time.

NEW **PAYFIVE (Apple II plus diskette, two drives required)** — **Price: $149.95**
This is an enormously flexible employee payroll system with extraordinarily good human engineering features. PAYFIVE prints checks and compiles the required federal, state and local forms for up to 148 employees. The pay methods may be hourly, salary, commission or any combination. There are multiple options for pay periods, and they also can be used in any combination. PAYFIVE includes *many* other features and comes extremely well documented with a 200 page manual. The manual may be purchased separately for $30, and that payment later applied to the software purchase.

SHOPPING LIST (Atari only) — **Price: $12.95 Cassette/$16.95 Diskette**
SHOPPING LIST stores information on items you purchase at the supermarket. Before going shopping, it will remind you of all the things you might need, and then display (or optionally print) your shopping list and the total cost. Adding, deleting, changing and storing data is very easy. Runs with 16K.

TAX OPTIMIZER (North Star only) — **Price: $59.95 Diskette**
The TAX OPTIMIZER is an easy-to-use, menu oriented software package which provides a convenient means for analyzing various income tax strategies. The program is designed to provide a quick and easy data entry. Income tax is computed by all tax methods (regular, income averaging, maximum and alternate minimum tax). The user may immediately observe the tax effect of critical financial decisions. TAX OPTIMIZER has been thoroughly field tested in CPA offices and comes complete with the current tax tables in its data files. TAX OPTIMIZER is tax deductible!

NEW **UTIL (Apple only, 48K)** — **Price: $19.95 Diskette**
UTIL is a disk-oriented utility system which permits examining and changing of the contents of DOS 3.2 and 3.3 diskettes at the bit (nibble or byte) level. With UTIL you can easily examine the contents of a diskette sector by sector, restructure the sector pointers, reallocate sectors (e.g. bad sectors may be "hidden"), and perform many other sophisticated operations. For the experienced programmer.

NEW **TURNKEY AND MENU (Atari only)** — **Price: $17.95 Diskette**
TURNKEY is a utility program which allows you to create autoboot/autorun diskettes easily. Simply load and run TURNKEY, load the program diskette to be modified, and answer the questions! The TURNKEY diskette also comes with DOS 2.0 and includes another program, MENU. MENU lists the contents of your diskette alphabetically, and permits the running of any BASIC program on the diskette by typing a single key. TURNKEY and MENU provide you with the ability to run any program on your diskette by simply turning on the computer and pressing a single key.

NEW **STOCKAID (Atari only)** — **Price: $29.95 Diskette**
STOCKAID provides a powerful set of tools for stock market analysis. With STOCKAID you can display point and figure charts, as well as bar charts with oscillators. You can also examine long term moving averages and on-balance volume features. STOCKAID allows you to input daily data with a single diskette storage capability of 239 days × 16 stocks. Included are stock dividend and split adjustment capabilities. A very professional package!

NEW **SHAPE MAGICIAN (Apple II, 48K, diskette only)** — **Price: $29.95**
At last! An utility for painlessly creating graphics shapes for the Apple. Create, edit and save up to 30 shapes which can then be used to develop arcade games or to simply enhance your programs. Add that professional touch!

EDUCATION

HODGE PODGE (Apple only, 48K Applesoft or Integer BASIC) — **Price: $14.95 Cassette/$18.95 Diskette**
Let HODGE PODGE be your child's teacher. Pressing any key on your Apple will result in a different and intriguing "happening" related to the letter or number of the chosen key. The program's graphics, color and sound are a delight for children from ages 1½ to 7. HODGE PODGE is a non-intimidating teaching device which brings a new dimension to the use of computers in education. See the excellent reviews of this very popular program in INFOWORLD and SOFTALK.

NEW **TEACHERS' AIDE (Atari only)** — **Price: $13.95 Cassette/$17.95 Diskette**
TEACHERS' AIDE consists of three basic modules contained in one program. The first module provides addition and subtraction exercises of varying levels of difficulty. The second module consists of multiplication problems in which the student may be tested both on the final answer and/or on the subtotal answers in the long hand procedure. Several levels of complexity are provided here as well. The third module consists of division problems; one particularly nice feature of the division module is that the long hand division steps can be displayed along with the remainder in order to clearly demonstrate the procedure by which the remainder is derived. Using TEACHER'S AIDE is not merely a drill, but rather a learning experience.

NEW **PHARMACOLOGY UPDATE (PET only)** — **Price: $169.95 Cassette/$149.95 Diskette**
This is DYNACOMP's first educational software entry for the medical profession (more are coming!). PHARMACOLOGY UPDATE was written by a R.N. as a masters project, with the aid of a practicing pharmacologist and an electronics instructor. This package comes in two parts. The first part is a 200 page manual which is divided into 11 sections. Each of these sections provides both concise information and probing questions. The second part consists of 11 programs that are keyed to the text and which test the degree of your understanding of the text material. This package has great educational value for the beginning student as well as the professional interested in an efficient way to review and update his or her knowledge. Available on cassettes (11) or diskette.

NEW **TEACHER'S GRADEBOOK (Apple 48K dual/single drive)** — **Price $49.95 Diskette**
TEACHER'S GRADEBOOK is a *complete* password protected record-keeping system for the classroom. It supports up to nine users, and each user may have data for up to nine classes on one disk (with up to 90 students per class). Typical information which can be entered, edited and processed includes rosters, absences and grades. Summary reports may be displayed (on the screen) or printed in various ways, with automatic weighted averaging and conversion to letter grades. This system has been tested ("goof-proofed") in the class environment and is both well-written and well-documented.

ORDERING INFORMATION

All orders are processed and shipped within 48 hours. Please enclose payment with order and include the appropriate computer information. If paying by VISA or Master Card, include all numbers on card. Purchase orders accepted.

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8" CP/M Disks
Add $2.50 to the listed diskette price for each 8" floppy disk (IBM soft sectored CP/M format). Programs run under Microsoft MBASIC or BASIC-80.

5¼" CP/M Disks
All software available on 8" CP/M disks is also available on 5¼" disks, North Star and Osborne format.

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STATISTICS and ENGINEERING

DIGITAL FILTER (Available for all computers) — **Price: $39.95 Cassette/$43.95 Diskette**
DIGITAL FILTER is a comprehensive data processing program which permits the user to design his own filter function or choose from a menu of filter forms. In the explicit design mode the shape of the frequency transfer function is specified by directly entering points along the desired filter curve. In the menu mode, ideal low pass, high pass and bandpass filters may be approximated to varying degrees according to the number of points used in the calculation. These filters may optionally also be smoothed with a Hanning function. In addition, multi-stage Butterworth filters may be selected. Features of DIGITAL FILTER include plotting of the data before and after filtering, as well as display of the chosen filter functions. Also included are convenient data storage, retrieval and editing procedures.

DATA SMOOTHER (Not available for Atari) — **Price: $19.95 Cassette/$23.95 Diskette**
This special data smoothing program may be used to rapidly derive useful information from noisy business and engineering data which are equally spaced. The software features choice in degree and range of fit, as well as smoothed first and second derivative calculation. Also included is automatic plotting of the input data and smoothed results.

FOURIER ANALYZER (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**
Use this program to examine the frequency spectra of limited duration signals. The program features automatic scaling and plotting of the input data and results. Practical applications include the analysis of complicated patterns in such fields as electronics, communications and business.

TFA (Transfer Function Analyzer) — **Price: $19.95 Cassette/$23.95 Diskette**
This is a special software package which may be used to evaluate the transfer functions of systems such as hi-fi amplifiers and filters by examining their response to pulsed inputs. TFA is a major modification of FOURIER ANALYZER and contains an engineering-oriented decibel versus log-frequency plot as well as data editing features. Whereas FOURIER ANALYZER is designed for educational and scientific use, TFA is an engineering tool. Available for all computers.

HARMONIC ANALYZER (Available for all computers) — **Price: $24.95 Cassette/$28.95 Diskette**
HARMONIC ANALYZER was designed for the spectrum analysis of repetitive waveforms. Features include data file generation, editing and storage/retrieval as well as data and spectrum plotting. One particularly unique facility is that the input data need not be equally spaced or in order. The original data is sorted and a cubic spline interpolation is used to create the data file required by the FFT algorithm.

FOURIER ANALYZER, TFA and HARMONIC ANALYZER may be purchased together for a combined price of $51.95 (three cassettes) and $63.95 (three diskettes).

REGRESSION I (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**
REGRESSION I is a unique and exceptionally versatile one-dimensional least squares "polynomial" curve fitting program. Features include very high accuracy; an automatic degree determination option; an extensive internal library of fitting functions; data editing; automatic data, curve and residual plotting; a statistical analysis (eg: standard deviation, correlation coefficient, etc.) and much more. In addition, new fits may be tried without reentering the data. REGRESSION I is certainly the cornerstone program in any data analysis software library.

REGRESSION II (PARAFIT) (Available for all computers) — **Price: $19.95 Cassette/$23.95 Diskette**
PARAFIT is designed to handle those cases in which the parameters are imbedded (possibly nonlinearly) in the fitting function. The user simply inserts the functional form, including the parameters (A(1), A(2), etc.) as one or more BASIC statement lines. Data, results and residuals may be manipulated and plotted as with REGRESSION 1. Use REGRESSION 1 for polynomial fitting, and PARAFIT for those complicated functions.

MULTILINEAR REGRESSION (MLR) (Available for all computers) — **Price: $24.95 Cassette/$28.95 Diskette**
MLR is a professional software package for analyzing data sets containing two or more linearly independent variables. Besides performing the basic regression calculation, this program also provides easy to use data entry, storage, retrieval and editing functions. In addition, the user may interrogate the solution by supplying values for the independent variables. The number of variables and data size is limited only by the available memory.

REGRESSION I, II and MULTILINEAR REGRESSION may be purchased together for $51.95 (three cassettes) or $63.95 (three diskettes).

ANOVA (Not available on Atari cassette or for PET/CBM) — **Price: $39.95 Cassette/$43.95 Diskette**
In the past the ANOVA (analysis of variance) procedure has been limited to the large mainframe computers. Now DYNACOMP has brought the power of this method to small systems. For those conversant with ANOVA, the DYNACOMP software package includes the 1-way, 2-way and N-way procedures. Also provided are the Yates $2^K P$ factorial designs. For those unfamiliar with ANOVA, do not worry. The accompanying documentation was written in a tutorial fashion (by a professor in the subject) and serves as an excellent introduction to the subject. Accompanying ANOVA is a support program for building the data base. Included are several convenient features including data editing, deleting and appending.

BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2 (Not available for Atari)
DYNACOMP is the exclusive distributor for the software keyed to the popular texts *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* by F. Ruckdeschel (see advertisements in BYTE magazine). These subroutines have been assembled according to chapter. Included with each collection is a menu program which selects and demonstrates each subroutine.

Volume 1
Collection #1: Chapters 2 and 3 - Data and function plotting; complex variables and functions.
Collection #2: Chapter 4 - Extended matrix and vector operations.
Collection #3: Chapters 5 and 6 - Random number generators (Poisson, Gaussian, etc.); series approximations.
Price per collection: $14.95 Cassette/$18.95 Diskette
All three collections are available for $39.95 (three cassettes) and $49.95 (three diskettes).

Volume 2
Collection #1: Chapter 1 - Linear, polynomial, multidimensional, parametric least squares.
Collection #2: Chapter 2 - Series approximation techniques (economization, inversion, reversion, shifting, etc.).
Collection #3: Chapter 3 - Functional approximations by iteration and recursion.
Collection #4: Chapter 4 - CORDIC approximations to trigonometric, hyperbolic, exponential and logarithmic functions.
Collection #5: Chapter 5 - Table interpolation, differentiation and integration (Newton, LaGrange, splines).
Collection #6: Chapter 6 - Methods for finding the real roots of functions.
Collection #7: Chapter 7 - Methods for finding the complex roots of functions.
Collection #8: Chapter 8 - Optimization by steepest descent.
Price per collection: $14.95 Cassette/$18.95 Diskette
All eight collections are available for $99.95 (eight cassettes) and $129.95 (eight diskettes).
Because the texts are a vital part of the documentation, *BASIC SCIENTIFIC SUBROUTINES, Volumes 1 and 2* are available from DYNACOMP:

BASIC SCIENTIFIC SUBROUTINES, Vol 1 (319 pages): $19.95 + 75¢ postage
BASIC SCIENTIFIC SUBROUTINES, Vol 2 (790 pages): $23.95 + $1.50 postage

See reviews in KILOBAUD and Dr. Dobbs.

NEW **SOFTNET (Apple II, 48K, diskette only)** — **Price $129.95**
SOFTNET may be used to create models of liquid pipeline systems to evaluate their flow performance. Up to 150 nodes with up to 150 connecting elements may be simulated, and models may be combined to form yet larger models. If you are involved in water distribution systems, chemical fluid flow problems, building plumbing, or similar situations, this is an ideal analysis tool.

NEW **MATCHNET (TRS-80 only)** — **Price: $19.95 Cassette/$23.95 Diskette**
It often takes days to iteratively optimize an L, Pi or T matching network for a particular application. Take a few minutes with MATCHNET and you will have the Q, frequency response and reflection coefficients for any of twelve matching networks. You input the source and load impedance and MATCHNET calculates the R, C, (and L) values and plots (and/or prints) the frequency response and reflection coefficients for each configuration. The reviewer of this program remembers when he use to do this by hand and loves MATCHNET!

ACTIVE CIRCUIT ANALYSIS (ACAP) (48K Apple only) — **Price: $25.95 Cassette/$29.95 Diskette**
With ACAP you may analyze the response of an active or passive component circuit. The circuit may be probed at equal steps in frequency, and the resulting complex voltages at each component juncture examined; the frequency response of a filter or amplifier may be completely determined with respect to both amplitude and phase. In addition, ACAP prints a statistical analysis of the range of voltage responses which result from tolerance variations in the components. ACAP is easy to learn and use. Circuit descriptions may be saved onto cassette or diskette to be recalled at a later time for execution or editing. ACAP should be part of every circuit designer's program library.

LOGIC SIMULATOR (Apple only; 48K RAM) — **Price: $24.95 Cassette/$28.95 Diskette**
Test your complicated digital logic design with respect to given set of inputs to determine how well the circuit will operate. The elements which may be simulated include multiple input AND, OR, NOR, EXOR, EXNOR and NAND gates, as well as inverters, J-K and D flip-flops, and one-shots. Inputs may be clocked in with varying clock cycle lengths/displacements and delays may be introduced to probe for glitches and race conditions. A timing diagram for any given set of nodes may be plotted using HIRES graphics. Save your breadboarding until the circuit is checked by LOGIC SIMULATOR.

NEW **NUMBERKRUNCHER (TRS-80 only)** — **Price: $69.95 Cassette/$73.95 Diskette**
This program is the most complete numerical analysis system available for the TRS-80. It can handle up to 255 data sets, each set having a six character name. It includes complete data editing facilities and convenient data input/output capability. The analyses available are multiple linear regression and correlation determination of residuals, data transformations and extensive graphics generation, including axis naming, and more. The supporting documentation is extremely well written and well organized, and includes appendices which describe the numerical procedures used in the program.

NEW **STATSORT (TRS-80 only)** — **Price: $39.95 Cassette/$43.95 Diskette**
STATSORT consists of several menu selected programs which allow the user to create (build, edit, merge), format and print files, (machine) sort them on any field, and numerically analyze (maximum, minimum, average, variance, standard deviation) tabulated data. STATSORT is well documented and easy to use. The cassette version can also be employed to create a data type which can be read by the Radio Shack Advanced Statistical Package.

NEW **STATTEST (TRS-80 only)** — **Price: $19.95 Cassette/$23.95 Diskette**
This is a statistical inference package which helps you make wise decisions in the face of uncertainty. In an interactive fashion you can build and edit data files and test the differences in means, variances and proportions. STATTEST will also perform data analysis as well as do linear correlation and regression. This menu-directed statistical workhorse is rounded out with a chi-square contingency test and a (uniform and normal) random sample generator. The documentation is written by a college professor who guides you through the various tests.

ABOUT DYNACOMP

DYNACOMP is a leading distributor of small system software with sales spanning the world (currently in excess of 50 countries). During the past three years we have greatly enlarged the DYNACOMP product line, but have maintained and improved our high level of quality and customer support. The achievement in quality is apparent from our many repeat customers and the software reviews in such publications as COMPUTRONICS, 80 Software Critique, A.N.A.L.O.G., Softalk, Creative Computing and Kilobaud. DYNACOMP software has also been chosen for demonstration on network television. Our customer support is as close as your phone. It is always friendly. The staff is highly trained and always willing to discuss products or give advice.

Don't bother to plan very much. Just go. The book on BASIC that they bought did not get much of a workout.

They like some very simple things. Many of the boys engaged in a very short "insult" program.

```
10 print "garbage head";
20 goto 10
```

That will print garbage head continuously across the screen until you hit the STOP key. It even has a certain graphic appeal which grows out of the normal flow of the program.

They like simple graphics. They are very enthusiastic about games. They learn to program "in use." One of my colleagues noted that his son was learning to program more like learning a language by living in another country than the way languages are learned in schools. He could *do* it even though he did not find it easy to talk about it.

Games and programming were going on in these computer camps. But something else was going on that I had not fully expected. Persons between the age of eleven and fifteen were busy exploring and fleshing out their "self." Steve is an eleven-year-old who is on the go. It shows up in everything he does; including his banner program.

However, in his crashing ahead he never managed to produce anything neat. Gus is different. What he managed on the last day was a very aesthetically appealing display. That is an important difference between Gus and Steve. I could see the same thing going on in each of these young individuals. They were defining themselves in what they did with the computer. And the computer is flexible enough to permit this form of self-expression.

One more thing came out of this camp. There are now 28 more people for whom the computer will be understood as a personal tool.

It isn't necessary to understand machine language to add this useful search utility to your library of programs. Just type in the BASIC loader program and it will build the machine language routine for you. There are versions here for Apple II Plus, and both Upgrade and 4.0 PET/CBM BASICs.

Search For PET And Apple II Plus

Michael Erperstorfer
Vienna, Austria

Here is a useful utility program, Search, which enables you to find any string or number of BASIC keyword within a BASIC program. For example, if you've written a large program and want to find out all the places where a variable, NAME$, appears, or all examples of GOSUB – use Search. It will print out all line numbers where it finds the target.

To start the search, you type in a new BASIC line at line zero and follow it with a colon and the target of your search. To look for NAME$:

```
0:NAME$
```

To be able to look for numbers, the first character of line zero is ignored (that's why the colon is necessary. To look for the number 102, you would type:

```
0:102
```

Program 1 is for the Apple II Plus. You can type the & key and hit RETURN because this is easier than typing CALL 768 every time you want to initiate a search. (The machine language routine must be linked at first, before any searches, with CALL 768.)

For PET/CBM 4.0 BASIC users, Program 2 will create the machine language routine which can then be used by typing in SYS 864 and hitting RETURN. PET/CBM Upgrade BASIC users should make the change to line 972 as indicated in Program 3.

Program 1.

```
10 REM FIND FOR APPLE II PLUS
700 FOR ADRES=768TO900:READ DATTA:POK
    E ADRES,DATTA:NEXT ADRES
768 DATA 169, 76, 141, 245, 3, 169
774 DATA 16, 141, 246, 3, 169, 3
780 DATA 141, 247, 3, 96, 162, 0
786 DATA 173, 1, 8, 133, 1, 173
792 DATA 2, 8, 133, 2, 160, 0
798 DATA 177, 1, 208, 6, 200, 177
804 DATA 1, 208, 1, 96, 160, 0
810 DATA 177, 1, 133, 3, 200, 177
816 DATA 1, 133, 4, 200, 177, 1
822 DATA 133, 117, 200, 177, 1, 133
828 DATA 118, 165, 1, 24, 105, 4
834 DATA 133, 1, 165, 2, 105, 0
840 DATA 133, 2, 160, 0, 177, 1
846 DATA 240, 28, 205, 6, 8, 240
852 DATA 4, 200, 76, 196, 3, 162
858 DATA 0, 232, 200, 189, 6, 8
864 DATA 240, 7, 209, 1, 240, 245
870 DATA 76, 76, 3, 32, 119, 3
876 DATA 165, 3, 133, 1, 165, 4
882 DATA 133, 2, 76, 28, 3, 169
888 DATA 163, 32, 253, 251, 32, 32
894 DATA 237, 169, 160, 32, 253, 251
900 DATA 96
```

Program 2.

```
10 REM FIND FOR 4.0 BASIC
800 FOR ADRES=864TO980:READ DATTA:POK
    E ADRES,DATTA:NEXT ADRES
864 DATA 162, 0, 173, 1, 4, 133
870 DATA 193, 173, 2, 4, 133, 194
876 DATA 160, 0, 177, 193, 208, 6
882 DATA 200, 177, 193, 208, 1, 96
888 DATA 160, 0, 177, 193, 133, 195
894 DATA 200, 177, 193, 133, 196, 200
900 DATA 177, 193, 133, 54, 200, 177
906 DATA 193, 133, 55, 165, 193, 24
912 DATA 105, 4, 133, 193, 165, 194
918 DATA 105, 0, 133, 194, 160, 0
924 DATA 177, 193, 240, 28, 205, 6
930 DATA 4, 240, 4, 200, 76, 156
936 DATA 3, 162, 0, 232, 200, 189
942 DATA 6, 4, 240, 7, 209, 193
948 DATA 240, 245, 76, 156, 3, 32
954 DATA 199, 3, 165, 195, 133, 193
960 DATA 165, 196, 133, 194, 76, 108
966 DATA 3, 169, 35, 32, 210, 255
972 DATA 32, 127, 207, 169, 32, 32
978 DATA 210, 255, 96
```

Program 3.

```
972 DATA 32, 213, 220, 169, 32, 32 ©
```

NEECO

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Tractor Feed Options are available

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Diablo 630	$2710.00
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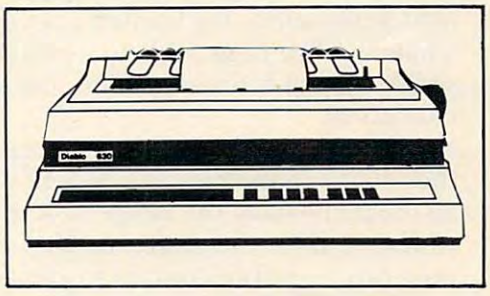

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Numerous ideas come to mind, especially for educational applications, when a VIC can be used to control a video disc machine.

A VIC Intelligent Video Disc System

Claire J. Carr and Everett Q. Carr
Herkimer, NY

The Commodore VIC-20 can control the Pioneer VP 1000 LaserDisc. What it takes is an adapter circuit attached to the VIC User Port. By adding a printed circuit board to the adapter it can be controlled by a PET computer. Adding the software and a suitable laser disc results in an "intelligent" video disc system. This new teaching tool is part of the information technology revolution that many predict will change schools radically during the next generation. We wanted to explore first-hand what could be done with an intelligent video disc system, possibly an important tool in the future of education.

As teachers, our major interest is to improve the art of teaching for the benefit of students. In an ordinary class, the range of student capability can be equal to the grade number. A fourth grade class can therefore contain students with a reading capability ranging from 1st to 8th grade level. In a 20 pupil class, students receive actual individual attention which amounts to only minutes a day. They get few trials at mastery of any topic. The wide spread in classroom capability, cultural biases of both city and rural schools, and the competition of TV can each damage a teacher's efforts to provide an atmosphere which motivates students.

Also, outstanding teaching is rarely transmitted. Few teachers have the resources to communicate beyond a local area. The use of an intelligent disc could lead to improved education. It actually leverages teacher time and permits an increase in contacts with students. This system can improve the accuracy of presentation and increase, by orders of magnitude, the number of possible trials a student encounters in achieving subject mastery. The system also requires student involvement and, with properly designed software, supplies immediate feedback to correct errors and speed mastery.

We had already built an adapter to connect between the PET 2000 (32K) and the Pioneer VP1000 LaserDisc video player.

What is significant about the video disc? It is the storage capacity, up to 54,000 individual picture frames on a half hour side of a LaserDisc. Each frame is numbered, encoded in the 17 spare lines of the TV frame. The Pioneer LaserDisc decodes the frame number and displays it on the TV screen on command. There are extended play versions of LaserDisc's operating at double the track density. Unfortunately, they skip putting the frame numbers on double density discs. One reason, it appears, is that, in one hour per side extended play made, the disc plays at constant linear velocity. The rate of disc rotation changes from 1800 RPM on the inner track to 600 RPM on the outer disc track. In the single play mode there is constant angular velocity with the disc held at 1800RPM.

It is straightforward to interface the VIC-20 to the Pioneer, VP1000 LaserDisc player. A block diagram of the VIC Intelligent Video Disc System is shown in Figure 1. The switch box shown in Figure 1 allows the use of a single TV monitor for the VIC and the Pioneer player. The switch box contains RF connectors for the computer, disc, and TV. We used the inexpensive Type F connectors.

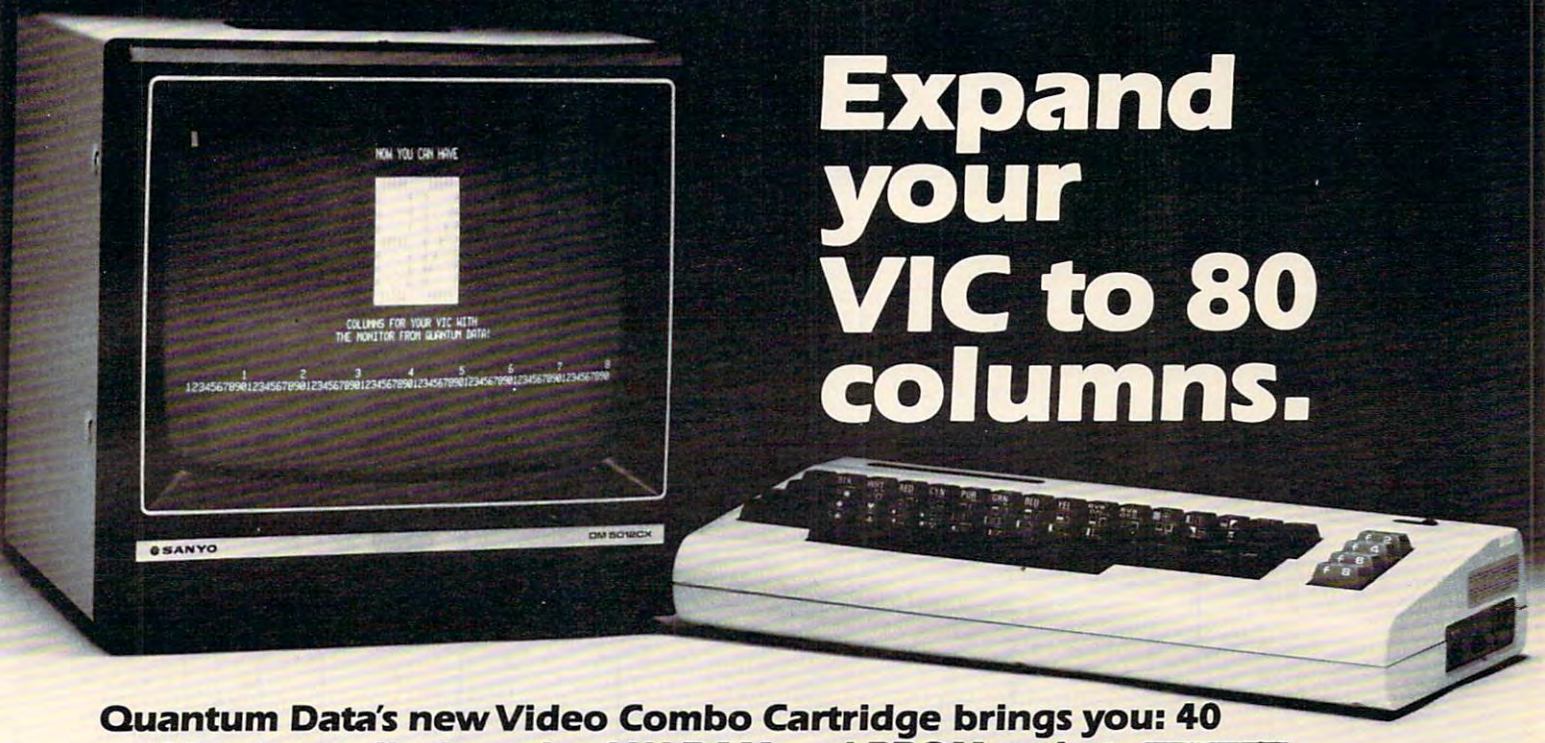
Our VIC-to-Pioneer Adapter was built by wire wrap on a Radio Shack 0.1 inch grid printed circuit board. This board has contact fingers on 0.156 inch centers along one edge. A 12/24 contact edge connector can be soldered along this edge and the adapter is then a plug-in for the VIC User Port. We actually cut a Radio Shack 20/40 pin connector down to size for the VIC.

IC-1 in the Adapter produces a 38 kilohertz pulse chain containing the encoded signals for each of the operations of the video disc player.

A data pulse string is 10 cycles of a 38 Kilohertz clock that is generated from the piezo-ceramic chip, XI, Pioneer Electronics part number VSS-002. A code word is 10 bits long and is contained within 11 actual data pulses. It is the period between the 38 kilohertz data pulses which determine the logic code. A logical zero is a pulse period of 0.93 millisecond. A logical one is twice that period, 1.86 milliseconds. Five bits of the ten encoded are fixed, leaving five bits for up to 32 commands to the LaserDisc.

The code selection is determined by the combination of lines effectively pulled to ground by the chips IC-1 and IC-2, the CD4051B. These are CMOS analog switches with a low saturation resistance when switched by the control lines. The "B" after the device number 4051 means that the devices are buffered, increasing their resistance to (but not

22-40-80 HIKE!



Expand your VIC to 80 columns.

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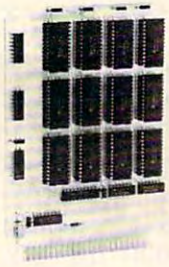
With the Video Combo Cartridge from Quantum Data you can now have 40 or 80 column display, 16K RAM and PROM all in one cartridge. It comes set for 40 column Display compatible with the VIC video modulator and your home T.V. Then, when you are ready to upgrade to 80 columns and a video monitor, just make a simple, no-cost change inside the cartridge. Instructions are provided. Also provided is a socket for a PROM, 16K of memory and AC adaptor. If you don't need memory, then 80 columns can be yours for only $199.50. A listing of the driver software is provided at no charge. A programmed PROM containing this software is also available for $19.95.



QDI expandor:

- Expands Basic user memory up to 24K in 8K steps
- PROMS may be mixed with RAM in 8K blocks
- 8K can be assigned to machine language area
- Plugs directly into VIC expansion port
- Low power, no additional power supply required
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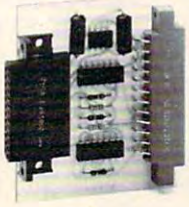
24K expandor..... **$199.95**



QDI Printor RS-232 interface:

- Provides RS-232 voltage conversion for VIC serial port
- Allows use of a wide variety of RS-232 peripherals including printers, modems and voice synthesizers
- Low power CMOS circuitry requires no external power supply
- Small size: 2½ x 3 inches

Printor..... **$49.95**

QDI Minimother:

- Adds 3 slots to the memory expansion port
- Removable card guides allow either boards or cartridges
- Requires no additional power supply
- Fused to protect VIC power supply from overload
- Simple plug-in installation

Minimother..... **$69.95**

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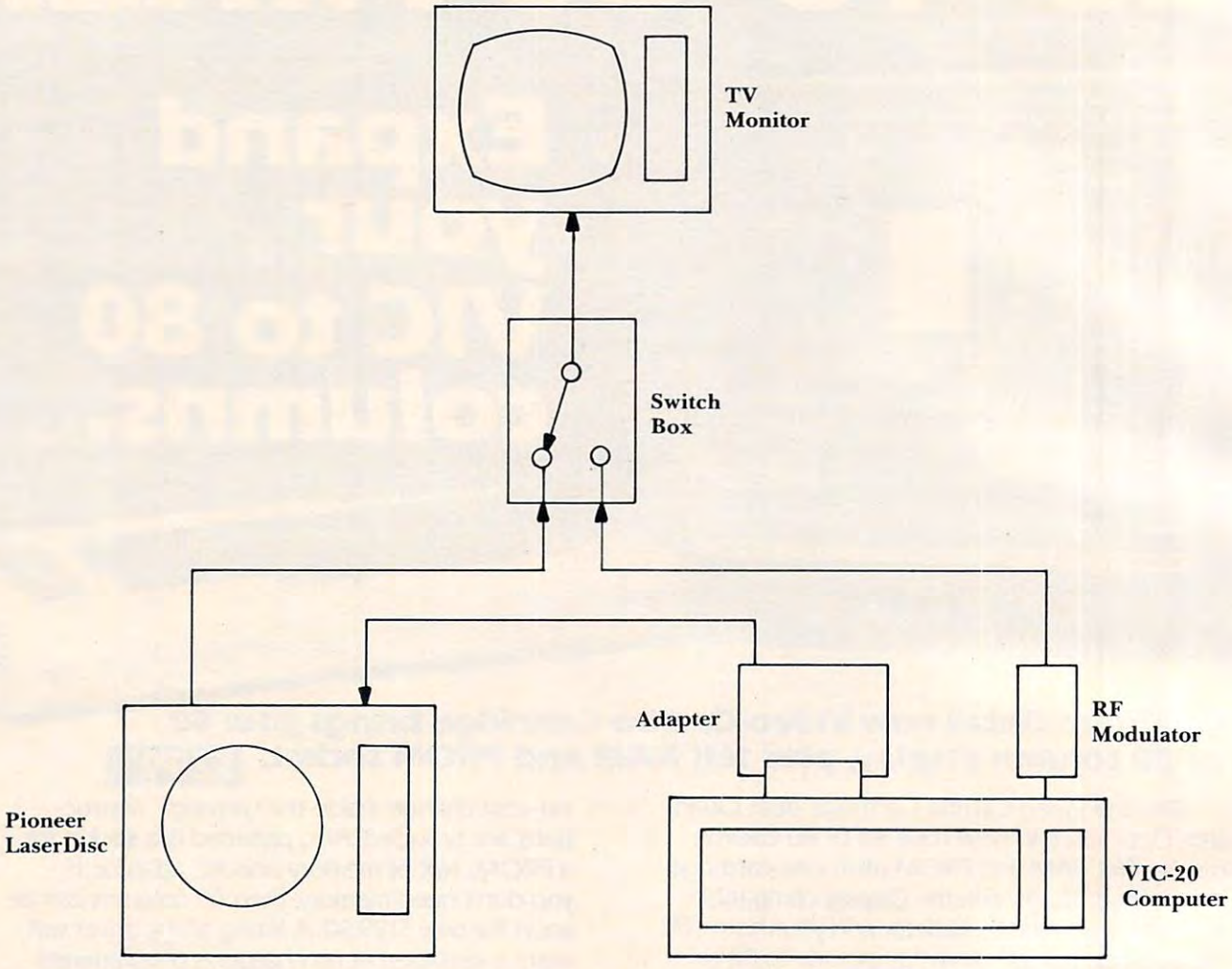
Figure 1: VIC's Intelligent Video Disc System



totally protecting against) electrostatic charge and voltage transients.

The CD4051s are switched by the output from the 6522 VIA chip in the VIC computer by way of the User Port terminals C thru K. The transistors Q1 and Q2 buffer IC-1, provide pulse inversion and drive for the 30 feet of audio cable connected to the LaserDisc player. The LED, D1, also blinks out the coded pulse string indicating that the data pulse chains are being sent by the Adapter.

The LaserDisc player controls are a fantasy machine. Imagine any way you would want to manipulate a motion picture and the LaserDisc has a control key to do it. Here is a partial list:

CONTROL KEY		FUNCTION
SEARCH	(S)	Sets up player to search for picture frame and initiates search.
DIGITS	"0 - 9"	Enter frame number 0-54000.
PAUSE	(P)	Stops picture. Blanks screen.
PLAY	(G)	Starts picture.
FRAME	(F)	Displays or removes frame number.
STILL	(H)	Stops picture on frame number.

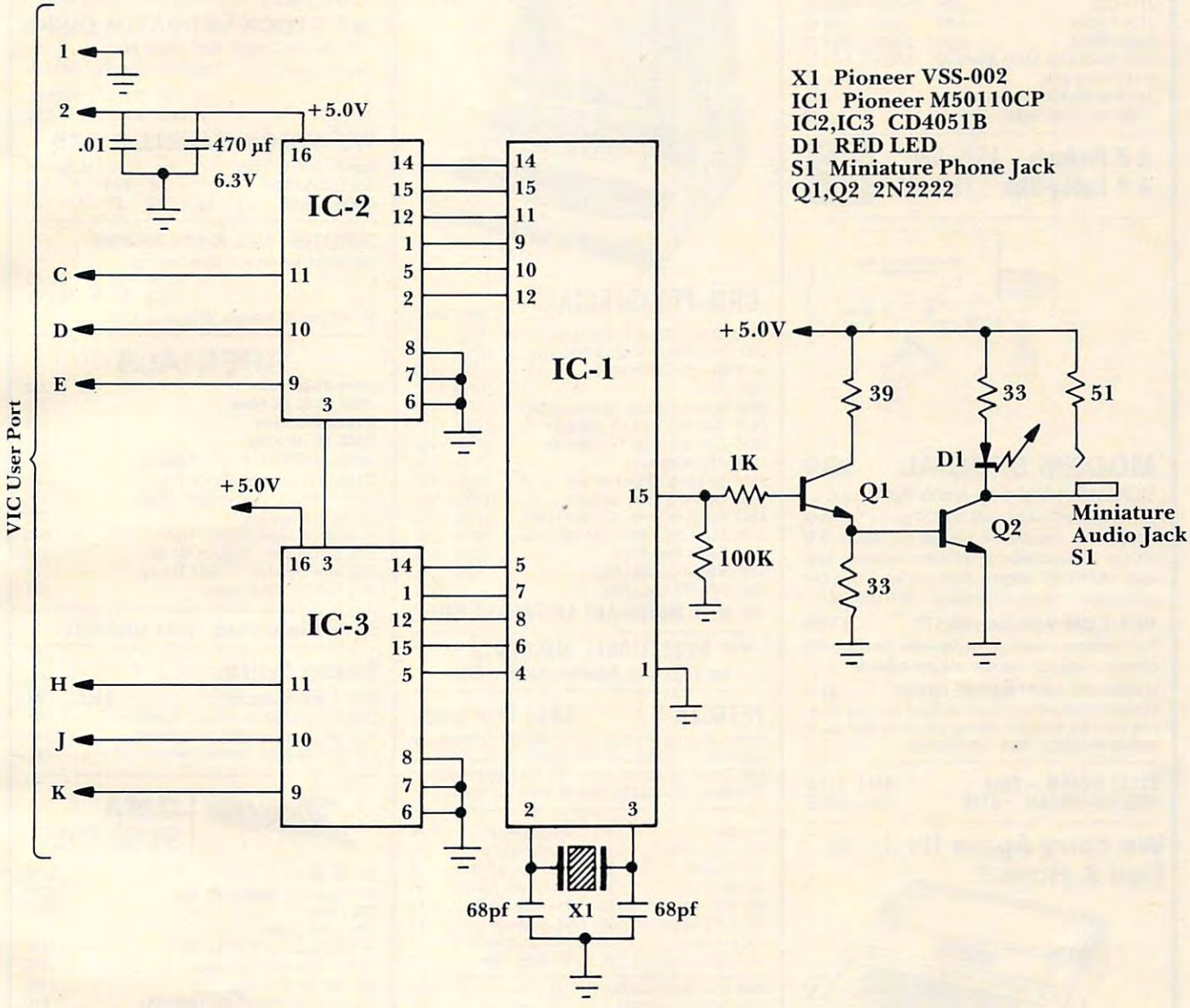
There are other functions as well: switching either of the audio channels, forward or reverse on single frame step, slow step, 3X scan and fast scan.

The program for the VIC-20 is called a "driver" and contains a simple routine in BASIC to control the LaserDisc player. You can build routines around it to make an Intelligent Video Disc system. With over 400 dealers already in the US sales of Pioneer LaserDiscs are estimated near 40,000 this year alone. Discounts on the $745 price are available, too.

Be forewarned. Dealers are having a difficult job keeping shelves stocked with discs. We bought 20 discs and the dealer said that that's about average.

```
1 REM VIC-DRIVE FOR LASER DISC"
10 D9=150
15 DIMTX(15)
20 GOSUB12000
30 INPUT"COMMAND STRING-->";CS$
40 PRINT
```

Figure 2: VIC To Pioneer Video Disc Adapter




```
45 GOSUB10000
50 PRINT:PRINT
60 GOTO30
10000 FORQ1=1 TO LEN(CS$)
10010 Q2=ASC(MID$(CS$,Q1)):GOSUB110
     00
10020 NEXT
10030 RETURN
11000 IFQ2>57 OR Q2<48 THEN 11020
11010 Q3=TX(Q2-47):GOTO 11060
11020 IFQ2>72 OR Q2<70 THEN 11040
11030 Q3=TX(Q2-59):GOTO11060
11040 Q3=0
11045 IF Q2=80 THEN Q3=TX(14)
11050 IF Q2=83 THEN Q3=TX(15)
11060 PRINT CHR$(Q2);:POKE 37136,Q3
11070 FOR J= 1 TO D9: NEXT
11080 POKE 36136,0
11090 FOR J= 1 TO D9:NEXT
11100 RETURN
12000 DATA 86,22,38,70,54,82,18,34,
     66
12010 DATA 50,81,52,69,53,83
12020 FOR J=1 TO 15:READTX(J):NEXT
12030 POKE 37138,255
12040 RETURN
13010 REM *** COMMAND SUMMARY ***
13020 REM NUMBERS "0" TO "9"
13030 REM SEARCH  "S"
13040 REM PAUSE   "P"
13050 REM PLAY    "G" (FOR "GO")
13060 REM STILL   "H" (FOR "HALT")©
```

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For Commodore Computers, the Signalman Mk1P includes connector, cable, and machine language software

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The Visible Music Monitor, by Frank Levinson, allows you to easily enter, display, edit, and play 4 part harmony music. Includes whole notes thru 64ths (with dotted and triplets), tempo change, key signature, transpose, etc. The KL-4M unit includes D to A converter and amplifier ready to hook to your speaker.

KL-4M Music Board with VMM Program $60

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RAM/ROM is compatible with any large keyboard machine. Plugs into one of the ROM sockets above screen memory to give you switch selected write protectable RAM.

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Subsort is an excellent general purpose machine language sort routine for PET/CBM computers. Sorts both one and two dimensioned arrays at lightning speed in either ascending or descending order. Other fields can be subsorted when a match is found, and fields need not be in any special order. Sort arrays may be specified by name, and fields are random length. Allows sorting by bit to provide 8 categories per byte. The routine works with all PET BASICs, adjusts to any memory size, and can co-exist with other programs in high memory.

SuperGraphics 2.0

NEW Version with TURTLE GRAPHICS

SuperGraphics, by John Fluharty, provides a 4k machine language extension which adds 35 full featured commands to Commodore BASIC to allow fast and easy plotting and manipulation of graphics on the PET/CBM video display, as well as SOUND Commands. Animations which previously were too slow or impossible without machine language subroutines now can be programmed directly in BASIC. Move blocks (or rocketships, etc.), or entire areas of the screen with a single, easy to use BASIC command. Scroll any portion of the screen up, down, left, or right. Turn on or off any of the 4000 (8000 on 8032) screen pixels with a single BASIC command. In high resolution mode, draw vertical, horizontal, and diagonal lines. Draw a box, fill a box, and move it around on the screen with easy to use BASIC commands. Plot curves using either rectangular or polar co-ordinates (great for Algebra, Geometry and Trig classes.)

The SOUND commands allow you to initiate a note or series of notes (or even several songs) from BASIC, and then play them in the background mode without interfering with your BASIC program. This allows your program to run at full speed with simultaneous graphics and music.

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for PET/CBM Computers

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MAILING LABELS

With typical record size of 127 characters, each disk can handle over 1000 records (about 2800 with 8050 drive). Labels may be printed any number wide, and may begin in any column position. There is no limit on the number or order of fields on a label, and two or three fields may be joined together on one line (like first name, last name, and title). A "type of customer" field allows selective printing.

REPORT WRITER

Print any field in any column. For numeric fields, use decimal point justification (and round to any accuracy). Define any column as a series of mathematical functions performed on other columns. These functions include arithmetic operations and various log and trig functions. Pass results of operations such as running total from row to row. At the end of the report, print total and/or average for any column. Complete record selection, including field within range, pattern match, and logical functions can be specified individually or in combination with other parameters.

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- ability to read and write BASIC sequential files.
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- reference manual.

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Some Similarities Between Applesoft And PET BASIC

Garry Kiziak
Burlington, Ontario

I wonder how often a PET owner will pick up a magazine article and seeing that it applies to the Apple say "Oh! This isn't of any use to me.". Similarly, how many Apple owners will pick up a PET article and say the same thing? In fact, there is much to be learned about the PET from Apple articles and vice-versa. In many cases translating a useful utility or idea from the one computer to the other simply involves chaining a few addresses or some simple modification.

For example, a very useful idea appeared in Volume 3 Issue #1 of The Transactor dealing with the idea of reading data from a particular DATA statement. The following short PET program demonstrates how it works.

```
10 DATA FIRST, SECOND, THIRD
20 DATA FOURTH
30 READ A$, B$
40 POKE 62, PEEK(119) : POKE63, PEEK(120)
50 READ A,B
60 DATA 1, 2, 3, 4
70 PRINT A$, B$, A, B
```

In this program, line 40 causes the READ statement in line 50 to get its data from the next DATA statement (i.e. line 60) instead of from the next data item which would have been in line 10.

To get this program to work on an Apple, it is only necessary to change the addresses in line 40. The following will do the trick.

```
40 POKE 125, PEEK(184) : POKE 126, PEEK(185)
```

In **COMPUTE!**, May, 1981, #12, Craig Peterson offered an elegant routine for the Apple that would allow you to input anything into a string (including commas, colons, etc.) without getting the EXTRA IGNORED error message. That routine is reproduced here.

```
1000 CALL 54572
1010 FOR B=512 TO 751 : IF PEEK(B) <> 0 THEN
     NEXT
1020 IN$="" : POKE PEEK(131)+256*PEEK(132)+
     1,0 : POKE PEEK(131)+256*PEEK(132+2,2 :
     POKE PEEK(131)+256*PEEK(132),B-512 : IN$
     = MID$(IN$,1) : RETURN
```

Once again, to get this to work on the PET, certain addresses will have to be changed. The necessary changes are as follows:

```
1000 SYS 48117
1010 FOR B=512 TO 592 : IF PEEK(B) <> 0 THEN
     NEXT
1020 IN$="" : POKE PEEK(68)+256*PEEK(69)+
     1,0 : POKE PEEK(68)+256*PEEK(69)+2,2
1030 POKE PEEK(68)+256*PEEK(69),B-512 : IN$
     = MID$(IN$,1) : RETURN
```

Notice that line 1020 had to be split into two lines. This is because the maximum length of a line in PET BASIC (including line numbers) is 80 characters. On the Apple, it is 239 characters.

The use of this subroutine instead of the traditional INPUT statement on the PET has an additional advantage – an empty response (i.e. simply pressing <RETURN>) does not break out of the program. Instead, the program continues and IN$ = "".

The above routine will prompt with a question mark and then a flashing cursor just like the regular INPUT statement. If you would rather that the question mark did not appear, then simply change line 1000 to:

```
1000 SYS 46306
```

Of course, not all programs will be as easy to change, but many will – even machine language programs. The trick is to find the correct change of addresses.

Recently, while writing a program for the Apple to draw the graph of practically any curve, I found it necessary to write a short machine language program which would change a line in the program to whatever you wanted. Specifically, it would be used to enter the equation of the curve to be graphed without going through the process of stopping the program, entering a new line, then typing in GOTO 550 or some similar process. This CHANGE routine would allow you to enter the equation just like in a regular INPUT statement. An assembly listing of the program is given below (Program 1). Here is an example of a machine language program that can be easily modified for the PET. The modified assembly listing is given in Program 2. Notice that the only changes required are in the addresses to the external ROM routines or zero page locations and to the IOSAVE and IORESTore routines of the Apple which had to be simulated on the PET.

To illustrate how this routine works on the

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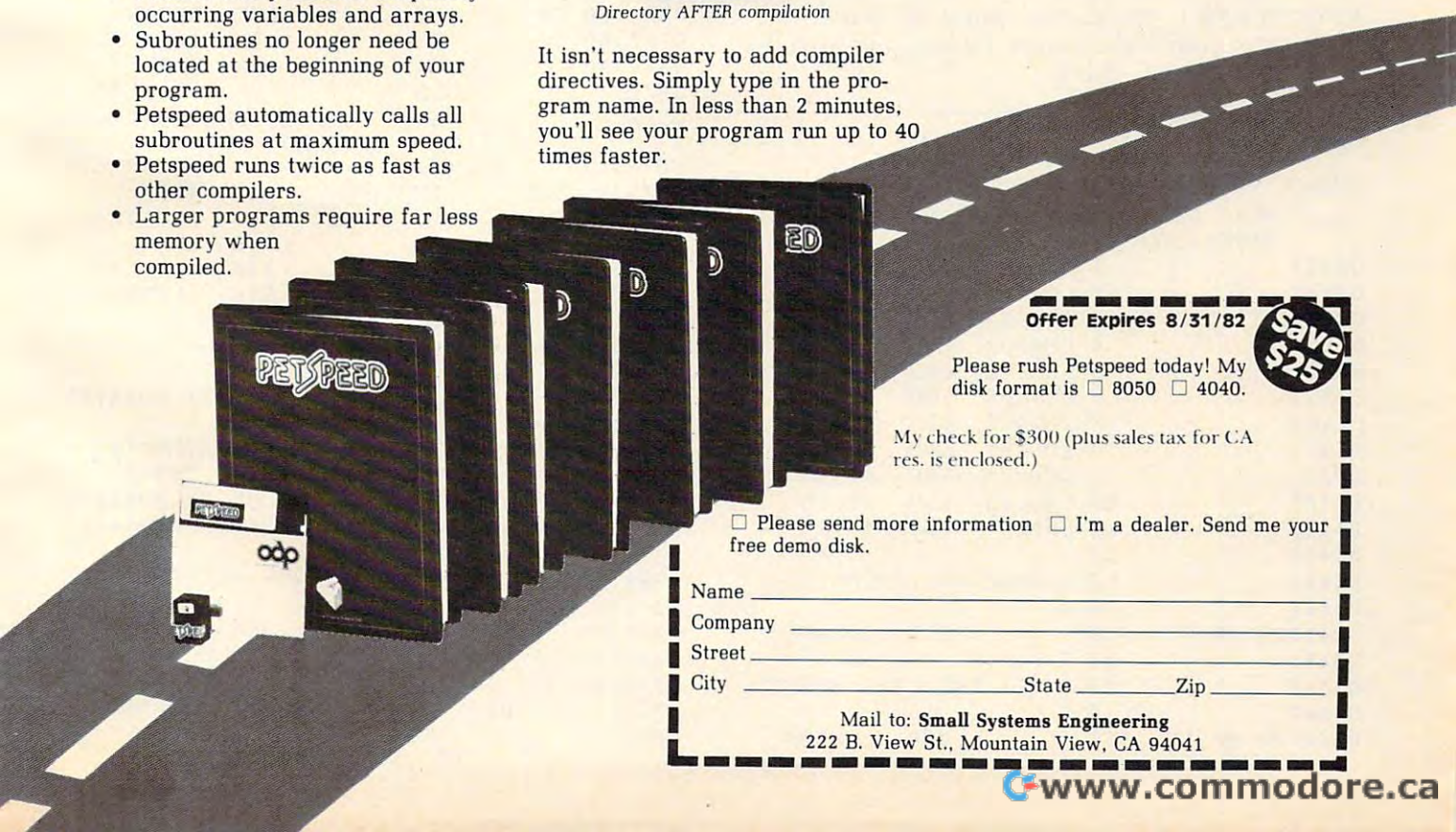

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PET, get into the monitor (i.e. SYS 4) and type in .M 033A 0399 . Then use the cursor to edit the displayed screen as indicated in the memory dump in Program 3. Get back into BASIC and type in the short program in Program 4. RUN it, type in anything that you want, and watch line 100 change. RUN it again as often as you like and line 100 changes to whatever you dictate.

Now RUN the program again, but this time type in X=T:Y=SIN(T) in response to the prompt. Notice the momentary display of the message EXTRA IGNORED. In the listing you will see that line 100 has been changed correctly, but IN$ is only equal to X=T. If you happen to need the correct value of IN$ later on in the program, this would be totally unacceptable.

Now type in Program 5, RUN it, and type in your responses as before. This time, when you type in X=T:Y=SIN(T), you will notice that line 100 gets changed correctly as does variable IN$.

A good question would be: "How do you know what to change the various addresses to?". Personally, I have found two excellent sources. The first is the article "Applesoft Internal Entry Points" which appeared in the original *Apple Orchard*. The second source is the *PET/CBM Personal Computer Guide* (second edition). Pages 476-493 have Hex Addresses and Label References for most of the zero page addresses and ROM routines in the new BASIC 4.0 (and BASIC 3.0) ROMs. Even most of the names of the routines from these two sources are the same. So, the next time you see an Apple article or a PET article, don't put it off as not applying to you, make it work for you and learn by the experiences of others.

Program 1.

```
SOURCE FILE: CHANGE - APPLE
----- NEXT OBJECT FILE NAME IS CHANGE -
      APPLE.OBJ0
0341:              1          ORG   $341
009B:              2 LOWTR    EQU   $9B
00B8:              3 TXTPTR   EQU   $B8
DEBE:              4 CHKCOM   EQU   $DEBE
DD7B:              5 FRMEVL   EQU   $DD7B
E752:              6 GETADR   EQU   $E752
FF4A:              7 IOSAVE   EQU   $FF4A
FF3F:              8 IOREST   EQU   $FF3F
D56C:              9 CRUNCH   EQU   $D56C
D61A:             10 FNDLIN   EQU   $D61A
D412:             11 ERROR    EQU   $D412
0341:             12 ;
0341:             13 ; SAVE REGISTERS
0341:             14 ;
0341:20 4A FF     15          JSR   IOSAVE
0344:             16 ;
0344:             17 ; GET THE LINE NUMBER
0344:             18 ;
0344:20 BE DE     19          JSR   CHKCOM
0347:20 7B DD     20          JSR   FRMEVL
034A:20 52 E7     21          JSR   GETADR
034D:             22 ;
034D:             23 ; SAVE TEXT POINTER
                     TEMPORARILY
034D:             24 ;
034D:A5 B8        25          LDA   TXTPTR
034F:8D 9A 03     26          STA   TEMPTXT
0352:A5 B9        27          LDA   TXTPTR+1
0354:8D 9B 03     28          STA   TEMPTXT+1
0357:             29 ;
0357:             30 ; TOKENIZE THE INPUT
                     BUFFER
0357:             31 ;
0357:A9 00        32          LDA   #$00
0359:85 B8        33          STA   TXTPTR
035B:A9 02        34          LDA   #$2
035D:85 B9        35          STA   TXTPTR+1
035F:A2 FF        36          LDX   #$FF
0361:A0 04        37          LDY   #$4
0363:20 6C D5     38          JSR   CRUNCH
0366:             39 ;
0366:             40 ; FIND THE LINE IN THE
                     BASIC PROGRAM
0366:             41 ;
0366:20 1A D6     42          JSR   FNDLIN
0369:90 2A        43          BCC   NOPE
036B:             44 ;
036B:             45 ; CHANGE IT TO THE NEW
                     LINE STORED IN THE
                     INPUT BUFFER
036B:             46 ;
036B:A0 04        47          LDY   #$04
036D:B9 FC 01     48 BEGIN    LDA   $1FC,Y
0370:F0 09        49          BEQ   DONE
0372:91 9B        50          STA   (LOWTR),Y
0374:C8           51          INY
0375:D0 F6        52          BNE   BEGIN
0377:A2 B0        53          LDX   #$B0
0379:D0 1C        54          BNE   ERR
037B:             55 ;
037B:             56 ; FILL UP THE LINE WITH
                     COLONS
037B:             57 ;
037B:A2 3A        58 DONE     LDX   #$3A
037D:B1 9B        59 START    LDA   (LOWTR),Y
037F:F0 06        60          BEQ   LAST
0381:8A           61          TXA
0382:91 9B        62          STA   (LOWTR),Y
0384:C8           63          INY
0385:D0 F6        64 .        BNE   START
0387:             65 ;
0387:             66 ; RESTORE TEXT POINTER
0387:             67 ;
0387:AD 9A 03     68 LAST     LDA   TEMPTXT
038A:85 B8        69          STA   TXTPTR
038C:AD 9B 03     70          LDA   TEMPTXT+1
038F:85 B9        71          STA   TXTPTR+1
0391:             72 ;
0391:             73 ; RESTORE REGISTERS
0391:             74 ;
0391:20 3F FF     75          JSR   IOREST
0394:60           76          RTS
0395:A2 5A        77 NOPE     LDX   #$5A
0397:4C 12 D4     78 ERR      JMP   ERROR
039A:             79 TEMPTXT  DS    $2
```

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Program 2.

```
SOURCE FILE: CHANGE - PET
----- NEXT OBJECT FILE NAME IS CHANGE -
      PET.OBJO
033A:              1          ORG   $33A
005C:              2 LOWTR    EQU   $5C
0077:              3 TXTPTR   EQU   $77
BEF5:              4 CHKCOM   EQU   $BEF5
BD98:              5 FRMEVL   EQU   $BD98
C92D:              6 GETADR   EQU   $C92D
B4FB:              7 CRUNCH   EQU   $B4FB
B5A3:              8 FNDLIN   EQU   $B5A3
B3CF:              9 ERROR    EQU   $B3CF
033A:             10 ;
033A:             11 ; SAVE REGISTERS
033A:             12 ;
033A:48           13          PHA
033B:08           14          PHP
033C:8A           15          TXA
033D:48           16          PHA
033E:98           17          TYA
033F:48           18          PHA
0340:             19 ;
0340:             20 ; GET THE LINE NUMBER
0340:             21 ;
0340:20 F5 BE     22          JSR   CHKCOM
0343:20 98 BD     23          JSR   FRMEVL
0346:20 2D C9     24          JSR   GETADR
0349:             25 ;
0349:             26 ; SAVE TEXT POINTER
                      TEMPORARILY
0349:             27 ;
0349:A5 77        28          LDA   TXTPTR
034B:8D 99 03     29          STA   TEMPTXT
034E:A5 78        30          LDA   TXTPTR+1
0350:8D 9A 03     31          STA   TEMPTXT+1
0353:             32 ;
0353:             33 ; TOKENIZE THE INPUT
                      BUFFER
0353:             34 ;
0353:A9 00        35          LDA   #$00
0355:85 77        36          STA   TXTPTR
0357:A9 02        37          LDA   #$2
0359:85 78        38          STA   TXTPTR+1
035B:A2 FF        39          LDX   #$FF
035D:A0 04        40          LDY   #$4
035F:20 FB B4     41          JSR   CRUNCH
0362:             42 ;
0362:             43 ; FIND THE LINE IN THE
                      BASIC PROGRAM
0362:             44 ;
0362:20 A3 B5     45          JSR   FNDLIN
0365:90 2D        46          BCC   NOPE
0367:             47 ;
0367:             48 ; CHANGE IT TO THE NEW
                      LINE STORED IN THE
                      INPUT BUFFER
0367:             49 ;
0367:A0 04        50          LDY   #$04
0369:B9 FC 01     51 BEGIN    LDA   $1FC,Y
036C:F0 09        52          BEQ   DONE
036E:91 5C        53          STA   (LOWTR),Y
0370:C8           54          INY
0371:D0 F6        55          BNE   BEGIN
0373:A2 B0        56          LDX   #$B0
0375:D0 1F        57          BNE   ERR
0377:             58 ;
0377:             59 ; FILL UP THE LINE WITH
                      COLONS
0377:             60 ;
0377:A2 3A        61 DONE     LDX   #$3A
0379:B1 5C        62 START    LDA   (LOWTR),Y
037B:F0 06        63          BEQ   LAST
037D:8A           64          TXA
037E:91 5C        65          STA   (LOWTR),Y
0380:C8           66          INY
0381:D0 F6        67          BNE   START
0383:             68 ;
0383:             69 ; RESTORE TEXT POINTER
0383:             70 ;
0383:AD 99 03     71 LAST     LDA   TEMPTXT
0386:85 77        72          STA   TXTPTR
0388:AD 9A 03     73          LDA   TEMPTXT+1
038B:85 78        74          STA   TXTPTR+1
038D:             75 ;
038D:             76 ; RESTORE REGISTERS
038D:             77 ;
038D:68           78          PLA
038E:A8           79          TAY
038F:68           80          PLA
0390:AA           81          TAX
0391:28           82          PLP
0392:68           83          PLA
0393:60           84          RTS
0394:A2 5A        85 NOPE     LDX   #$5A
0396:4C CF B3     86 ERR      JMP   ERROR
0399:             87 TEMPTXT  DS    $2
```

Program 3.

```
. :  033A 48 08 8A 48 98 48 20 F5
. :  0342 BE 20 98 BD 20 2D C9 A5
. :  034A 77 8D 99 03 A5 78 8D 9A
. :  0352 03 A9 00 85 77 A9 02 85
. :  035A 78 A2 FF A0 04 20 FB B4
. :  0362 20 A3 B5 90 2D A0 04 B9
. :  036A FC 01 F0 09 91 5C C8 D0
. :  0372 F6 A2 B0 D0 1F A2 3A B1
. :  037A 5C F0 06 8A 91 5C C8 D0
. :  0382 F6 AD 99 03 85 77 AD 9A
. :  038A 03 85 78 68 A8 68 AA 28
. :  0392 68 60 A2 5A 4C CF B3 EF
.
```

Program 4.

```
10 INPUT"{CLEAR}CHANGE TO ";IN$
20 CHANGE=826:LINE=100
30 SYSCHANGE,LINE
40 PRINT"{CLEAR}IN$ EQUALS :"IN$:L
   IST
100 ::::::::::::::::::::::::::::::
    ::::::::::::::::::::::::::
    ::::::::::::::::::
```

Program 5.

```
10 PRINT"{CLEAR}CHANGE TO ";:GOSUB
   1000
20 CHANGE=826:LINE=100
30 SYSCHANGE,LINE
40 PRINT"{CLEAR}IN$ EQUALS: "IN$:L
   IST
100 ::::::::::::::::::::::::::::::
   ::::::::::::::::::::::::::
   ::::::::::::::::::
1000 SYS48117
1010 FORB=512TO592:IFPEEK(B)<>0THEN
   NEXT
1020 IN$="":POKEPEEK(68)+256*PEEK(6
   9)+1,0:POKEPEEK(68)+256*PEE
   K(69)+2,2
1030 POKEPEEK(68)+256*PEEK(69),B-51
   2:IN$=MID$(IN$,1):RETURN
```

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The Beginner's Page

Files Versus Programs

Richard Mansfield
Assistant Editor

A friend of mine bought a computer a couple of months ago. I asked him what he found to be the most baffling, the toughest thing to learn to do with it. "Files," he said without hesitation, "I can't make the dang things work."

Files were also the most confusing thing to me when I first bought a computer. In fact, several years ago, handling files mystified nearly everyone who hadn't had previous experience with computers. Some of the early newsletters for home computerists were full of discussions and techniques on how to make files work.

They are somewhat more tricky than most programming techniques – there is more responsibility left up to the programmer. OPEN, CLOSE, PRINT# and INPUT# are so useful, however, that they deserve to be studied a little until they are understood.

Because file handling (also called *data base management*) requires a bit of explanation, we can look this month at the general differences between programs and files. In the July issue, we'll get down to specific filing techniques.

Telling Them Apart

The first step is to realize that tapes or disks store two different things – programs or files. (Some books refer to programs saved on tape or disk as "program files," but that terminology is worse than redundant, it's also confusing.) A BASIC program is a list of "lines" and each line contains instructions to the computer. These instructions are to be carried out during a RUN of the program. That is, the instructions are followed in order, from the lowest line number to the highest, when you type the word RUN. A data file, by contrast, is raw information like a page in a telephone book, without any instructions about what to do with that information.

When programs are SAVEd onto a disk or tape they can later be LOADed back into the computer to be RUN at any time in the future. Any programs you write into the computer will stay there only as long as the computer is turned on. So, to build a library of programs, you must SAVE them on tape or disk. They are SAVEd as if the tape or disk (let's just call them "magnetic memory") were given a photo of the program that was in the computer at the time of the SAVE. BASIC keeps track of how large a program is, where it starts and ends in the computer's memory cells, so it knows just what to "photograph" when you ask for a SAVE.

You, however, are far more responsible for handling the storage of *files*. BASIC doesn't supervise their storage or recall nearly as completely as it does with programs. You must do several things to create a file on magnetic memory and several things to get it back into the computer later. You establish the size of the file, the divisions between items in the file (called *delimiters*), and the order of the items. We'll illustrate this next month, but first let's *see*, visually, how programs and files differ:

A typical recipe will have both a "file" and a "program" in it:

MEATLOAF

1 lb. Hamburger
1 cup bread crumbs
1/2 cup milk
spices

1. Mix ingredients.
2. Form into loaf.
3. Bake 45 minutes at 325.

Steps one through three are clearly a "program" of sorts. The first clue is that each item starts with a number, indicating the order in which the steps are performed. The ingredients – standing by themselves as raw data – are a file. Just as the ingredients "file" in the example above is *acted upon* by the cooking instructions "program," a computer program acts upon a data file.

On Magnetic Memory

Here's a simple program which will create a tape file on a Commodore computer:

```
10 DATA AAA,BBB,CCC
20 OPEN 1,1,1,"FILE"
30 FOR I=1 TO 3
40 READ D$
50 PRINT#1,D$
60 NEXT I
70 CLOSE 1
```

PRINT# (usually pronounced "print-number") is an entirely different command from PRINT and the punctuation, as usual in programming, must be exact. Line 40 is interesting because we keep READing D$ over and over to use it as a temporary holding place until we can PRINT# it to a magnetic memory. D$ isn't anything in itself (it varies, it's a *variable*). READ will pick out each datum from the DATA line in turn, keeping track of the last one that was READ.

In any case, after this program is RUN, the magnetic memory would contain a file. If we could look at that file on the tape the way we would look

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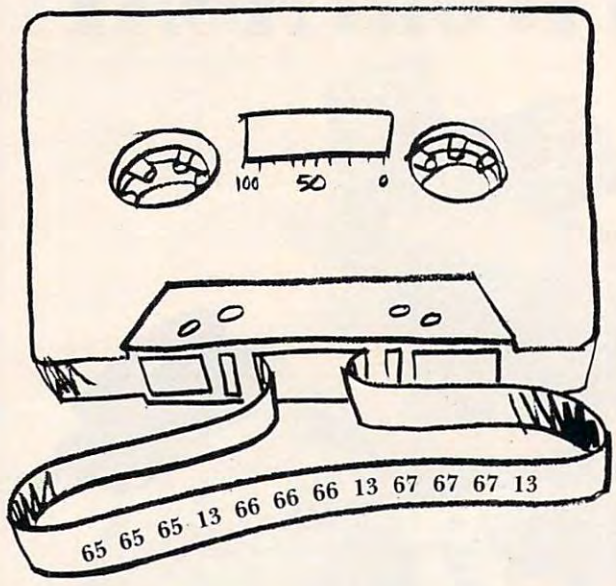
at a photograph, we would see a row of numbers. The number 65 stands for the letter A and 13 represents a carriage return. Here's what the photograph would look like:

Figure 1: A File

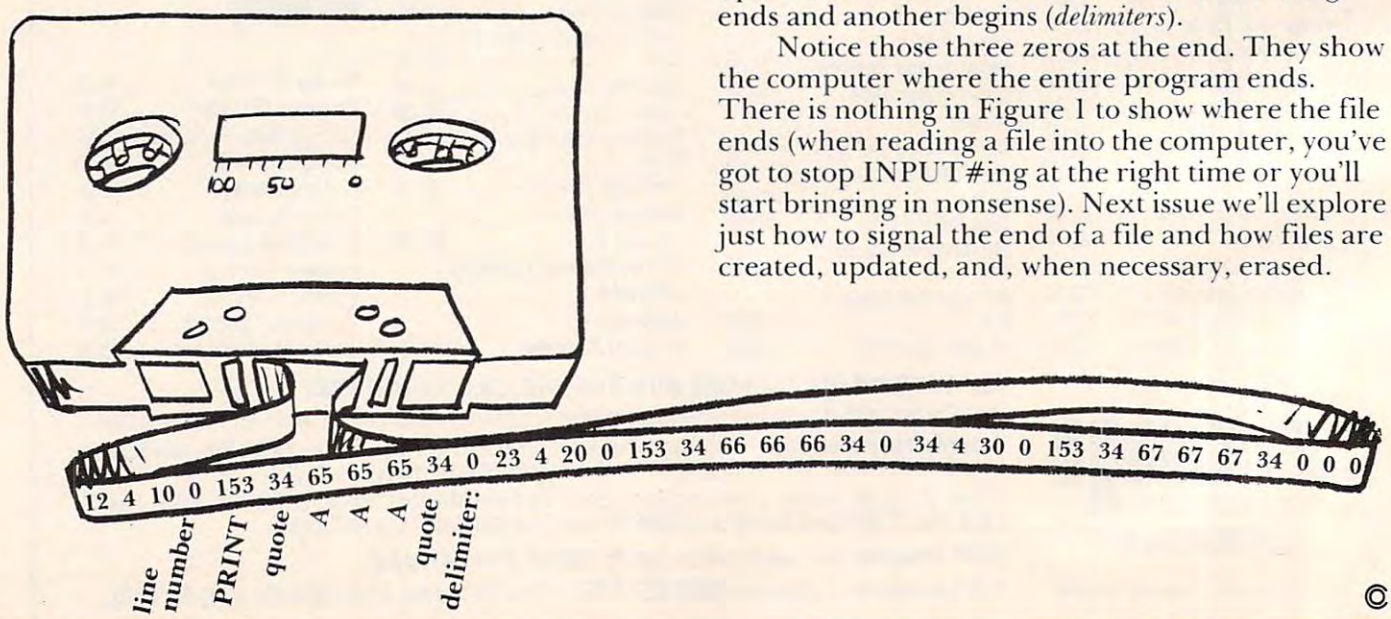


A program (with its line numbers and instructions) would be longer than a file containing the same data:

```
10 PRINT "AAA"
20 PRINT "BBB"
30 PRINT "CCC"
```

The Microsoft BASIC version of this short program would look like this in the computer's memory or on magnetic memory after a SAVE:

Figure 2: The Program



We still find the AAA's, BBB's, and CCC's in there, but surrounded by line numbers, the 34's (quotes), and zeros which show where one thing ends and another begins (*delimiters*).

Notice those three zeros at the end. They show the computer where the entire program ends. There is nothing in Figure 1 to show where the file ends (when reading a file into the computer, you've got to stop INPUT#ing at the right time or you'll start bringing in nonsense). Next issue we'll explore just how to signal the end of a file and how files are created, updated, and, when necessary, erased.

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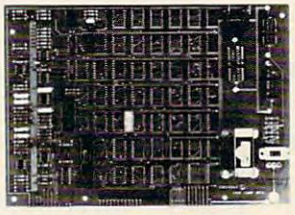

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This article takes you step by step through the design of a graphics dump routine.

Copy Atari Graphics To Your Printer

Harry A. Straw
Wilmington, DE

Let's look at some techniques involved in copying the graphics window to a printer.

First of all, we have to match the number of columns in the graphics display to the number of columns on the printer. My printer is 80 columns, so GRAPHICS 4 and GRAPHICS 5 (both 80 column modes) are a natural fit. If your printer is different, don't worry. We'll come back to that question later. Let's take the easy situation first, then modify the program as necessary.

For an 80 column printer, the simplest case is GRAPHICS 4: 80 columns by 40 rows, just two colors. We must make the graphics cursor look at each pixel on the screen and tell us whether it is blank (background color) or displays a spot of light. This is easy to do with a double FOR-NEXT loop and Atari's LOCATE command. See Listing 1. At the start, Y = 0 (line 10). This corresponds to the top row of the screen. Line 20 then increases X from 0 to 79, one step at a time. Line 30, LOCATE X,Y,Z, causes the cursor to move across all 80 columns (X values) for this value of Y. It also returns the value of Z, the pixel color, at each location. If Z = 0, this is background color, a blank spot. If Z = 1, a spot of color is found on the screen. The cursor then moves on to the next column (NEXT X). When it reaches the end of the row (X = 79), it moves to the next row (Y = 1) and starts a new horizontal scan (X = 0 to 79 again). See Program 1.

Now all we have to do is tell the printer what to print. If the screen is blank at a given location (Z = 0), we tell the printer to print a blank space, and then go on to the next X:

```
40 IF Z=0 THEN LPRINT CHR$(32);: GOTO 60
```

Don't forget the semicolon. It prevents carriage return. If there is a spot of color at this location, Z is not zero, and we want the printer to print something. You can select any character you want by consulting the list of ASCII characters and numbers for your printer. Let's pick the *, ASCII number 42, and add:

```
50 LPRINT CHR$(42);
```

Now we have a complete program for copying the GRAPHICS 4 graphics window to an 80 column printer. (Program 2.)

In case you have trouble with no carriage return, try adding:

```
65 IF X=79 THEN LPRINT CHR$(13)
```

If you get no line feed, make it:

```
65 IF X=79 THEN LPRINT CHR$(10)
```

If necessary, use both:

```
65 IF X=79 THEN LPRINT CHR$(13): LPRINT
   CHR$(10)
```

With Graphics 5

We can easily expand our program to take care of GRAPHICS 5, a four-color mode. The same FOR-NEXT loops and LOCATE statement work. All we need to do is to select a different printer character for each color, and add some more IF-THEN statements to make the printer character correspond to the color at each location. One setup for three characters plus the blank is shown in Program 3. You can change the printed characters to suit yourself.

This program uses high line numbers, starting at 31000, so it can be merged with a program already in RAM without line number interference. Line 31000 is insurance: it makes sure that the printer head starts at the left-hand margin.

It is convenient to record this program on a cassette using the LIST"C command. You can then enter it into RAM using the ENTER"C command without destroying your main program already in RAM. Adding:

```
line no. GOSUB 31000
```

to your main program will now cause your graphics display to print out. Program 3 will work for GRAPHICS 4 and GRAPHICS 5.

What if you have a 40 column printer? Use GRAPHICS 3 (40 columns by 20 rows) to set up your display. Change lines 31010 and 31020 to match the cursor scan to the graphics display:

```
31010 FOR Y=0 TO 19
31020 FOR X=0 TO 39
```

and line 31080 to:

```
31080 IF X=39 THEN LPRINT CHR$(13)
```

A problem can turn up if the last statement in your main program is Atari's XIO "fill" command:

```
XIO 18,#6,0,0,"S:"
```

It makes the computer think that ports are open to read, not write, and it shows

```
ERROR-131, IOCB write only
```

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when the printer subroutine starts. You can fix this by inserting the following line after the last XIO statement:

PLOT X,Y: DRAWTO X+1,Y

where X,Y and X+1,Y are any two points within your filled area so the screen display is not changed. The print routine then runs fine.

What can you do with this? Copy graphs or charts of data, or plan ahead for your 1981 Christmas cards. Try running Program 4 along with Program 3!

Line 29999 of Program 4 is not a necessary part of the printer copying routine. It merely provides a line to which the program can RETURN from line 31110, and ends the run. Without line 29999, an ERROR message will appear, but only after the printout has been completed.

Program 1.

```
10 FOR Y=0 TO 39
20 FOR X=0 TO 79
30 LOCATE X,Y,Z
60 NEXT X
70 NEXT Y
```

Program 2.

```
COPY GRAPHICS 4 TO PRINTER

10 FOR Y=0 TO 39
20 FOR X=0 TO 79
30 LOCATE X,Y,Z
40 IF Z=0 THEN LPRINT CHR$(32);: GOTO 60
50 LPRINT CHR$(42);
60 NEXT X
70 NEXT Y
```

Program 3.

```
GRAPHICS 4 OR 5
4 COLORS

COPY GRAPHICS TO PRINTER

USE 'GOSUB 31000' IN MAIN PROGRAM

31000 LPRINT CHR$(13)
31010 FOR Y=0 TO 39
31020 FOR X=0 TO 79
31030 LOCATE X,Y,Z
31040 IF Z=0 THEN LPRINT CHR$(32);:GOTO
    31080
31045 REM - COLOR 1, Z=0 - BACKGROUND
31050 IF Z=1 THEN LPRINT CHR$(42);:GOTO
    31080
31055 REM - COLOR 2, Z=1
31060 IF Z=2 THEN LPRINT CHR$(43);:GOTO
    31080
31065 REM - COLOR 3, Z=2
31070 LPRINT CHR$(111):
31075 REM - COLOR 4, Z=3
31080 IF X=79 THEN LPRINT CHR$(13)
31090 NEXT X
31100 NEXT Y
31110 RETURN
```

Program 4.

```
10 GRAPHICS 5
20 COLOR 1
30 PLOT 55,31:DRAWTO 40,7
40 POKE 765,1
50 POSITION 25,31
60 XIO 18,#6,0,0,"S:"
70 COLOR 3
80 FOR X=39 TO 41
90 PLOT X,32:DRAWTO X,39
100 NEXT X
110 COLOR 2
120 PLOT 40,6
130 PLOT 38,7:DRAWTO 42,7
140 PLOT 39,8:PLOT 41,8
150 GOSUB 31000
160 LPRINT CHR$(10):LPRINT CHR$(10)
170 LPRINT "                              MERR
  Y CHRISTMAS !!"
29999 GOTO 29999                          ©
```

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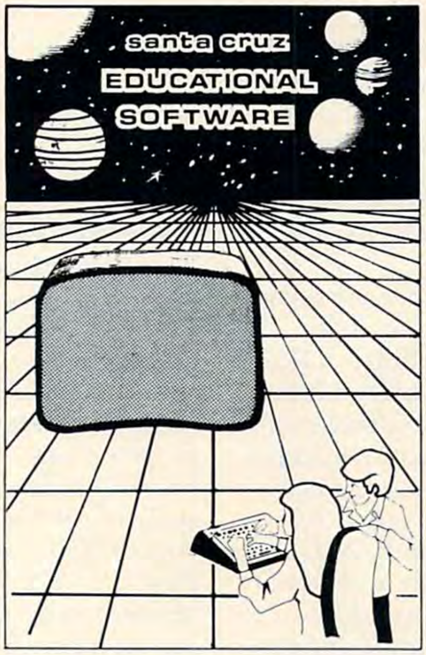

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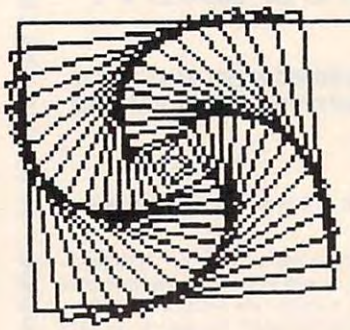


Friends Of The Turtle

David D. Thornburg
Los Altos, CA

The Computer Faire Of The Turtle...

While some might argue with the exact date, I place the start of the Personal Computer Revolution in 1978. That was the year in which affordable desk-top computers were first made available to the general public. The big sellers that year, Commodore, Apple, and Radio Shack, are still going strong – as are other companies who joined in the explosion of enthusiasm which greeted these products.

But during these past years there was another revolution brewing – a revolution in computer languages which promised to make the newly affordable computer easy to program by its largely non-technical owners.

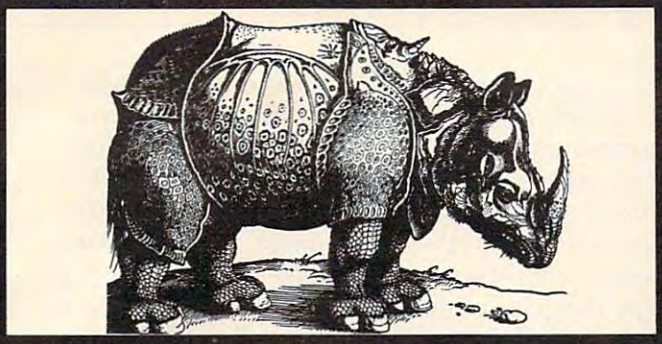
The mainstay of the personal computer revolution was the language BASIC. The fact that many hundreds of thousands of people are able to write programs in this language is strong testimony to its effectiveness. But BASIC has two problems. First, the threshold for learning the language is not very low and, second, the power of the language isn't large enough to invite the user to create extremely sophisticated programs. When BASIC was the only language in town, it was gladly accepted. After all, one alternative – assembly language – doesn't appeal to many first-time computer users; and more powerful structured languages such as PASCAL seem too complex for people interested in balancing checkbooks or generating games.

But, for a decade before 1978, research in university and industrial laboratories was pointing the way to a new type of computer language – a language with a low threshold for learning and a power so great that it could continue to serve the needs of its user at any level of sophistication. One such language, LOGO, was developed and studied on the East Coast, primarily at MIT. While research showed that this language was easy for children to learn and powerful enough for advanced applications, one problem remained – LOGO needed a lot of memory in which to run. As a result, most potential users had to be content either with reading articles about the language or, more recently, with reading Seymour Papert's book, *Mindstorms*.

And then, last year, the seeds of the new revolution began to sprout. Atari released its version of PILOT – a powerful yet simple text manipulation language which had been enhanced by the addition of a graphics environment similar to that in LOGO. At about the same time, Texas Instruments released a version of LOGO which had been compressed to fit on a memory expanded TI 99/4. With these two products, it was evident that a new class of computer language was starting to appear on small affordable computers.

Increasing Literacy

The acceleration of this trend was most evident at the 7th West Coast Computer Faire held in San Francisco this March. This show was packed by attendees who, in my estimation, were the most computer literate group to ever attend this show. In past years an exhibitor was likely to hear questions such as: "Why can't I receive television signals on a color monitor?" This year I was asked questions such as: "What are the major differences between Atari PILOT and LOGO?" Many people had read Papert's book and were fully prepared for the revolution in user friendly languages. They were not let down. The presence of Seymour Papert as keynote speaker and the booths providing information on YPLA (Young People's LOGO Association), FOLLLK (Friends of LISP, LOGO, and Logic for Kids), and FOTT (Friends of the Turtle) set the tone for the release of several versions of LOGO for the Apple II. A special exhibit on the fourth floor of the Faire devoted considerable space to the demonstration of Apple's own LOGO product which was developed by LOGO Computer Systems, Inc. (LCSI). In addition to the language, other exhibits included a prototype of a "sprite" board for the Apple which allows the computer to control four animated turtles at once. Two floors down, another version of Apple LOGO was being offered by Terrapin – a company known previously for its computer controlled robot turtles. (I have copies of both the LCSI and Terrapin LOGO, and



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5. LOGO FOR THE APPLE II* by Harold Abelson, Byte Books. A complete instructional manual for intermediate and advanced users of LOGO.
6. THE ALICE IN LOGOLAND PRIMER, a step by step, lavishly illustrated introduction to LOGO for those who are new to both programming and to LOGO. (available in May and sent free to all purchasers of Krell's LOGO for Apple II*).
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8. A one-year's free subscription to the LOGO & EDUCATIONAL COMPUTING NEWSLETTER. (Regularly $30.00 per year). A new authoritative source of information about the structure, classroom application and capabilities of LOGO, plus an up to the minute forum on the most significant new ideas and issues in educational computing.

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will report my opinions to you in a later column. At first glance, they are each terrific!)

Just as some people feel that IBM has legitimized the personal computer by entering the market themselves, one got the feeling that the presence of LOGO on the Apple (with its massive installed base) was going to help wean people from BASIC faster than might otherwise be expected.

Product and information booths were only one source of information on this topic. In addition, no less than a dozen demonstrations, workshops, tutorials and speeches were devoted to user friendly languages.

While I spent much of my time helping Addison Wesley show my book on turtle geometry (yes, Atari PILOT fans, *Picture This!* is now at your local bookstore!), I was still able to talk with many attendees and visit the other booths. Those people who knew about LOGO could hardly wait to see a version on their own computer.

Decked out in my Friends of the Turtle T-shirt, I visited with Rich Pattis who was demonstrating software supporting his excellent book, *Karel the Robot* (Wiley) – a book devoted to introducing people to programming through the medium of the turtle. While geared towards the beginning PASCAL programmer, Pattis' work shows a sensitivity that is characteristic of the user friendly languages such as PILOT and LOGO. The people from FOLLLK were acting as guides to the host of LOGO-based exhibits and talks. Larry Muller and his dad, Jim, demonstrated TI LOGO at the YPLA booth. Recent price reductions in both the TI 99/4A computer and in the TI LOGO cartridge have further fanned the flames on a product whose sales were already heating up quite nicely.

The Computer As A Mudpie

Considering the booths, talks, workshops, and enthusiastic attendees, it was clear that this year's Computer Faire was the focal point of the new revolution – the user friendly languages had come home at last. People were lined up against the walls to hear Papert's keynote address. While much of his talk was devoted to describing the function of the World Center for Informatics and the Human Resource (in Paris, France), he also talked about his view of the computer as a "mudpie" – a tool with which children could (through languages such as LOGO) make discoveries on their own and with which they could acquire for themselves information which was previously "taught" to them by teachers. It was easy to be swept along in the belief that we were witnessing the onset of a revolution which promises to be as significant as the advent of the personal computer itself.

I can state, without equivocation, my belief that languages such as LOGO and PILOT will completely displace BASIC as the popular programming medium in the next five years. This belief arises not from my own excitement with something new, but from the results of my own experiences with these languages over the past several years. I have had the pleasure of sharing these programming environments with children from second to sixth grade, as well as with teachers, college students, and artists. The enthusiasm expressed by these varied audiences is enormous.

And each of you who calls yourself a Friend of the Turtle is sharing in this new age of computing – in this new level of power now being unlocked in the Apple, Atari and TI computers all over the world.

Let the revolution continue!

For more information on LOGO and other user friendly languages, contact:

Young People's LOGO Association
1208 Hillsdale Dr.
Richardson, TX 75081

The FOLLLK Foundation
c/o Social and Information Service
HLL 382
San Francisco State University
1600 Holloway Ave.
San Francisco, CA 94132

and, of course,

Friends of the Turtle
P.O. Box 1317
Los Altos, CA 94022

The World Inside The Computer

Fred D'Ignazio is a computer enthusiast and author of several books on computers for young people. He is presently working on two major projects: he is writing a series of books on how to create graphics-and-sound adventure games. He is also working on a computer mystery-and-adventure series for young people.
As the father of two young children, Fred has become concerned with introducing the computer to children as a wonderful tool rather than as a forbidding electronic device. His column appears monthly in **COMPUTE!**

Last issue we looked at the history, and some of the future possibilities, for the microelectronics world. We closed with the question, "What does all this have to do with our children?"...

Architects Of The Micro World

Our journey into the world inside the computer might be like some exotic travel story. It might be like Jack London telling tales from the far north, or like Gulliver describing his voyage to Lilliput. It might be far removed from our everyday experience and the concerns of us and our children.

Except it's not.

All of the changes, the fascinating developments in chip design and technology, might not be expected for many years, and these new designers might all be faceless adult experts, hidden away inside corporate and university labs, performing mysterious feats of electronic alchemy.

Except they're not.

Just a couple years ago, Lynn Conway of Xerox and Carver Mead of Caltech wrote a book called *An Introduction to VLSI Systems* (Addison-Wesley, 1980). In it, and in college courses they taught, Conway and Mead called for a new generation of chip designers – architects of the micro world. Conway and Mead proved that, using automated drafting tools (*CAD/CAM* – Computer-Aided Design/Computer-Aided Manufacturing), even graduate students at universities could design custom-made computer chips. And they didn't have to be engineers or experts in computer logic.

Young people, by the thousands, are following the lead of Conway and Meade's students, and are designing custom-made chips and revolutionary new kinds of computers. They treat the basic components – the transistors, gates and memory cells – like "bristle blocks." They sit in front of a computer keyboard, press buttons, and the computer fits the bristle blocks together, and displays the mazelike circuit on a color picture screen. When the chip is finished, the student and his teacher send the design to a "silicon foundry" – a regional center that prints the chip on a sliver of silicon.

Within days, the student has the chip back and can plug it into a circuit board and turn on the power. The chip might be a new kind of computer, a "graphics engine" specializing in high-speed, animated color pictures, or a music-synthesis chip capable of making the computer sound like a bass guitar or a pipe organ.

For two decades, chip design was done exclusively by experts at major corporations, such as Intel, Texas Instruments, and Motorola. Now, all this has changed, due to the new CAD/CAM tools, to the new microminiaturization (VLSI – Very Large-Scale Integration) of circuits, and to Conway and Meade's "paint-by-numbers" approach to chip design.

Today, computer *software* is being written and

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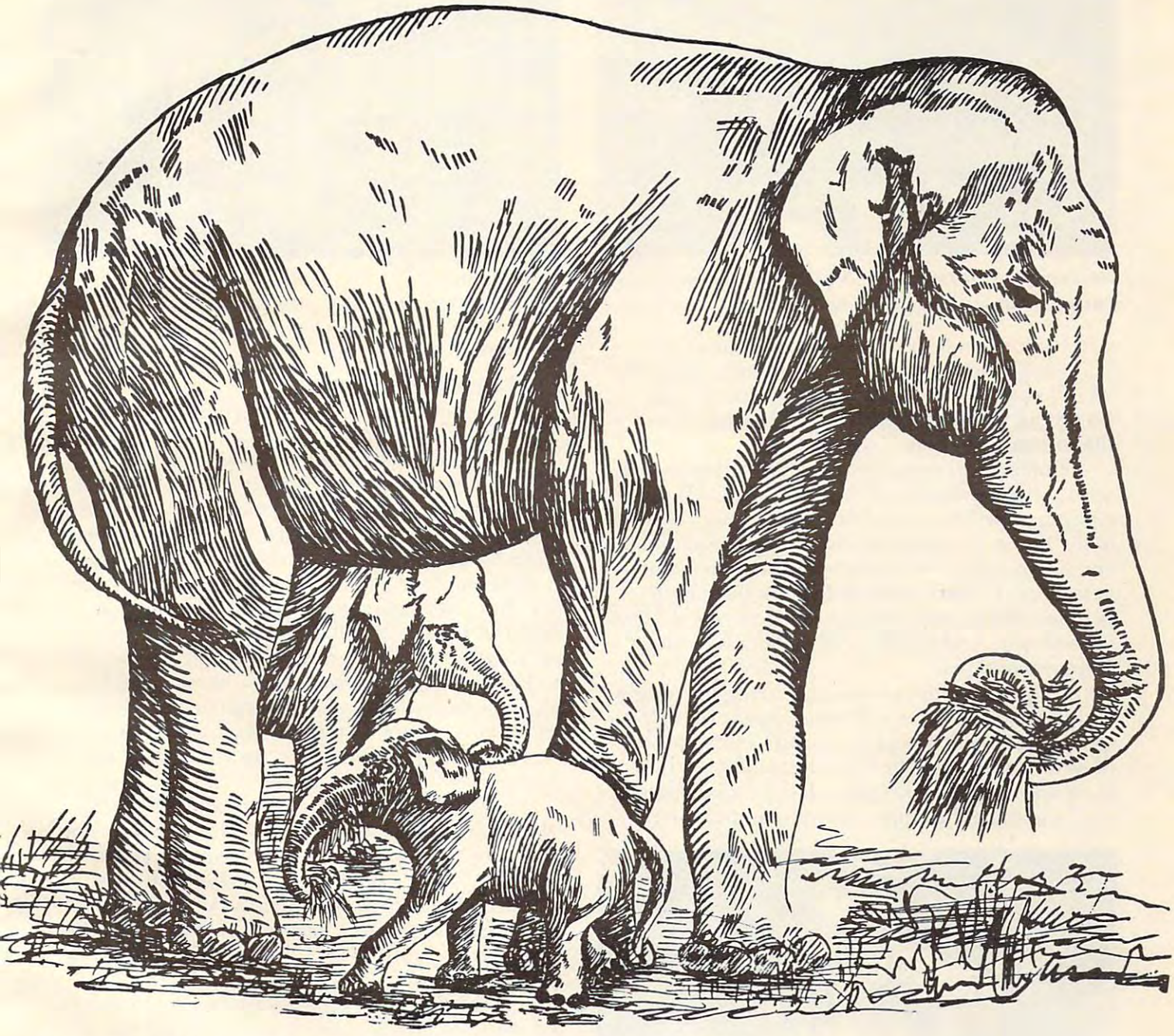

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Designing new computer chips with the aid of intelligent programs and color graphics.

CREDIT: courtesy of Henry Fuchs and the Department of Computer Science, University of North Carolina. Photo by Mike Pique.

sold by thousands of people, all over the world. It is a cottage industry performed in the home by a lot of low-budget suppliers. Big companies are becoming software publishers and distributors for the software "authors."

Similarly, in just a few years we will probably see a cottage industry of chip authors. CAD/CAM equipment will be rented or cheap enough to install in the home. "Intelligent" chip design programs, like Xerox's *Palladio*, will work with young chip designers. The programs will check the young people's designs for mistakes, suggest new designs of their own, and explain the trade-offs between different designs.

Chip architects are now appearing in colleges and universities. They will soon appear in high school. They will design thousands, even millions of new computers. The best computers will find their way to the marketplace. Large "chip foundries" will print the chips. Large "chip publishers" will market them.

"It's like painting with numbers." Inventing a new computer may someday be as easy as writing a game program in BASIC.

CREDIT: Courtesy of Floyd James, Henry Fuchs and the Department of Computer Science, University of North Carolina. Photo by Jim Erickson, Raleigh *News & Observer*.

The Playdough Computer

What do we mean by "personal computers", or by "personal computing"?

Until now, we meant *one person, one machine* (Portia Isaacson's definition).

Personal computing has made the computer accessible to the average person, the non-expert. Even little kids can sit down in front of the family's home computer and use it to learn or play a game.

But personal computing will soon have an added meaning. It will mean *computing on a machine we designed ourself*. Even young people will be able to fashion their own computers, like they build an airplane or castle from playdough or clay. Everyone will have the opportunity to become a computer designer – a computer artist, an architect of the micro world.

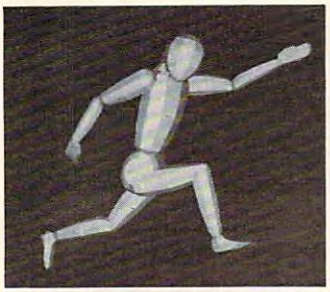
Naturally, airplanes made of clay do not fly. And computers made by young children may not compute. Still, they will be an important exercise in creativity. And, unlike models made from clay or plastic, simple computer models can gradually become more sophisticated and realistic. They can be a first step toward building real chips and computers that work.

Many of today's most innovative, most successful software entrepreneurs are young people, of college or high-school age. In the near future, young people will be some of the most creative chip architects, artists, and inventors.

Your Kids: The Computer's Creators

The purpose of these first columns has been to demonstrate the relevance and the reality of the world inside the computer – to all of us and to our children.

Although the surface of the computer will continue to remain the same, the computer's insides will soon change dramatically. New computers will



Creating the tiny inhabitants of the world inside the computer, using advanced computer graphics, animation, and Artificial Intelligence. Of course, the inhabitants need not be human. They might be sprites or turtles – or whatever else you can imagine.

CREDIT: Charles Csuri and Ohio State University Computer Graphics Laboratory.

soon be created with capabilities exceeding our wildest dreams. The revolutionary new computers will be molded from youthful imaginations. Young people will be the computers' creators.

Fantasy, Turtles, and Sprites

The present trend toward black-box computers is positive, in that it is encouraging millions of people to try personal computing. But don't let this trend "distance" you or your children from the world inside the computer. The real action is taking place under the computer's "hood."

How do you and your children learn more about the world inside the computer? How can you learn *today*?

Computer micro-worlds are so enchanting, so exciting that they can be a pleasure to learn about and explore. Pretend that you and your children are pioneers. I hope these first columns have given you some ideas about where you can focus your pioneering.

But what about a pioneering vehicle – a land rover, jeep, or canoe? After all, sophisticated computer-design tools, such as CAD/CAM machines, still aren't off-the-shelf items, sold at your local Radio Shack for $19.95. How can you explore the world inside the computer without the proper tools?

Fortunately, the first tools are now appearing. They are, first of all, what Bob Albrecht calls the "Rainbow Computers" – the sound-and-color machines that retail for less than five hundred dollars. The Sinclair ZX 81A, the low-cost VIC machines, the TI 99/4A, the TRS-80 Color Computer, and the Atari 400 are all rainbow computers. They provide an environment for simulating the world inside the computer. Using the rainbow computers, you can build models of that world with computer programs.

What kind of programs? You can use a language like BASIC. But new languages are now appearing that make superior micro-world building tools. These languages are Atari PILOT and the various versions of LOGO, including Apple LOGO and TI LOGO.

When you write a program in BASIC, you are like a chef inventing a recipe for a new food dish. The recipe itself is the list of steps you must follow (the *algorithm*) to get the program to perform some function. To make the recipe work, you need to add ingredients in a precise amount and in the proper order. In a program, these ingredients are your *data*.

But programming in the new languages – especially LOGO – is quite different. You are no longer a chef working with a recipe and ingredients. Now you are a band leader conducting a band of jazz musicians, or a film director overseeing the efforts of a diverse bunch of live actors.

When you program in BASIC, you are dealing with inert objects and structures, and the computer marches in lockstep, doing one thing at a time.

On the other hand, when you program in LOGO, an *actors* language, you treat the computer like a tiny world. You are the world's creator. You define the world's laws. You populate the world with tiny creatures. TI's LOGO world comes with "canned" sprites. Various LOGO, PILOT, and PASCAL worlds come with prepackaged, artistic turtles.*

And, using these languages, you can also create other beings drawn purely from your own imagination.

When you type RUN, you turn the world *on*. You breathe life into your creatures and set them in motion. All together. All at the same time.

In upcoming columns, I will develop "computer world" programs written in BASIC, in Atari PILOT and in Apple and TI LOGO. Also, you should consult David Thornburg's column, "Friends of the Turtle," which appears each month in **COMPUTE!** (And take a look at the references at the end of this month's column.)

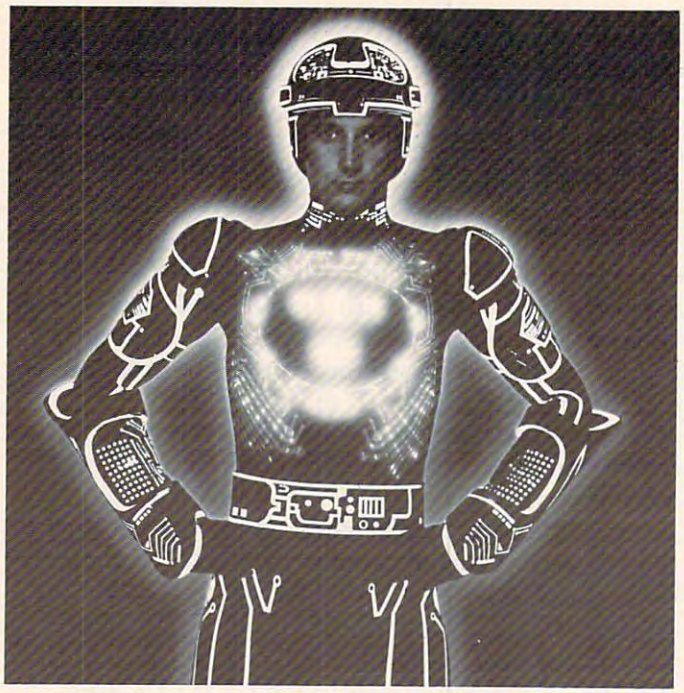
The Computer World Goes to Hollywood

The world inside the computer is a little known and obscure place. But it won't be for long.

This summer (on July 9th), Walt Disney Productions will be releasing the long-awaited film, *TRON*. The hero of TRON is a young computer genius who gets transported to the world inside the computer – Hollywood style.

The hero, Flynn, is the owner of a video game arcade and the inventor of fabulous new game

*I am excited about Alan Kay's new job as Chief Scientist at Atari. Kay is the brilliant scientist who helped create Xerox's Smalltalk language system, and the Xerox Altos and Star computers. Smalltalk is one of the most powerful "Actor" languages. It lets you easily create computer worlds filled with active, interacting beings, processes, and events. Two Smalltalk-type machines, code-named, "Mackintosh" and "Lisa," are under development at Apple Computer Company. And it is likely that at Atari, Kay will be developing Smalltalk-type languages that will run on Atari computers.

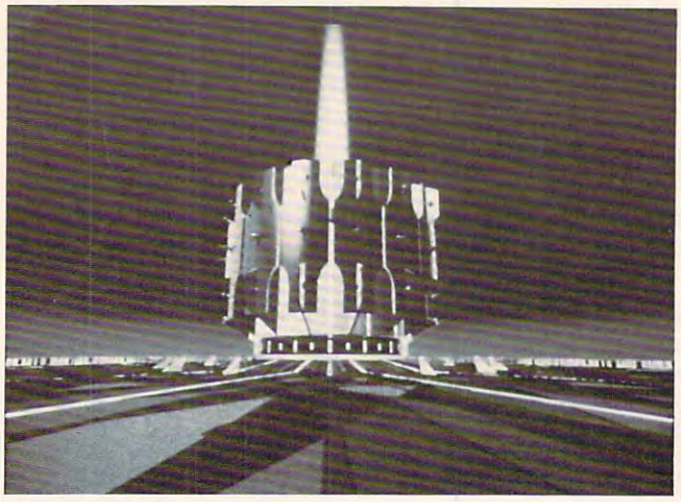


What do inhabitants of the world inside the computer look like? If you entered a computer, what would you *look like? This is Walt Disney Productions' answer in its new movie* TRON.

CREDIT: Courtesy of Walt Disney Productions. Copyright 1982, Walt Disney Productions.

programs. But the programs are stolen by a video game company. To recover his programs, Flynn breaks into the company's computer system but is caught by the computer's intelligent control program. The evil program, MCP, uses a laser to blast Flynn into electronic particles.

Somehow Flynn survives. When he awakens, he is no longer in the real world. Instead, he has entered the world inside the computer. But he has entered the world as a condemned prisoner. The control program places him on a huge video game grid and sentences him to die.



The fantasy world inside the computer in Walt Disney's new movie TRON.

CREDIT: Courtesy of Walt Disney Productions. Copyright 1982, Walt Disney Productions.

Several leading computer graphics firms have helped Disney produce the film. Their vision of the world inside the computer is sure to be startling, enchanting, and exciting.

But it is only one vision. There are endless others. And you and your family can create them.

The metaphor of the "world inside the computer" will soon become widely known. Already, primitive worlds exist in the form of arcade and home video games. The mazes, rockets, monsters, and little people you see on the game screen emerge from their silicon "homes" when the game is turned on. They are swiftly becoming more lifelike and realistic.

A Rabbi In A Box

Have you ever been to a novelty store and seen the Thing-in-a-Box? The box is really a small, black, plastic cube. You flip an ON switch, and the cube begins whirring strangely. Then the top of the cube opens, and a little green hand pokes out, knocks the switch to OFF, and, in the blink of an eye, disappears back inside the cube.

After watching the box in action, you have the strong impression that someone – or something – is living inside.

We may soon have the same impression about our personal computer.

Personal computers may soon have Artificial Intelligence (AI) programs and AI chips. Your computer may become an "intelligent assistant" that can think, reason, even learn. It will be a "fluent" computer that can carry on a casual conversation with you in normal English. If your family or friends won't listen to you, you will be able to turn on the computer and have a good heart-to-heart discussion with a machine.

AI research, tools, and technology are hot items. After almost four decades of research, AI professors have tied their bedsheets and pillow cases together into a rope, and have descended the ivory tower. Suddenly, at the same time their feet touch the ground, AI is becoming a big business.

What kind of big business? The hottest item in AI is known as *knowledge engineering*. AI scientists have created "expert systems" – chip-sized electronic clones of human experts. Already, these intelligent programs have been put to work diagnosing lung diseases, locating mineral deposits, and designing new clothing fashions. For a relatively small price, you will soon be able to have a world-class expert working alongside you, even if you are a lonely country doctor, or an oceanologist on an oil platform in the turbulent North Atlantic.

Putting a human-like, intelligent program on a chip is like having a wise slave who lives in a package of gum, or like a genie who lives inside a music box. We will very shortly see experts-in-a-box, advisors-in-a-box, and teachers-in-a-box. The knowledge, expertise, and personality of a doctor, a minister, a psychoanalyst, or a lawyer can be "mined" and captured on a home computer in the form of a small, inexpensive chip. AI companies like Cognitive Systems, Inc., Computer Thought Corporation, and Machine Intelligence Corporation are already developing the first AI software for personal computers.

"Know thyself," is an ancient prescription and a unique ability of human beings. Only humans seem to have a strongly developed sense of self-consciousness and self-awareness.

But not for long.

New computer chips are being developed with "expert" programs that know how to design other computer chips. These chips are being fed huge quantities of knowledge. (Some use optical scanners and hungrily read all sorts of technical papers and reports). What do they learn? They are learning about themselves, and about others of their kind. They are being endowed with a primitive sense of self-awareness.

Imagine someday when entire micro universes inside the computer – the chip neighborhoods, cities, and worlds – all have a sense of self-knowledge and self-consciousness. This awareness will only partly be human. Much of it will be non-human, perhaps even alien. It will be suited to the chips' electronic, inorganic bodies and to the complicated knowledge pattern stored in their local and global memories.

One day you and your children may design your own chips and create your own real computer worlds. Yet, even today, you can imagine them, then implement them in PASCAL, PILOT, BASIC or LOGO. Right now the worlds are fanciful, the blue-sky stuff of fantasy and magic. But by inventing them and building them into programs, you and your kids will gain insight into the real computer worlds that await you. These worlds and the tools to fashion them already exist as blueprints and prototypes in scientists' labs. Before you know it, they will enter your office, your classroom, and your home.

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PILOT And LOGO Addresses

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Atari PILOT. Atari, Inc., 1196 Borregas Avenue, Sunnyvale, CA 94086. (408/745-2000)

TI LOGO. Texas Instruments Inc., P.O. Box 10508, M/S 5849, Lubbock, TX 79408. (806/741-2978)

Young Peoples' LOGO Association (YPLA), 1208 Hillsdale Drive, Richardson, TX 75081.

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A painless, no-POKE method for mastering Atari high resolution, four-color Graphics from BASIC.

Graphics 8 In Four Colors Using Artifacts

David Diamond
DiamondSoft Co.
Mt. Laurel, NJ

Contrary to what the *Atari BASIC Reference Manual* states, Graphics Mode 8 is a true four-color mode (five colors if you count the border). Other articles have shown you how to obtain 16 or 128 colors by PEEKing, POKEing, and using machine language subroutines to fake out the operating system. This article is different. You can paint with four colors using simple, straightforward BASIC programming.

You probably have noticed that patterns drawn in Graphics Mode 8 often contain spurious colors. Atari stretches your television's resolution to its limits and the extra hues do sneak in.

The spurious colors seem random because they are appearing within a random pattern. They are, however, well behaved. They can be harnessed, controlled, and used for brilliant displays.

Before I get into the details, try the following demonstration program:

```
10 GRAPHICS 8 : COLOR 1
15 R=50
20 FOR X= -R TO R STEP 2
30 Y=SQR(R*R-X*X):REM FORMULA FOR A
   CIRCLE
40 PLOT 100+X, 100+Y : DRAWTO 100+X, 100-Y :
   REM CIRCLE #1
50 PLOT 151+X, 100+Y : DRAWTO 151+X, 100-Y :
   REM Circle #2
60 NEXT X : FOR I=1 TO 350 : NEXT I
70 FOR C=0 TO 15
80 SETCOLOR 2,C,4 : SETCOLOR 4,15-C,8
85 FOR I=1 to 350 : NEXT I
90 NEXT C
```

Surprise! You have five vivid, solid colors on the screen at the same time. Now let's take a look at that program:

Line 10 – Straight Graphics 8. Standard color defaults.

Line 15 – "R" is the radius of a circle.

Line 30 – This is the formula for a circle: $X^2+Y^2=R^2$. ("R*R" is a little faster than "R^2").

Line 40 – This draws the first circle. It is vertically cross-hatched to fill it in with a solid color.

Line 50 – This draws the second circle. *But why is it a different color* from the first circle?

Line 20 – Ah, here begins the secret: "STEP 2." Before reading further, change it to "STEP 1," and rerun the program.

Lines 40,50 – Here is the second half of the secret: "100+X" is an *even* offset. "151+X" is an *odd* offset. Change both occurrences of "151" to "150" on Line 50, and see what happens. (Remember to set Line 20 back to "STEP 2").

Lines 70-90 – These lines show you the wide range of color combinations available. Of course, when varying the luminance level, there will be even more.

Alternating Colored Fields

Without any additional programming lines, the circles can easily be changed into beach balls with alternating bands of color. Make sure that Line 20 says "STEP 2," and change lines 40 and 50 as follows:

```
40 PLOT 98+X, 100+Y : DRAWTO 101+X, 100-Y :
   REM Circle #1
50 PLOT 147+X, 100+Y : DRAWTO 150+X, 100-Y :
   REM Circle #2
```

Changing the slope of the cross-hatching by a single horizontal point will add or remove one band of color. Increment the DRAWTO's by one horizontal point, and see what happens:

```
40 PLOT 98+X, 100+Y : DRAWTO 102+X, 100-Y :
   REM Circle #1
50 PLOT 147+X, 100+Y : DRAWTO 151+X, 100-Y :
   REM Circle #2
```

Although the quirk that provides us with the extra colors seems somewhat magical, the reason for the varied solid colors is not. Remember that the "colored-in" areas are really comprised of finely separated, vertical lines. To better see what is happening, spread those lines out into a large grid for easier inspection:

```
10 GRAPHICS 8 : COLOR 1
20 FOR X=10 TO 160 STEP 15
30 PLOT X, 1 : DRAWTO X, 160
40 PLOT 1, X : DRAWTO 160, X
50 NEXT X
```

This isolates your three colors. The even column vertical lines are one color. Odd column vertical lines are a second color. Horizontal lines are the third color. (The background is the fourth, and the border is the fifth).

Line 20 controls the colors. Try "FOR X=10 TO 160 STEP 14" and try "FOR X=9 TO 160 STEP 14".

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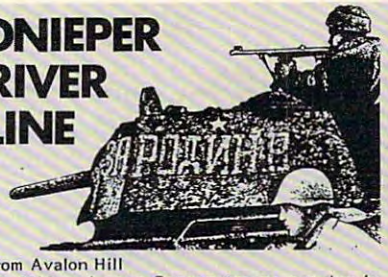

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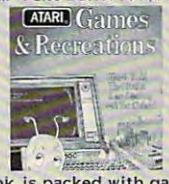

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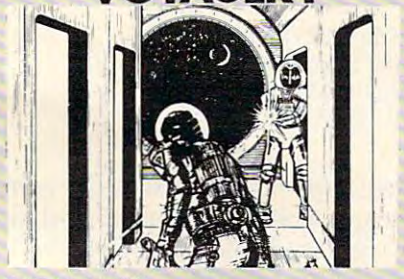

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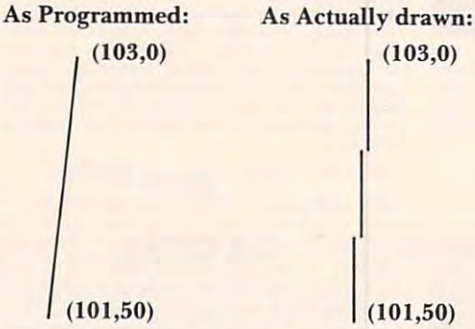
When two adjacent lines touch each other ("FOR X= ... STEP 1"), the two colors blend into the official color for Graphics Mode 8. Another way to look at it is that there are no longer separate lines when they touch, but rather a solid field of pixels.

The Alternating Color Phenomena

The beach ball display, with its alternating bands of color, takes advantage of the fact that, with a pixel matrix, one cannot draw nearly vertical pure diagonal lines. Instead a series of shorter vertical lines are drawn, as shown below:



You can see that the three vertical line segments are drawn on odd, even, and odd columns, respectively, thus alternating colors.

Why Multiple Colors

The horizontal resolution limit of a television set is about 160 unique points. This is because on any one line of the television tube surface there are 160 sets of phosphor points which emit light when struck by the scanning electron beam. Each set actually contains three separate phosphor points – one that glows blue when struck, one that glows green, and one that glows red. Combinations of these dots in various intensities creates the myriad of colors available.

Atari, in order to provide finer resolutions than 160 bytes across, plots 320 points across the screen – two for each set of color dots. (This is referred to as a *half color cycle*, or a *half color clock*.) Thus, even-column points will turn on the left portion of the three color phosphors, and odd-column points will turn on the right portion, producing alternating colors. The effect is referred to as *artifacting*.

Diagonal Lines

Diagonal lines, ranging from vertical to almost 45 degrees, contain vertical components, and are therefore subject to the artifacting effects described above. However, when these lines are drawn on top of a "...STEP 2" solid colored field (such is demonstrated in the above programs), much of the spurious color effect is minimized, so that the "official" color for Graphics Mode 8 will be seen. If the background is dark, a medium intensity line will appear light (whitish). If the background is bright, a medium intensity line will appear dark (often a rich chocolate brown).

The bold splashes of multiple solid colored shapes can thus be combined with the more delicate effects of intersecting diagonal lines, as in the following demonstration program:

```
10 GRAPHICS 8 : COLOR 1
20 SETCOLOR 4, 15, 10 : SETCOLOR 2, 0, 15
30 FOR A=20 TO 140 STEP 2
40 IF A=100 THEN A=101
50 PLOT 65,20 : DRAWTO A,1 : DRAWTO A,A :
   DRAWTO A+30,70
60 DRAWTO 65,A : DRAWTO 30,A+40 :
   DRAWTO 65,20
70 NEXT A
80 FOR I=1 TO 350 : NEXT I
90 FOR COLOR=0 TO 15
100 SETCOLOR 2, COLOR, 5 : SETCOLOR 4,
    15-COLOR, 10
110 FOR I=1 TO 350 : NEXT I
120 NEXT COLOR
```

Moire Patterns

No discussion of multiple colors would be complete without mentioning color moire patterns. There are two types of moire patterns. One type is the secondary pattern produced by the intersection of diagonal lines, such as is illustrated by DEMO Program 2, above. This type is not dependent on color for its effect. The second type is the subtle and delicate designs produced by shifts in color along diagonal lines. This type is dependent on the artifacting effect, and is illustrated in the following program:

```
10 GRAPHICS 8 : COLOR 1
20 FOR A=0 TO 319 STEP 3
30 PLOT 0,159 : DRAWTO A, 0
40 PLOT 319, 0 : DRAWTO 319-A, 159
50 NEXT A
```

Notice that the pattern is whitest in the center, where the lines are not as steeply sloped, and also toward the upper right and lower left corners, where the lines are closest together. In addition to the white and the two artifacted colors, you may notice a fourth and fifth color along the top and bottom sections of the pattern. These extra colors are formed by a *visual* blending of the two artifacted colors. It is caused by the fact that the alternating colored areas are so close together that the eye has difficulty resolving them (a trick used by the Impressionists).

You can combine the various effects discussed in this article. Experiment with different color and intensity combinations. Blend in some dynamic color changes. You have a palette that any artist would envy. ©

Using Atari Joysticks With Your VIC

Christopher J. Flynn
Herndon, VA

Description

What is the most inexpensive peripheral that you can buy for your VIC? A color television? Certainly not. Memory expansion? Probably not. No, a joystick. What? You mean one of those gadgets for playing games? That's right!

Perhaps you didn't realize it, but your VIC can use the very same joysticks that are found on the Atari and Sears video games. Absolutely no hardware modifications are needed at all. Best of all, your local Sears store will sell you a joystick for about ten dollars. How about that! It may turn out, however that the Commodore joystick will differ from the Atari joystick in subtle ways.

Here we will concentrate on showing you how to use an Atari or Sears joystick. Since the VIC joysticks are not available yet (as of this writing), anything we might say about them would only be speculation. So we won't deal too much with what might be.

To give you an idea of the capabilities of the joystick, we've included a demonstration program called Doodle. It's a fast-paced game in full sound and color designed for drawing patterns with the joystick. Your kids will love it – if they can get it away from you.

Before we get into the details, an acknowledgement is due. (Creative Software of California deserves credit for pointing out to me that Atari joysticks are usable on the VIC.)

How We Do It

Figures 1 and 2 compare the VIC joystick socket with the Atari's. The similarities are striking. (Actually, if we ever need to, the Atari joystick can be quite easily rewired. If you take one apart, you'll find that the wires are connected with solderless terminals.)

So let's go with the joystick the way it is. We need to do a little exploratory surgery first. Since I've already done this, please just follow my description. You don't need to do this to your VIC. First we gently open up VIC's case. Armed with our trusty ohmmeter, we trace the joystick connections. We assume that they must reach the 6522 VIA I/O chips. So that's where we start looking. Voila! Tracing all the connections, we find that the joystick switches do indeed go to the 6522s.

Finally, we determine that the joystick is connected as follows:

6522 #1	E	?	?	?	?	?	?	?
	PB7	PB6	PB5	PB4	PB3	PB2	PB1	PB0
6522 #2	?	?	F	W	S	N	?	?
	PA7	PA6	PA5	PA4	PA3	PA2	PA1	PA0

E, W, S, and N represent the four compass directions. F represents the fire button. We won't be concerned with the fire button in this article.

How do we use this information in a program? What we generally have to do is read each I/O port and test the appropriate bits. Then our program can take any action needed. And there are some complications. Don't forget that the 6522 has data direction registers which program each bit for an input or output operation. Also, the signals from the joystick are in what is called an "active low" state. That is, if the joystick is pointing, say, north, the north bit will be low or zero. The other three directions will be high or ones.

That probably sounds a lot harder than it is. We can actually use BASIC to obtain the joystick readings pretty easily. The BASIC statements shown here are the key to using joysticks on the VIC.

```
POKE 37154,127
V1 = PEEK(37152) AND 128
V2 = PEEK(37151) AND 28
POKE 37154,255
JS = V1/16 + V2/4
JS = (NOT JS) AND 15
```

These statements read the I/O ports and manipulate the bits. We end up with a bit configuration like this:

```
O O O O E W S N
```

The least significant four bits in the variable JS thus correspond to the four joystick switches. Normally, this would mean that JS could range in value from 0 to 15. In practice, JS will take on values from 0 to 10. This is because some bit patterns just aren't possible. With a properly functioning joystick, you can't press the north and south switches at the same time, for example.

The following table shows the values that JS will assume for each of the valid joystick positions.

Direction	JS Value	Delta X	Delta Y
Neutral	0	0	0
N	1	0	-1
S	2	0	1
Can't occur	3	0	0
W	4	-1	0
NW	5	-1	-1
SW	6	-1	1
Can't occur	7	0	0
E	8	1	0
NW	9	1	-1
SE	10	1	1

Note that JS is 0 in the neutral position. This gives us a handy way to test for joystick movement.

Delta X and Delta Y are variables which will help us if we're trying to move an object around the screen. Suppose we're using an X and Y coordinate system like this:

```
          X
     0 1 2 3 4 5 ... 21
     1
     2
Y    3
     4
     .
     .
     .
    22
```

Y represents a row number and X represents a position within a row. When the joystick moves, we want to update the values of X and Y so they indicate the new position. We can do this again easily in BASIC:

```
X=X+DX(JS)
Y=Y+DY(JS)
```

DX and DY are arrays where we've saved the list of values for Delta X and Delta Y.

An example will show how this works. Let us assume that we have an object at X=7 and Y=5. We test the joystick and determine that it has moved. Let's assume that it's pointing north. From our table, we know that JS will contain 1. So, the new positions of X and Y will be:

```
X=7+DX(1)
Y=5+DY(1)   or

X=7
Y=4
```

Thus, our object is moved up one line closer to the top of the screen. There was no forward or backward horizontal change.

One last detail we need to think about is how to convert X and Y into something VIC understands. As you know, we can POKE things into VIC's screen memory. But we need a memory location for that. Again, BASIC helps us out:

```
P=22*Y+X
```

That little formula will convert valid X and Y values into a number ranging from 0 to 505. Next, we must add P to the screen and color memory starting locations:

```
POKE 7680+P, code
POKE 38400+P, color
```

Use any screen code and color that you wish.

Doodling

We've covered joysticks pretty quickly; we've only discussed the highlights. There are many other details involved. The best way to pick these up is to study Program 1 and to enjoy the Doodle game.

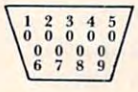
Doodle is a lot of fun to play. The object is just to enjoy yourself. When you start Doodle, it will display instructions on how to use the special function keys.

Key	Message	Description
f1	TO QUIT	Ends the game.
f3	MOVE CURSOR	The cursor moves, but does draw a line. Erases any objects that it crosses.
f5	DRAW LINE	The cursor moves and draws a line.
f7	CLEAR SCREEN	The screen is cleared and the cursor is centered. VIC is ready to doodle again.

You may press any key at any time while doodling. For interesting effects, alternate the f3 and f5 keys. By doing this properly, you can enclose a figure within another figure without any intersecting lines.

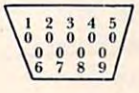
Comparison Of VIC And Atari Joystick Sockets (as viewed from the outside)

Figure 1: VIC Joystick Socket



1 JOY 0
2 JOY 1
3 JOY 2
4 JOY 3
5 POT Y
6 LIGHT PEN
7 +5V
8 GROUND
9 POT X

Figure 2: Atari Joystick Socket



1 NORTH
2 SOUTH
3 WEST
4 EAST
5 NO CONNECTION
6 FIRE BUTTON
7 NO CONNECTION
8 GROUND
9 NO CONNECTION

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```
100 REM VIC-20 DOODLE
200 REM .BEGIN
210 GOSUB 30000
220 REM DOODLE
230 GOSUB 2000
240 IF F1=0 THEN 230
250 REM .END
260 GOSUB 34000
270 END
300 REM READ JOYSTICK AND K.B. (***
    ATARI JOYSTICK***)
310 POKE DD,127
320 V1=PEEK(R1)AND128
330 V2=PEEK(R2)AND28
340 POKEDD,255
350 JS=V1/16+V2/4
360 JS=(NOT JS)AND15
370 GET A$:IF A$<>"" THEN GOSUB 400

380 RETURN
400 REM SERVICE K.P.
410 A=ASC(A$)
420 IF A=133 THEN F1=1
430 IF A=134 THEN CH=32
440 IF A=135 THEN CH=32+128
450 IF A=136 THEN GOSUB 32000
460 RETURN
500 REM CHOOSE COLOR
510 CL=INT(RND(1)*8)
520 IF CL=1 THEN 510
530 RETURN
600 REM VERIFY X&Y
610 IF X<0 THEN X=0
620 IF X>21 THEN X=21
630 IF Y<0 THEN Y=0
640 IF Y>22 THEN Y=22
650 RETURN
700 REM X&Y TO ADDR
710 P=22*Y+X
720 POKE VA+P,BT
730 POKE CA+P,CL
740 RETURN
800 REM SET NOISE AND  VOLUME
810 POKE VL,(3+INT(RND(1)*6))
820 POKE S3,(128+INT(RND(1)*110))
830 RETURN
2000 REM DOODLE
2010 TL=TI+60*2.5
2020 GOSUB 300:REM POLL JOYSTICK
2030 IF F1 THEN RETURN
2040 IF JS<>0 THEN 2070
2050 IF TI<TL THEN 2020
2060 GOSUB 800:GOTO 2010
2070 POKE VL,15:POKE S3,220
2080 FOR Z=1 TO 100:NEXT
2090 POKE S3,0:GOSUB 800
2100 REM CLEAR OR FILL CURSOR SPOT
2110 BT=CH
2120 GOSUB 500:REM GET COLOR
2130 GOSUB 700:REM STORE BT
2140 REM NEW CURSOR POSITION
2150 X=X+DX(JS)
2160 Y=Y+DY(JS)
2170 GOSUB 600:REM CHECK X&Y
2180 REM SET CURSOR
2190 BT=CS:CL=0
2200 GOSUB 700:REM STORE BT
2210 RETURN
30000 REM .BEGIN
30010 PRINT CHR$(147);
30020 PRINT SPC(8);"VIC-20"
30030 PRINT
30040 PRINT SPC(5);"D O O D L E"
30050 PRINT:PRINT CHR$(158)
30080 PRINT CHR$(31):PRINT
30090 PRINT "PRESS:":PRINT
30100 PRINT "F1- TO QUIT"
30110 PRINT "F3- MOVE CURSOR"
30120 PRINT "F5- DRAW LINE"
30130 PRINT "F7- CLEAR SCREEN"
30140 PRINT:PRINT
30150 PRINT"ATARI/SEARS JOYSTICK"
30160 PRINT"PLUGGED IN ?"
30170 REM VARIABLES
30180 REM JOYSTICK
30190 DD=37154:R1=37152:R2=37151
30200 REM VIDEO AND SOUND
30210 VA=7680:CA=38400:BG=36879
30220 VL=36878:S3=36876
30225 CS=90:CH=32+128:Z=RND(-TI)
30230 REM DELTA X, DELTA Y FOR JOYSTI
    CK
30240 DIM DX(10),DY(10)
30250 FOR I=0 TO 10:READ DX(I):NEXT
30260 FOR I=0 TO 10:READ DY(I):NEXT
30270 DATA 0,0,0,0,-1,-1,-1,0,1,1,1
30280 DATA 0,-1,1,0,0,-1,1,0,0,-1,1
30290 FOR Z=1 TO 4000:NEXT
30300 REM INITIAL CONFIGURATION
30310 POKE BG,25:REM WH-WH
30320 GOSUB 800:REM GET NOISE
30330 GOSUB 32000:REM CLEAR
30340 RETURN
32000 REM CLEAR SCREEN
32010 PRINT CHR$(147);
32020 X=10:Y=10:BT=CS:CL=0
32030 GOSUB 700
32040 RETURN
34000 REM.END
34010 PRINT CHR$(147);
34020 POKE BG,27
34030 PRINT:PRINT
34040 PRINT "SO LONG!"
34050 PRINT:PRINT
34060 POKE VL,0:POKE S3,0
34070 RETURN
```

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This program was written in Microsoft BASIC. We have included notes on adapting it to the Atari.

Analysis Of Variance

Anselm Wachtel
Pittsburgh, PA

Suppose you wanted to find out which department store chain sells some item at the lowest price. You could simply go to a store representing each chain and compare prices. Or for greater accuracy, you could go to a number of stores of each chain and compare the averages. But now there's a problem: the differences between individual stores of any one chain may differ from each other by about as much as the averages differ from each other. What can you now say about the pricing by the chains? Those differences may simply reflect normal scatter, i.e. chance, and therefore be insignificant.

This problem is very difficult to handle by "inspection," but is readily solved by a *One-Way Analysis of Variance* (ANOVA). Without going into the details of statistics, let's just say that this technique compares the scatter of data within each group of data (in our case the prices of individual stores within any one chain) with the overall scatter of all data. Scatter (variability) is measured by what is called variance. It is estimated by summing the squares of differences between data and the average, and dividing the sum by the number of data, minus one. Number -1 is called the degrees of freedom, abbreviated DF in the program.

The program subtracts the "treatment sum of squares" from sum of squares of the overall mean to arrive at an "error sum of squares" which, divided with its degrees of freedom, represents the variance due to chance.

The Degree Of Confidence

Finally, the ratio of variances, associated with treatments and error, yields the *F-statistic*. It's up to you to decide on the degree of confidence, i.e. in how many cases out of 100 future pricings, you can expect the differences between chains to be real. You need a table of F-values which you enter with the number of degrees of freedom associated with each statistic and find a number. If your F value is greater, then the chains can be expected to be different in, say, 95% of future pricings. Naturally, the more confidence you demand, the less chance you have of finding that your results are significant to that degree.

I have deliberately structured the program to require data entry with DATA statements rather than INPUT. The DATA become part of the program and can be edited easily. Simply type:

line # DATA xx,xx,xx,xx,999,yy,yy,yy,999,zz,zz,zz,zz, zz,999,9999

and RUN. xx,yy,zz represent individual prices with any one chain contained within the 999s.

Instead of using a table, you might wish to use the F-distribution program in *Some Common Basic Programs*, page 140, by Lon Poole and Mary Borchers (A. Osborne and Assoc., Inc.). Entering your F-value and degrees of freedom returns the confidence level directly (called percentile). Naturally, this could be incorporated as a subroutine.

Atari Notes

These are the modifications necessary to adapt Analysis of Variance to the Atari:

```
115 DIMSP$(40):SP$=" ":SP$(40)=" ":SP$
    (2)=SP$
140 ?"----------":REM 15 DASHES
150 (DELETE)
300 ?"T";K;"=";INT(H*100+.5)/100
370 ?"SOURCE";SP$(1,6);"SSQ";SP$(1,9);"DF";
    SP$(1,7);"MS"
380 (DELETE)
400 ?" CRUDE";:POKE85,8:PRINT Q1;:
    POKE85,23:?N1
410 ?" COR.F";:POKE85,8:PRINTG;:POKE85,
    24:?1
420 ?" TOTAL";:POKE85,8:PRINTC;:POKE85,
    23:?N1-1
430 ?" TREAT";:POKE85,8:PRINTT2;:POKE85,
    23:?D1;:POKE85,31:?INT(M1*100+.5)/100
440 ?" ERROR";:POKE85,8:?E;:POKE85,23:
    ?D2;:POKE85,31:?INT(M2*100+.5)/100
460 ?"F(";D1;" AND ";D2;" DEGREES OF
    FREEDOM)=";INT(F*100+.5)/100
```

```
0 PRINT"{CLEAR}":GOTO480
100 REM ONE WAY ANALYSIS OF VARIANCE
110 REM A. WACHTEL, PITTSBURGH, PA 15235
120 PRINT"{CLEAR}"
130 PRINT"TREATMENT MEANS"
140 PRINT"################"
150 DEF FNA(X)=INT(X*100+.5)/100
160 S1=0:Q1=0:T1=0:N1=0:K=0
170 N=0:S=0:Q=0
180 READ Y
190 IF Y=999 THEN 250
200 IF Y=9999 THEN 320
210 S=S+Y
220 Q=Q+Y*Y
230 N=N+1
240 GOTO 180
250 S1=S1+S:Q1=Q1+Q:N1=N1+N
260 H=S/N
270 T=S*S/N
```

```
280 T1=T1+T
290 K=K+1
300 PRINT"T"K"="FNA(H)
310 GOTO 170
320 G=S1*S1/N1
330 C=Q1-G:T2=T1-G:E=C-T2
340 D1=K-1:D2=N1-K
350 M1=T2/D1:M2=E/D2:F=M1/M2
360 PRINT
370 PRINT"SOURCE";SPC(6);"SSQ";SPC(9);"DF";
    SPC(7);"MS"
380 PRINT"######";SPC(6);"###";SPC(9);"##";
    SPC(7);"##"
390 PRINT
400 PRINT" CRUDE";TAB(8)Q1;TAB(23)N1
410 PRINT" COR.F";TAB(8)G;TAB(24)"1"
420 PRINT" TOTAL";TAB(8)C;TAB(23)N1-1
430 PRINT" TREAT";TAB(8)T2;TAB(23)D1;TAB(31
    )FNA(M1)
440 PRINT" ERROR";TAB(8)E;TAB(23)D2;TAB(31)
    FNA(M2)
450 PRINT
460 PRINT"F("D1"AND"D2"DEGREES OF FREEDOM)=
    "FNA(F)
470 GOTO 530
480 PRINT"USE LINE 0 AND LINES UP TO 119 TO

490 PRINT"ENTER DATA. PLACE 999 AT THE END
500 PRINT"OF EACH TREATMENT SERIES.
510 PRINT"PLACE 9999 AFTER THE LAST 999.
520 PRINT"(AVOID 999 OR 9999 AS DATA).
530 END
```

©

Atari Dice Simulation

W. C. McLachlan
Dallas

So you wanted to program a board game utilizing dice? Well, you've come to the right place: Atari's graphics and string handling capabilities make it easy.

It is possible to simulate dice in graphics modes 3 through 7 (even 8), but it is cumbersome. It is much easier and faster in mode 0. The following program uses one large string (DICE$) to store the die faces one through six. Each die is divided into nine parts. By effectively utilizing Atari's cursor controls, we can build the parts into a realistic looking die.

```
100 GR.0
110 DIM DICE$(102): POKE 752,1:REM TURN
  OFF CURSOR
120 DICE$="AAACDDDABACDDDAAABAACDDDAAACD
DDAABBAACDDDABACDDDAABBAACDDDAAACDDDBABB
AACDDDABACDDDBABBBBCDDDAAACDDDBBB"
130 X=20 : Y=10: REM X AND Y ARE INITIAL
  DIE POSITION
140 DICE = INT(6*RND(0)+1): REM RANDOM N
  UMBER
150 A=DICE*17-16:REM A=SUBSTRING START P
  OSITION
160 COUNT=COUNT+1
170 IF X>25 THEN X=20
180 POSITION X,Y
190 PRINT DICE$(A,A+16): REM PRINT THE S
  UBSTRING
200 X=X+5: REM MOVE OVER 5 SPACES TO PRI
  NT NEXT DIE
210 SO. 0,10,2,15:S0.0,0,0,0: REM SOME D
  ICE ROLLING NOISE
220 IF COUNT <> 20 THEN 140
```

To enter line 120, the following code prevails:

A = (REVERSE VIDEO) SPACE
B = (REVERSE VIDEO) CTRL-. (PERIOD)
C = ESC-CTRL-DOWN ARROW
D = ESC-CTRL-LEFT ARROW

You'll note that the first 17 characters constitute die face #1, the second 17 – die face #2, etc. All six faces *will* fit on one logical line, although it's a tight fit. Now to the program:

Line 140 selects a number from one to six. After the number is selected, it will be necessary to tell the computer what part of the string contains the die face corresponding to it. This is the function of line 150. Next, the substring is printed (line 190) at the position determined in line 180. Since two dice are displayed, lines 170 and 210 are required to select the die position. Lines 160 and 220 combine to roll each die ten times to simulate a dice "throw." Easy!

This routine has been expanded just to make it clearer. You can compact it to four logical lines and store it away as a subroutine in your programs. [*The word* logical *means "as the computer would see it." In other words, four "logical lines" might break into seven or eight lines on your TV because it can only show 40 characters per line. There would still only be four "logical lines," however, since there would only be four line numbers (to the computer). Sometimes, for example, sector 15 on a disk might be located* physically *before sector 14. They would still be* logical *14,15.*]

Other additions, such as adding more dice, or using joysticks to initiate a dice roll, are made easily.

Atari BASIC allows for extremely fast string handling. This is just one example of how to use a string to its fullest advantage. Remember, you can use any of the edit commands (tab, cursor up, cursor right, backspace, line delete, etc.) in a string by first pressing the ESC key. Usually, you can save a considerable amount of time and unnecessary program steps by employing string edit commands. ©

Jim Butterfield responds to a number of recent queries about Commodore computers.

PET Miscellany

Jim Butterfield
Toronto

Q: How do I get my CBM disk to do things (like direct access) from machine language?

A: The disk doesn't know or care who's giving it instructions: BASIC or machine language. All you really need to do is to send to the disk (or receive from disk) exactly the same information that BASIC would send. Some commands go to the command channel (secondary address 15) and some to the data channel, so you'll need to keep things sorted out and know the command channel formats. See a separate article on Machine Language and the CBM Disk [**COMPUTE!**, *March, 1982, #22, pg. 139*].

Q: A previous article says that SYS 54386 on 4.0 systems will *call* the Machine Language Monitor (as opposed to *breaking* to the Monitor). What is the BASIC Upgrade ROM address for this? I'd like to get that C* to show instead of that B*.

A: Upgrade ROM may call the monitor with SYS 64785. It's not needed quite so badly in earlier ROMs since they do not turn off the CMD that's in effect.

Q: I see that memory locations 1001 to 1012 decimal are used in the Fat 40. Are there any that are useful to know to the average programmer? For example, what does "New Key Marker," location 1001, do?

A: The interrupt working values in the Fat 40 aren't really too important to the end user; you need to know that they're there so that you can leave those locations alone. I don't plan to comment in any depth on them ... if you want to play, be my guest. The New Key Marker spots if a new key is pressed, so that when you hold down cursor-right and then press cursor-down instantly, it still knows to pause before taking off again. (Note that it goofs up if you use the shift key to change cursor-left to cursor-right.)

Q: More questions on memory maps. The 80 column machine has a lot of constants used near the top of zero page for windows and things. What is this space used for in the 40 column ones?

A: The 80-column locations are mostly used in the 40-column job for the "line wrap table" which keeps track of single versus double lines. You don't need to do this in 80 columns, of course.

Q: I have a screen dump program which prints a hard copy of everything on the screen to the printer. At the end of each line it sends CHR$(0) five times before it proceeds to the next line. Why?

A: Some printers need time to return the carriage to the left hand side of the page. To allow for this, some programs add "pad" characters after the RETURN/LINEFEED to give this time; CHR$(0) doesn't print, but fills in the time.

Q: What is the difference between ASCII and "true ASCII"?

A: True ASCII is a standard 7-bit code. Upper case A is decimal 65, and lower case a is decimal 97. In the PET, an 8-bit code is used; if you're in Text mode then upper case A is 193 and lower case a is 65. To go to a standard device or a communications line, you'll need to do a translation from PET-ASCII to true-ASCII.

Q: I have a program which does a "soft" change of the device number of a particular device. How does it do it?

A: Some devices – notably disk units – place their device ID's into RAM at the time of power-up. If you can download to the device's memory, and know the locations, you can change these memory values and, thus, the disk ID.

Q: I'd like to be able to check to see if the disk is busy. If the disk is doing a Header (New), Collect (Verify), or other lengthy jobs, I'd like to know when it is finished. Trying to use the disk when it's busy causes my program to lock up until the disk is free.

A: Try using the following code:

```
POKE 59456, PEEK(59456) AND 251
X=PEEK(59456) AND 64
POKE 59456, PEEK(59456) OR 4
```

At this point, X will have a value of zero if the disk is busy, and 64 otherwise. ©

Ms. Deal has been working with Commodore machines for several years. Many of the tidbits below represent questions people have asked her. You're bound to learn something you didn't know.

Bits And Pieces

Elizabeth Deal
Malvern, PA

• It's sometimes hard to tell where the screen boundaries are. Annoying, if the cursor jumps the line or the screen scrolls when you don't want it to. Cheap solution: fill screen with the full white square character and put borders on the picture using 1/8" or 1/16" vinyl tape sold in stationary or art supply stores. Do it on the right and bottom edges of the screen. Watch for parallax!

• Don't use SYS4 within a running BASIC program (to get to the monitor). Location 4 is busy at that time and you'll crash. Use SYS1024 or *call* the Monitor instead (64785 on Upgrade).

• Most, if not all, tape load errors are preventable. Keep tapes clean. Clean the cassette unit immediately after getting the first VERIFY ERROR or a bad ST value. Use Radio Shack freon head cleaner or grain alcohol and Q tip. No rubbing alcohol. Don't permit the Q-tip to get tangled up in moving parts inside.

• If you can't find any pencils in the house turn to your PET. They are all under there. A real "world computer" would have legs either too small for pencils to roll under or big enough for a person's hand, if you want my opinion.

• Recent Commodore printers (4022) have a trace of descenders and work quietly, but slower, than the old ones. It is easier to flip character sets than previously. They don't get stuck any more. Surprise – the values are opposite from those in the PET itself. Quote from the manual: to set text mode (upper and lower case) 10 poke59468,12: open7,4,7: print#7: close7, and to set graphics mode (graphics and upper case) 10 poke59468,14: open8,4,8: print#8: close8. Note that two secondary addresses are used, 7 and 8.

• Both Osborne *PET/CBM GUIDES*, the red and white books, incorrectly describe several aspects of array storage on the PET. The general logic is all right, but many details have been mangled. BASIC 4 users should be aware of the fact that their character strings occupy two more bytes of storage per string than previous BASICs. All users should note that the Osborne books, in text and/or some illustrations, reverse the low-high order of addresses, and that the description of storage of character strings is in error.

• Update on Partitions: to set up partitions in the PET, it is always necessary to reset the "beginning of BASIC" pointer and to put zeros in the first three bytes of a partition (NEW). Assuming two partitions, the way to get going is via the monitor. For instance, to set up a partition at $6000 (24576 decimal), type SYS4 and:

```
.M  0028 0028
.:  0028 01 60 03 60 03 60 03 60
.M  6000 6000
.:  6000 00 00 00 xx xx xx xx xx
```

To reenter a previously established partition, it's a good idea to check the presence of that zero in the first position, otherwise BASIC can't work. Do the check while in the Monitor changing your pointers. Otherwise, if you exit with the zero missing, BASIC will not function and you probably won't be able to get back into the monitor without a reset (power turned off, then back on).

Existing program files can be loaded into a partition using "Toolkit" 's APPEND command (tape only). Existing programs in ASCII format can be so loaded via the XEC command of "Power" (tape and disk).

Saving programs from a partition has to be done by the Monitor's .S command in case of the Toolkit. In Power, saving a program as an ASCII file (relocateable, by definition) does the job automatically.

For many applications a method described in **COMPUTE!**, November, 1981, #18, "Inverse Partitioning" should simplify the task.

• Supermon (SM) [*a machine language monitor extension program which appeared in* **COMPUTE!**, *December, 1981, #19*] is handy in resetting the top of BASIC pointer in case of continuing shrinkage of your PET's memory while you POKE and rePOKE some undebugged machine code program. Assume that SM is the SYS address given by the loader during original setup. Doing SYS SM at any time will set the pointers to the original condition. By the same token, if you have some code below (lower address) Supermon, don't use its SYS command, use PET's SYS4. PET recognizes Supermon's commands by checking a pointer at $03FA-03FB. If you crash and reset the PET, this pointer has to be fixed by SYS SM.

• Wedge relocates itself to the top of the PET, next to the screen. The code uses ROM routines and contains no location-sensitive addresses. It can be block-moved anywhere in memory with the Supermon's Transfer command, so long as you notify the CHRGET routine of the move: change $0071-0072 (low byte-high byte of Wedge's address) to

chips...chips...chips...chips...chips...chips...chips...

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*NOTE: Old DOS doesn't recognize 3 commands.

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The address for the 2000/3000 (which would require PicChip module PC2), for the 4000 (PC4) and for the 8000 (PC8) is $A000...unless you have a Mikro, Word Pro 3 or 4, or Jinsam, which occupy that same address. In those cases, you will need the PicChip on an interface board... for the 2000/3000 series, PCB2, for the 4000, PCA4, and for the 8000, PCA8. In all cases, the Mikro or WordPro would be switchable manually using the Skyles Socket-2-ME...available at a very special price. **$60.00**

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point to the new location.

While Wedge is loading itself it uses some screen area for working storage (evidenced by a quick flash on the screen). This can be deadly if you plan to put Wedge below some existing code, as the code will turn to mush. There are several ways around it: use the old DOS-Support program which doesn't jump its boundaries, or load the Wedge first to a lower location, followed by the desired program, or load the Wedge next to the screen and move it.

- Wedge is hard-coded to be available only with disk as device 8. Untested suggestion: it can be used with a differently numbered disk device if you poke the device number in two locations in the Wedge code. Use Supermon's Hunt command to find two 8's. They are in A9 08 (LDA #$08) code sequence. No other 8's exist in the code.

- Wedge's handy curiosity: you can quickly obtain the names of the floppies and bytes free from both drives by saying such things as ›$10, or ›$01, or ›$55 or $›XX or whatever.

- While developing a long BASIC program (or when putting it away for some time) it's a good idea to document it. Otherwise, later it won't seem to resemble any of your thoughts. The meanest thing is the structure of the program – "what does it do and when?" You can't modify a program without knowing that you won't stick a line in a place that breaks up a subroutine or without knowing where it might even be executed.

A cross-reference program is a good thing to use, for instance Cursor (tape-magazine) published Jim Butterfield's fast, machine code Cross-ref routine for disk users (only, I think). It lists variables (in alphabetical order) and lines (in numeric order) indicating places where those variables or numbers are used.

Here is a halfway approach I sometimes use. It's good for tape people. And it can, of course, be used with Cross-reference for a complete picture.

Devoting some space at the end of a program to housekeeping, I can list all subroutine entry points and all GOTO references, like this:

```
2000  ‹S›:ON S GOSUB 450,500,510,320,620,800
2001  ‹G›:ON G GOTO 60,100,150,250,455
```

The syntax in ‹S› and ‹G› guarantees against those lines ever executing, even if I were to lose control of the program, since a SYNTAX ERROR would result. ON X GO X, however, is seen by me, Cross-reference, Toolkit and Power as a perfectly valid list of addresses. They get renumbered correctly and, *if* I keep them clean and up to date, I stand a better chance of knowing how the program is built. It's primitive, but it works. ©

PET Newsletters And Magazines

Richard Mansfield
Assistant Editor

There are several magazines, besides **COMPUTE!**, which feature articles and programs for Commodore computers. Many of them are devoted exclusively to the coverage of PET/CBM machines. Here is a list, in alphabetical order:

1. *Commodore,* Commodore Business Machines, 681 Moore Road, King of Prussia, PA, 19406. Published bi-monthly. $15 per year, $25 Canada and Mexico.

2. *The Midnight Gazette,* (Published by the Central Illinois PET Users' Group), CIPUG, 635 Maple, Mt. Zion, IL 62549. The newsletter is financed by donations and ads from readers. You can send up to four, double-stamped (40 cents) self-addressed, long envelopes to receive the next four issues. Quarterly.

3. *The Paper,* Pearl St., Livingston Manor, NY, 12758. Published six times a year, a single issue is $4. A year's subscription is $20.

4. *TORPET,* 381 Lawrence Avenue West, Toronto, Ontario, Canada M5M 1B9. Newsletter of the Toronto PET Users' Group. $1 per issue. Quarterly.

5. *The Transactor,* Commodore Business Machines Limited, 3370 Pharmacy Ave., Agincourt, Ontario, Canada, M1W 2K4. Official publication of Commodore Canada. All back issues, $35. Current volume (six issues per year), $10. Bi-monthly.©

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@N	Format (header) a new diskette
@I	Force initialize diskette
@V	Validate diskette (collect)
@D	Duplicate diskette
@C	Copy or concatenate disk file(s)*
@R	Rename file
@S	Scratch file(s)*
@$	List directory*
@U:	Reset disk drive
@L	List disk file or BASIC program*

* Added/enhanced disk command.

EXTENDED EDITOR

Command	Function
/	Quick load from disk
↑	Quick load from disk with auto run
APPEND	Append from disk to end of current program
AUTO	Auto line number (allows header)
BLOAD	Load machine language (binary) file
BRUN	Load and execute machine language program
CHANGE	Change pattern to another pattern
CLOSE	Close one or all files
CMD	Set output to file (does not send "READY.")
DELETE	Delete a range of lines from program
DUMP	Dump all scalar variables to screen or file
EXEC	Execute a file as keyboard commands
FIND	Find occurances of a pattern
GET	Read a sequential file into editor
KEY	Define a key as a special function
KEYS	Turn key functions on
KILL	Disable SYSRES™
KILL*	Disable SYSRES™ and unreserve memory
LIST	Improved BASIC LIST command
LOAD	Defaults to disk drive
MERGE	Merge from disk into current program
MON	Break to current machine language monitor
OLD	Restore program after "NEW"
PUT	Send program to disk as text file
RENUMBER	Renumber all or part of program
RUN	Run current program, ignores screen garbage
SAVE	Defaults to disk drive, allows replace
SETD	Set disk device #, allows multiple drives
SETP	Set printer channel, format mode, paging
TRACE	Select 1 of 3 trace/step modes and speed
VERIFY	Compare current program against disk/tape
WHY	Print position of last error
WHY?	List line of break or error
*	Send output to printer
#	Display current version of SYSRES™

COMPARE SPECIFICATIONS!

	SYSRES™	POWER™
Number of ADDED commands	33	13
Number of IMPROVED BASIC commands	7	none
Number of DOS SUPPORT commands	11	none
Approximate added syntax options	1200	60
Instruction manual length	86 pages	75 pages
Instruction manual style	structured	conversational
Re-loactable?	yes	no
Use on more than one (any) PET/CBM™	yes	no
Upgradable	yes	no

COMPARE FEATURES!

	SYSRES™	POWER™
Automatic printer output?	yes	no
Selectable ASCII conversion?	yes	no
List programs without loading them?	yes	no
Formatted program listings?	yes	no
Dump SEQuential/RELative files?	yes	no
Edit data files?	yes	no
True program merge?	yes	no
Auto number with **AUTO TEXT**?	yes	no
Load machine language programs?	yes	no
Auto-execute machine language programs?	yes	no
Directory (menu) file commands?	yes	no

COMPARE "EQUIVALENT" FUNCTIONS!

Function: Change occurances of one pattern to another.

Feature	SYSRES™	POWER™
Command word	CHANGE	@
'Wild cards' in search string?	yes	yes
'Wild cards' in replace string?	yes	no
Selectable range?	yes	yes
Match in entire text?	yes	yes
Match in commands only?	yes	no
Match exact variable names?	yes	no

Function: Define special one-key functions.

Feature	SYSRES™	POWER™
Command word	KEY	REM"
Requires BASIC program changes?	no	yes
Destroys variables?	no	yes
Re-define any key?	yes	no
Maximum string length	255	73
Quotes and carriage-return allowed	yes	no
Re-define any token key?	yes	no
Retain user keys from program to program?	yes	no

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Programs which let motor impaired, nonverbal people communicate with others using a computer, can be of great benefit. Below are versions of a menu-communicator for Apple, PET, and VIC computers.

Micros With The Handicapped

Developing A Communications Program: Part II

Susan Semancik and Marshall Curtis
Delmarva Computer Club

In our last column, we discussed the need for developing a program to help nonverbal, motor-impaired individuals in their communication needs. As the following outline shows, the second part of this series on construction of such a program will identify some of the considerations in the selection of a menu for the program:

I. Introduction (April issue of **COMPUTE!**)
  A. Need for communications program
  B. Outline of series
  C. Reasons for tutorial approach
II. Menu Setup (June issue of **COMPUTE!**)
  A. Type of Communication
    1. Word processing
    2. Computer programming
    3. Daily routine
    4. School classes
  B. Format of Message
    1. Considerations
      a. Output device for message
      b. Multiple input functions
      c. Maximum message length
      d. Screen size of computer display
    2. Calculations
      a. Number of screen lines for message
      b. Number of screen lines for menu
    3. Positioning
      a. Top of screen
      b. Bottom of screen
  C. Format of Menu
    1. Menu entries
      a. Sentences
      b. Words
      c. Characters
    2. Menu arrangement
      a. Row
      b. Column
      c. Block
    3. Menu spacing
      a. Number of blank rows and columns
      b. Number of entries per row or column
      c. Number of rows or columns per screen
  D. Display of Menu
    1. Static
      a. PET computer
      b. VIC computer
      c. Apple II computer
    2. Dynamic

There are many things to consider when developing a communications program. The most fundamental is the purpose for which communication is desired. Rather than develop one program to deal with all types of communication needs, it might be better to have separate programs dedicated to specific objectives – for instance, a program to do word processing functions with printer or modem output; or a program to communicate to a computer in a programming language such as BASIC, PASCAL, or machine language; or a program to communicate with others on a daily routine basis; or a program to use specific vocabularies for different school classes; etc. A list of communication needs compiled on an individual basis among nonverbal, motor-impaired persons would have many similar requirements, regardless of differences in computer equipment available or alternative input devices needed.

We will start with the development of a program to communicate with others on a daily basis, and will develop other types of programs as requests warrant them. Having decided on the type of communication, the next choice to consider is the format for communication: will the user be communicating by selecting from a menu of sentences, words, characters, or a combination of these? Must the physical line length of the computer's display screen be the deciding factor in this choice? Not necessarily. With the use of vertical and/or horizontal scrolling, screen sizes do not have to limit the length of menus or messages.

If enough computer memory or a disk is available, even multiple screens or "pages" of menus could be alternately displayed to increase the number of selections that can be made rapidly. If screen size is limited, a possible alternative might be to have a menu of sentences and/or words permanently displayed on a large poster rather than on the computer's screen. Then the user could access the poster's menu by a row/column or number selection method, with the choice being displayed on a printer, or even verbalized by a

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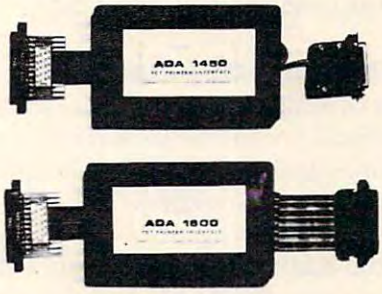

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A Versatile And Portable Program

In the series of articles we will be presenting on communications, we will be looking at some of the special features of three different computers and input devices we have available. This will mean that we will want the program we develop to be as versatile and portable as possible, and will try not to use features peculiar to a particular system if a more standard approach can be found. This will help those readers who want to develop a similar communications program for different systems. The three computers we will use have the following screen characteristics: 1) Commodore PET computer with 25 lines of 40 characters each; 2) Commodore VIC computer with 23 lines of 22 characters each; and 3) Apple II computer with 24 lines of 40 characters each.

Since this program will involve communicating with others on a daily basis, each user must make up an individual list of words involving his/her own routines. Start with a list of frequently used names of people, places, and articles, and of activities, actions, or descriptions most often associated with these words. Also, consider word endings if grammatical structure will be important in your messages, as well as punctuation, numbers, and special symbols. The alphabet should also be included so words can be formed that are not accessible from the menu.

Individualizing the menu will speed up the communication process. Not only can a message be formed faster with the computer's help, but the formation will not require the active involvement of the person with whom you want to communicate. The computer would be used in this case as a recorder of the message, so that there will be continuity of expression, and the message can be repeated without having to be reformed. Using the sound capability of most home computers, an audible signal could also be given when a message is ready for viewing.

For this demonstration program, we will choose a menu format that will include words and characters. If you want the entire menu to be visible at all times, then the computer's display screen characteristics will determine the size and structure of the menu. This type of menu will be called a static menu and will be shown first, since it is the easiest to create in a general fashion for any type of home computer. Later, we will investigate several types of dynamic menus, such as multiple menus and scrolling menus.

Next, decide on whether the message you form will be sent to an external device, and/or displayed on the computer's screen. If it will only be sent to an external device, such as a printer, then the entire screen can be used for the menu. If it will also be sent to the screen, then consider the maximum length necessary for your messages. To calculate the number of screen lines needed for the message area in a static menu, divide the maximum message length by the number of characters contained in the computer's screen width. Round up if any remainder exists, and/or add one to the result if you don't want words split at the right edge of the screen.

Also, decide if you will need several input functions and, if so, will they be performed by an alternative input device, or menu-driven from the screen. Input functions will be the topic of a later column, but they can include such things as erasing your last entry from the message, changing the selection speed for input, changing menus, changing output devices, or alternating between areas of the screen. If these functions are selected from the screen, then your communication's menu area will be smaller for a static menu.

We will assume in this demonstration that 160 characters will be the maximum message length to be displayed on the computer's screen. Also, we will reserve two lines of the screen for input functions, and will include an extra line in the message area to take care of words that would otherwise be split at the right edge of the screen. This means that our three computers would require 5, 9, and 5 lines, respectively, of the screen for the message area, and would have 18, 12, and 17 lines, respectively, remaining for the menu area.

Example 1: Commodore VIC Computer

```
160/22 =  8  lines for message
        +1  for no edge-splitting of words
         9  lines for message area
        +2  for input functions
23 - 11 = 12 lines for menu
```

The menu can be arranged in rows, columns, blocks, etc. Remember that the main consideration in the arrangement is how easy it will be to indicate and retrieve a selection. The row or column arrangements give sufficient structure to satisfy the selection consideration. For this demonstration, we will use a column arrangement, with an attempt made to set the words in columns simulating sentence structure, and with characters appearing in an end column.

Spacing between adjacent columns and rows will be a factor of the distance the user will be from the computer's screen, in conjunction with the character size displayable by the computer. If vision is also a problem for the user, can the computer's characters be displayed larger? Yes, but since that's a concern shared by many others who

may not need a communications program, we will address that problem as a separate issue in a later article.

For our demonstration program, we will assume one blank row between column entries, and one space between adjacent columns. The number of entries per column will be the quotient when you divide the number of screen lines for the menu by one more than the number of blank rows between column entries. This means that the PET, VIC, and Apple computers can have 9, 6, and 8 column entries, respectively, with the decisions made so far.

Example 2: Apple II Computer

17/2 = 8 entries per column

Since the width of each column will be determined by the largest word within it, group your list of words into sentence structure arrangement, and determine the number of columns that will form a static menu for your screen width. Sample menus follow for each of the three computers:

Example 3: Menu for the PET Computer:

```
DOCTOR I    IS   HAVE COME  SEE INGEDS
TEACHER YOU ARE HAS   BATH  EAT AOTFR
WILL    WE  GO  GOOD DRINK AND .ULHCP
```

Example 4: Menu for the VIC Computer:

```
DR.  IS   COLD   INGEDS12
I    AM   WHEN   AOTFR34
YOU  ARE  DRINK  .ULHCP56
MOM  EAT  WANT   ?MYWKB78
DAD  NO   TIME   ,VJQZX90
HOT  YES  SLEEP  ;$%()'+-
```

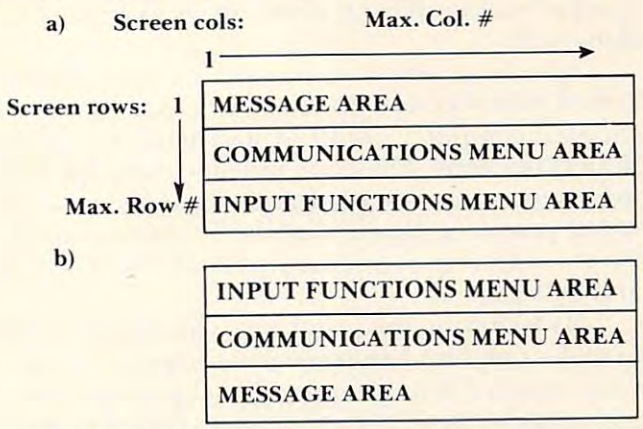
Example 5: Menu for the Apple Computer:

```
DOCTOR I    IS   HAVE COME  SEE INGEDS
TEACHER YOU ARE HAS   BATH  EAT AOTFR
WILL    WE  GO  GOOD DRINK AND .ULHCP
```

Once you've given the menu sufficient thought, then one of the last decisions to be made is the placement of the communications menu and the input functions menu, either at the top, bottom, or middle of the screen. And, if the message is also to be placed on the screen, where will it go? For our demonstration program, we will assume the communications menu will be in the middle of the screen, with the message area being either at the top or bottom of the screen. We are also assuming that the screen columns are numbered from left to right starting from one, and the screen rows are numbered from top to bottom starting from one.

We are finally at a point where we can start to consider the programming aspect of the project. It may seem that it took us a long time to get to this point, but if not enough attention is paid to the choosing and positioning of the elements of the menu, then no amount of programming tricks will make this be a functional tool for the motor impaired, nonverbal user.

Example 6: Display screen placement.



A Simple BASIC Program

We will start with a simple BASIC program that will enable you to view your individual menus on your computer's display screen. Programs 1 through 3 contain programs for our three computers to display the menus of Examples 3-5 by rows. The following is a list of variables that will be used in those programs:

W = the number of characters per screen width

RM = the number of rows in the communications menu

BR = the number of blank rows between column entries

CM = the number of columns in the communications menu

BC = the number of spaces between adjacent columns

RI = the number of rows in the input functions menu

SR = the starting screen row for the communications menu

SC = the starting screen position for the 1st column

S( ) = the starting column positions for each column

L( ) = the width of each column

P = the tabbing position for a column

Note that line 75 of the program is written for a TAB function which starts count at zero. If your computer's TAB function starts count at one, replace line 75 with P=S(C)+TP. In line 95, TP is used to adjust the TAB value for computers which can TAB beyond the screen width. For those that don't, this line can be adjusted or deleted. If your system doesn't allow variable dimensions as in statement 25, then set the DIM for each variable to

the value of W. Also, on other computers you may need to enclose all your data entries within quotation marks.

Line 65 is a check to be sure the menu as described will indeed fit on the screen. The programs for each computer use REM statements to explain important steps. These are only included for your information, and do not have to be typed in as part of the program. Notice that the lines that change for the different computers are lines 10, 20, 30, 95, and 140-195.

By following the programs, you should be able to make suitable changes to run the program on your system if it is different. Try changing your menu and some of the program parameters, such as number of columns, number of blank rows between column entries, starting row or column position on the screen. You should get a feel for how flexible this program can be.

In the next issue we'll cover the selection process in the program. Will selected entries be retrieved from DATA lists, subscripted variables, memory blocks, or from the screen itself? We will also need to look ahead at the possibility of a dynamic menu and how multiple menus can be entered without disturbing the flow of the program. Let us know if you have any special ideas you'd like developed in this program, and we'll try to incorporate them as we go along.

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Program 1.

```
5 REM EXAMPLE 8A) PET COMPUTER
10 PRINT CHR$(147);:REM CLEAR TEXT SCREEN
20 W=40:RM=9:BR=1:CM=7:BC=1:RI=2:SR=3:SC=1
   :REM SET MENU PARAMETERS
25 DIM S(CM),L(CM):S(1)=SC
30 DATA 7,4,4,4,5,3,6:REM COLUMN WIDTHS
35 IF CM=1 THEN 50
38 REM CALCULATE STARTING POSITION OF EACH
    COLUMN
40 FOR I=2 TO CM:READ L(I-1):S(I)=S(I-1)+L
   (I-1)+BC:NEXT I:READ L(CM)
50 IF SR=1 THEN 70
60 FOR X=1 TO SR-1:PRINT:NEXT X:REM POSITI
   ON CURSOR TO 1ST ROW OF MENU
65 LP=S(CM)+L(CM)-1:IF LP>W THEN 200
70 TP=0:FOR R=1 TO RM:FOR C=1 TO CM:READ M
   $
75 P=S(C)-1+TP
80 PRINT TAB(P);M$;:NEXT C
90 IF S(CM)+LEN(M$)-1<W THEN PRINT:GOTO 10
   0:REM WRAPAROUND ADVANCES A LINE
95 IF BR=0 THEN TP=TP+W:IF TP>87 THEN TP=0
   :REM UPDATE TAB IF LINE ENDS W/NO ~
   LF
100 IF BR=0 THEN 120
110 FOR B=1 TO BR:PRINT:NEXT B:REM SKIP BLA
   NK ROWS BETWN COLUMN ENTRIES
120 NEXT R
130 GOTO 130:REM DISPLAY ISN'T DISTURBED UN
   TIL USER BREAKS PROGRAM
139 REM ENTER DATA BY ROWS
140 DATA DOCTOR,I,IS,HAVE,COME,SEE,INGEDS
145 DATA TEACHER,YOU,ARE,HAS,BATH,EAT,"·AOT
   FR"
150 DATA WILL,WE,GO,GOOD,DRINK,AND,.ULHCP
155 DATA HOW,DO,CAN,BAD,SLEEP,IN,?MYWKB
160 DATA WHO,GET,AM,DID,BED,OUT,",VJQZX"
165 DATA WHAT,MOM,WANT,HOT,RADIO,TV,";$%()'
   "
170 DATA WHERE,DAD,TO,COLD,ROOM,YES,"!*/^=:
   "
175 DATA WHEN,JOHN,TIME,THE,FOOD,NO,-01234
180 DATA WHY,RICK,DAY,CALL,PLAY,AT,+56789
200 PRINT "MENU SIZE ERROR!":END
```

Program 2.

```
5 REM EXAMPLE 8B) VIC COMPUTER
10 PRINT CHR$(147);:REM CLEAR TEXT SCREEN
20 W=22:RM=6:BR=1:CM=4:BC=1:RI=2:SR=3:SC=1
   :REM SET MENU PARAMETERS
25 DIM S(CM),L(CM):S(1)=SC
30 DATA 3,3,5,8:REM COLUMN WIDTHS
35 IF CM=1 THEN 50
38 REM CALCULATE STARTING POSITION OF EACH
    COLUMN
40 FOR I=2 TO CM:READ L(I-1):S(I)=S(I-1)+L
   (I-1)+BC:NEXT I:READ L(CM)
50 IF SR=1 THEN 70
60 FOR X=1 TO SR-1:PRINT:NEXT X:REM POSITI
   ON CURSOR TO 1ST ROW OF MENU
65 LP=S(CM)+L(CM)-1:IF LP>W THEN 200
70 TP=0:FOR R=1 TO RM:FOR C=1 TO CM:READ M
   $
75 P=S(C)-1+TP
80 PRINT TAB(P);M$;:NEXT C
90 IF S(CM)+LEN(M$)-1<W THEN PRINT:GOTO 10
   0:REM WRAPAROUND ADVANCES A LINE
95 IF BR=0 THEN TP=TP+W:IF TP>87 THEN TP=0
   :REM UPDATE TAB IF LINE ENDS W/NO ~
   LF
100 IF BR=0 THEN 120
110 FOR B=1 TO BR:PRINT:NEXT B:REM SKIP BLA
   NK ROWS BETWN COLUMN ENTRIES
120 NEXT R
130 GOTO 130:REM DISPLAY ISN'T DISTURBED UN
   TIL USER BREAKS PROGRAM
139 REM ENTER DATA BY ROWS
140 DATA DR.,IS,COLD,INGEDS12
145 DATA I,AM,WHEN," AOTFR34"
150 DATA YOU,ARE,DRINK,.ULHCP56
155 DATA MOM,EAT,WANT,?MYWKB78
160 DATA DAD,NO,TIME,",VJQZX90"
165 DATA HOT,YES,SLEEP,";$%()'+-"
200 PRINT "MENU SIZE ERROR!":END
```

Program 3.

```
5 REM EXAMPLE 8C) APPLE II COMPUTER
10 TEXT : HOME : REM CLEAR TEXT SCREEN
20 W=40:RM=8:BR=1:CM=7:BC=1:RI=2:SR=3:SC=1
   :REM SET MENU PARAMETERS
25 DIM S(CM),L(CM):S(1)=SC
30 DATA 7,4,4,4,5,3,6:REM COLUMN WIDTHS
35 IF CM=1 THEN 50
38 REM CALCULATE STARTING POSITION OF EACH
    COLUMN
40 FOR I=2 TO CM:READ L(I-1):S(I)=S(I-1)+L
   (I-1)+BC:NEXT I:READ L(CM)
50 IF SR=1 THEN 70
60 FOR X=1 TO SR-1:PRINT:NEXT X:REM POSITI
   ON CURSOR TO 1ST ROW OF MENU
```