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on the keyboard will halt the printer at the end of the next printed line and display the same pause message. You'll also have the same options. I would suggest using the space bar or some key other than the C, R, or S characters to avoid possible problems.

The heart of the program is the M-R command to the disk unit that lets you read any address within the disk controller. All reads of the disk address space are done by the subroutine in lines 605 - 607. Line 605 converts the address (A) to the corresponding high (H) and low (L) bytes for the M-R command. Line 606 first issues the M-R command and then the GET#15 command to read the data from the address specified. The remainder of line 606 and the beginning of line 607 convert the data into the decimal value (V) of the byte.

Exploring The Controller

Now that we know how to use the program, what do we do with it? The first thing you'll probably want to look at is the interrupt vectors at the top of the ROMs. The NMI vector is at \$FFFA - \$FFFB, the RESTART vector is at \$FFFC - \$FFFD, and the IRQ vector is at \$FFFE - \$FFFF. The data in each pair of bytes will be the hex address of the start of the routine that processes the corresponding interrupt. Remember that the addresses will be in the standard 6502 format, low byte first, then high byte.

The RESTART vector is probably the most revealing pointer since this is where the disk controller starts executing instructions when the unit is first turned on. If you follow the instruction flow from there, you'll see the self-test procedures executed when the unit is turned on and the disk controller checks to see that everything is working properly. After these tests, the unit goes on to initialize various pointers and control flags and then waits for a command.

There's 2K of RAM from locations \$0000 - \$07FF plus 8K of ROM from locations \$C000 - \$FFFF. Additionally, there are two 6522 Versatile Interface Adapters (VIAs) based at locations \$1800 and \$1C00. If you do go peeking elsewhere, you may see "reflections" of various devices at other addresses due to the address decoding scheme within the disk controller.

For PET/CBM And VIC Users

Although written for the Commodore 64, this program can also be used on the older PET and CBM models to look into the 4040, 8050, and similar disk units. However, those units have a much more complex structure with two microprocessors and shared memory. You might want to refer to Jim Butterfield's article "Inside the 2040 Disk Drive" on page 94 of the January/February 1980 issue of COMPUTE! for more information.

For VIC-20 users, at least 8K memory expansion is required. You'll have to tinker with reducing the length of the displayed data to fit the 22-column screen. The hex dump can be trimmed to four bytes per line by simply changing the heading in line 1000 and the FOR-NEXT loop count in line 1010. The disassembly display is a little harder to trim, but you could eliminate the decimal address (line 330), separating spaces in the object (lines 350 and 370) and corresponding blanks for no object (SPC in lines 360 and 390), plus fix the heading (line 305).

Disk Explorer

```

90 PRINT"{CLR}{RVS} D I S K{3 SPACES}L O
   {SPACE}O K E R"
100 PRINT"{3 DOWN}INITIALIZING ....
105 OPEN15,8,15
110 DIM M$(255):{2 SPACES}H$="0123456789A
   BCDEF"
120 FOR X=0 TO 255: READ A$: IF A$="" TH
   EN A$="0*?"
130 A$=LEFT$(A$+ "{6 SPACES}.",6): M$(X)=A
   $: NEXT X
140 PRINT"{CLR}ENTER DECIMAL STARTING ADD
   RESS{DOWN}
150 PRINT"OR HEX ADDRESS PRECEDED BY '$'
   {DOWN}
160 INPUT A$: IF LEFT$(A$,1)="$" THEN 0
170 FOR X=1 TO LEN(A$): C$=MID$(A$,X,1):
   {SPACE}IF C$ < "0" OR C$ > "9" THEN 1
   40
180 NEXT X: A=INT(VAL(A$)/8)*8: GOTO 250
190 A=0: IF LEN(A$)<2 THEN 140
200 FOR X=2 TO LEN(A$): C$=MID$(A$,X,1):
   {SPACE}IF C$ < "0" THEN 140
210 IF C$<="9" THEN A=A*16+VAL(C$): GOTO
   {SPACE}240
220 IF C$<"A" OR C$>"F" THEN 140
230 A=A*16+ASC(C$)-55
240 NEXT X
250 INPUT"{DOWN}WANT PRINTED COPY (Y/N)
   {3 SPACES}N{3 LEFT}";C$
260 P=3:IF LEFT$(C$,1)="Y" THEN P=4
270 OPEN4,P
275 INPUT"{DOWN}HEX DUMP (H) OR DISASSEMB
   LY (D){3 SPACES}H{3 LEFT}";DM$
276 IF DM$<>"D" AND DM$<>"H" THEN 275
280 PRINT"{CLR}";: IF P=3 THEN 300
290 PRINT"DEPRESS ANY KEY TO HALT PRINTER
   ":PRINT#4
300 IF DM$="H" THEN 1000
302 IF DM$<>"D" THEN 300
305 PRINT#4,"{RVS} LOC-DEC/HEX{3 SPACES}O
   BJECT{3 SPACES}DISASSEMBLY{2 SPACES}
   ": PRINT#4
310 IF P=3 THEN FOR N=1 TO 20
320 IF A>65535 THEN A=A-65536
330 A$=STR$(A): L=LEN(A$): PRINT#4,""SPC(
   7-L);A$;" ";
340 Y=A:GOSUB 620: PRINT#4,"": ";
350 GOSUB 605: GOSUB 630: PRINT#4,"": ";:
   {2 SPACES}A=A+1:{2 SPACES}A$=M$(V)
355 IF A>65535 THEN A=A-65536
360 IF LEFT$(A$,1)="0" THEN PRINT#4,""SPC
   (7);MID$(A$,2,3): GOTO 540
370 GOSUB 605: GOSUB 630: PRINT#4,"": ";: A
   =A+1

```


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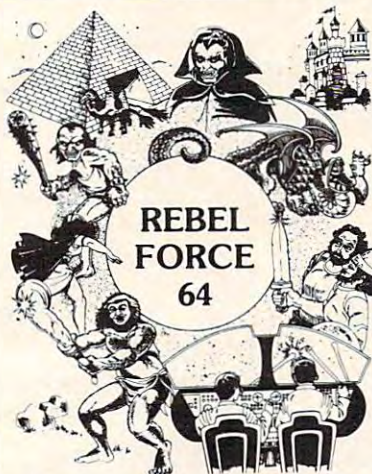


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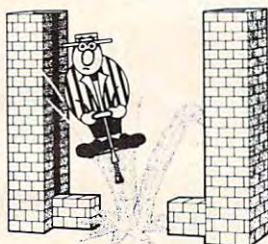
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```

380 IF LEFT$(A$,1)="2" THEN 470
390 PRINT#4,"SPC(4);MID$(A$,2,3);" ";: I
  F MID$(A$,5,1)<>"R" THEN 420
400 IF V>127 THEN V=V-256
410 Y=A+V: IF Y>65535 THEN Y=Y-65536
415 GOSUB 610: GOTO 530
420 IF MID$(A$,5,1)="#" THEN PRINT#4,"#$"
  ;: GOSUB 630: GOTO 530
430 IF MID$(A$,6,1)=")" THEN PRINT#4,"("
440 PRINT#4,"$";: GOSUB 630: IF MID$(A$,5
  ,1)=" " THEN 530
450 IF MID$(A$,5,2)="Y)" THEN PRINT#4,")
  ,Y": GOTO 540
460 PRINT#4,"";MID$(A$,5,2): GOTO 540
470 V1=V: GOSUB 605: GOSUB 630: A=A+1: PR
  INT#4,"{2 SPACES}";MID$(A$,2,3);" ";
475 IF A>65535 THEN A=A-65536
480 Y=V1+(256*V)
490 IF MID$(A$,5,1)=")" THEN PRINT#4,"("
  : GOSUB 610: PRINT#4,")": GOTO 540
500 GOSUB 610
510 IF MID$(A$,5,1)=" " THEN 530
520 PRINT#4,"";MID$(A$,5,1);
530 PRINT#4
540 IF P=3 THEN NEXT N: GOTO 560
550 GET C$: IF C$="" THEN 320
560 PRINT"{DOWN}{RVS}CONTINUE, RESTART, O
  R STOP (C,R,S) ?{2 SPACES}";
570 GET C$: IF C$="C" THEN 280
580 IF C$="R" THEN CLOSE 4: GOTO 140
590 IF C$<>"S" THEN 570
595 CLOSE15
600 PRINT#4: CLOSE 4: END
605 H=INT(A/256):L=A-(H*256)
606 PRINT#15,"M-R";CHR$(L);CHR$(H):GET#15
  ,AC$:IFAC$="" THEN V=0: RETURN
607 V=ASC(AC$): RETURN
610 PRINT#4,"$";
620 V=INT(Y/256): GOSUB 630: V=Y-(V*256)
630 H=INT(V/16): L=V-(H*16)
640 PRINT#4,MID$(H$,H+1,1);MID$(H$,L+1,1)
  ;:{2 SPACES}RETURN
650 DATA 0BRK,1ORAX),*,*,*,1ORA,1ASL,*
660 DATA 0PHP,1ORA#,0ASL,*,*,2ORA,2ASL,*
670 DATA 1BPLR,1ORAY),*,*,*,1ORAY,1ASLX,*
680 DATA 0CLC,2ORAY,*,*,*,2ORAX,2ASLX,*
690 DATA 2JSR,1ANDX),*,*,1BIT,1AND,1ROL,*
700 DATA 0PLP,1AND#,0ROL,*,2BIT,2AND,2ROL
  ,*
710 DATA 1BMIR,1ANDY),*,*,*,1ANDX,1ROLX,*
720 DATA 0SEC,2ANDY,*,*,*,2ANDX,2ROLX,*
730 DATA 0RTI,1EORX),*,*,*,1EOR,1LSR,*
740 DATA 0PHA,1EOR#,0LSR,*,2JMP,2EOR,2LSR
  ,*
750 DATA 1BVCR,1EORY),*,*,*,1EORX,1LSRX,*
760 DATA 0CLI,2EORY,*,*,*,2EORX,2LSRX,*
770 DATA 0RTS,1ADCX),*,*,*,1ADC,1ROR,*
780 DATA 0PLA,1ADC#,0ROR,*,2JMP,2ADC,2RO
  R,*
790 DATA 1BVSR,1ADCY),*,*,*,1ADCX,1RORX,*
800 DATA 0SEI,2ADCY,*,*,*,2ADCX,2RORX,*
810 DATA *,1STAX),*,*,*,1STY,1STA,1STX,*
820 DATA 0DEY,*,0TXA,*,2STY,2STA,2STX,0
830 DATA 1BCCR,1STAY),*,*,*,1STYX,1STAX,1ST
  XY,*
840 DATA 0TYA,2STAY,0TXS,*,*,2STAX,*,*
850 DATA 1LDY#,1LDAX),1LDX#,*,1LDY,1LDA,1
  LDX,*
860 DATA 0TAY,1LDA#,0TAX,*,2LDY,2LDA,2LDX
  ,*
870 DATA 1BCSR,1LDAY),*,*,*,1LDYX,1LDAX,1LD

```

```

XY,*
880 DATA 0CLV,2LDAY,0TSX,*,2LDYX,2LDAX,2L
  DX,*
890 DATA 1CPY#,1CMPX),*,*,1CPY,1CMP,1DEC,
  *
900 DATA 0INY,1CMP#,0DEX,*,2CPY,2CMP,2DEC
  ,*
910 DATA 1BNER,1CMPY),*,*,*,1CMPX,1DECX,*
920 DATA 0CLD,2CMPY,*,*,*,2CMPX,2DECX,*
930 DATA 1CPX#,1SBCX),*,*,1CPX,1SBC,1INC,
  *
940 DATA 0INX,1SBC#,0NOP,*,2CPX,2SBC,2INC
  ,*
950 DATA 1BEQR,1SBCY),*,*,*,1SBCX,1INCX,*
960 DATA 0SED,2SBCY,*,*,*,2SBCX,2INCX,*
1000 PRINT#4,"{RVS} LOC{3 SPACES}0
  {2 SPACES}1{2 SPACES}2{2 SPACES}3
  {2 SPACES}4{2 SPACES}5{2 SPACES}6
  {2 SPACES}7{2 SPACES}-ASCII-":PRINT
  #4:
1010 IF P=3 THEN FOR N=1 TO 16
1040 Y=A:GOSUB 620: PRINT#4," ";
1045 F$=" ": FOR X=1 TO 8
1047 IF A>65535 THEN A=A-65536
1050 GOSUB 605: GOSUB 630: PRINT#4," ";
1060 V=(V AND 127): IF V<32 OR V>95 THEN
  {SPACE}F$=F$+" ": GOTO 1080
1070 F$=F$+AC$
1080 A=A+1: IF A>65536 THEN A=A-65536
1085 NEXT X: PRINT#4,F$
1090 IF P=3 THEN NEXT N:GOTO 560
1100 GETC$:IFC$="" THEN 1020
1110 GOTO 560

```

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THE HIDDEN PITFALLS OF COMPUTER ARITHMETIC

Michael A. Covington

Computers sometimes give "false" results after performing calculations. This article discusses the way a computer handles numbers, describes the most common types of errors, and offers solutions.

Here is a simple — and surprising — BASIC program to try on your computer.

```
10 LET A = 0
20 LET A = A + 0.1
30 PRINT A
40 GO TO 20
```

You'd expect it to print the numbers, 0.1, 0.2, 0.3, 0.4, 0.5, 0.6, and so on until you stop it. But unless your computer is a TI-99 — which is different in a way we'll get to presently — you probably won't get what you're expecting. If you let the program run long enough, you'll get numbers that are just a bit off, such as 5.00001 or 4.99999 instead of 5. The margin of error may increase as the program runs, or it may rise for a while, then diminish, then go off in the other direction, then diminish to zero again, over and over.

The Computer's Approach To Numbers

What's going on? Well, you've just seen that numbers are not always what they seem inside a computer. We humans ordinarily write numbers in *base 10* notation — that is, there are ten different digits (0 through 9); and in a number like 1234.567, the successive digits represent thousands, hundreds, tens, ones, and, to the right of the point, tenths, hundredths, and thousandths. But numbers inside the computer are represented in *binary* (*base 2*) notation. In the binary system there are

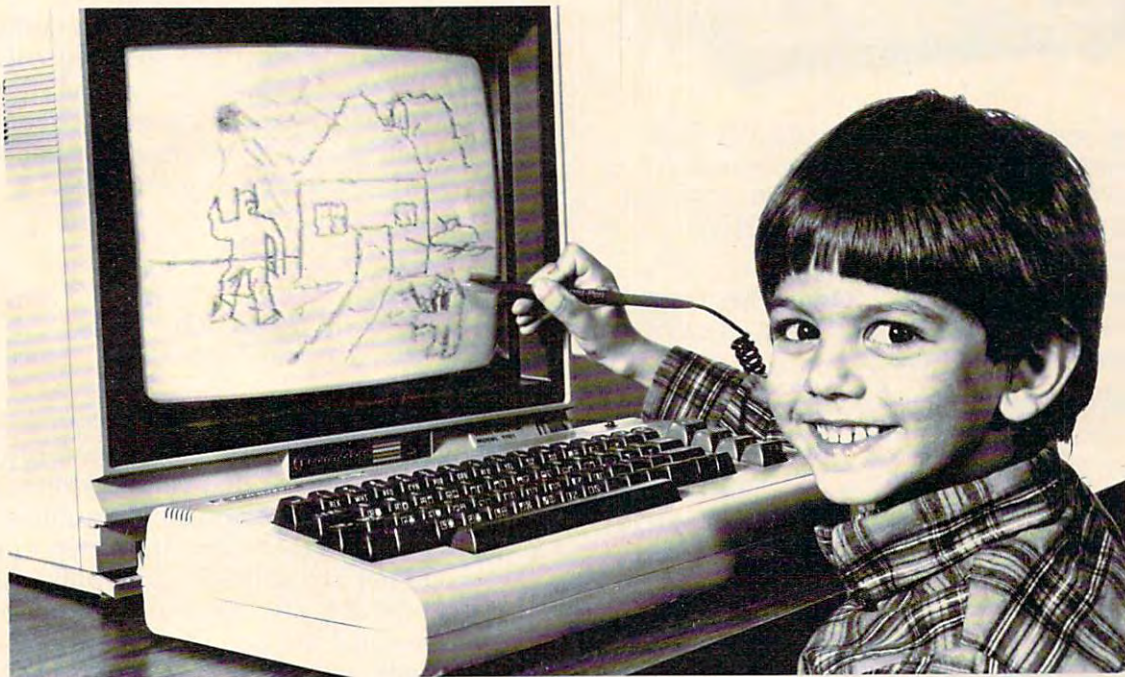
only two digits, 0 and 1, and the successive digits represent sixteens, eights, fours, twos, ones, and, to the right of the point, halves, quarters, eighths, sixteenths, and so on. Thus, for example, the decimal number 9.5 goes into binary as 1001.1 (one eight, no fours, no twos, one one, and one half). The place value associated with each digit is half that of the preceding one.

So far, so good. In binary, 2 becomes 10 (one two, no ones), 8 becomes 1000, 39.125 becomes 100111.001, one-sixteenth becomes 0.0001, and so on. But the binary system suffers from a problem that we're already familiar with from the decimal system — there are numbers which can't be represented using a finite number of digits.

Consider 1/3, for example. In decimal notation, 1/3 is approximately 0.3333. A better approximation is 0.3333333333. But a completely correct representation would require an infinitely long list of 3s — you can keep adding decimal places until your paper leaves the galaxy and still never quite get to 1/3. Not surprisingly, 1/3 isn't representable with a finite number of binary digits either.

What is surprising is that many numbers that give us no trouble in decimal notation aren't representable exactly in a finite number of binary digits. In fact, *most* decimal numbers can't be represented exactly in binary. Consider 0.1, for instance. There is no combination of halves, quarters, eighths, sixteenths, and such that exactly adds up to 0.1. If we had an infinite number of binary digits, we could represent 0.1 as 0.0001100110011001100110011..., with the 0011 repeating ad infinitum. But the computer has only a finite number of binary digits — usually about 24 — and hence it can't represent 0.1 exactly.

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That's why what gets added to A in the program above isn't exactly 0.1.

A Matter Of Precision

In order to be representable exactly in binary, a number has to be divisible by an integral power of 2, such as 16, 8, 4, 2, 1, 1/2, 1/4, 1/8, and so forth. Since 1 is in the list, all integers (numbers divisible by 1) go into binary without any problem, and you can trust your computer's representation of them. But numbers with decimal places almost always get distorted a bit within the computer.

This is of practical concern because if numbers aren't represented exactly within the computer, your program can't test for precise equality between numbers that were arrived at in different ways. Try this program, for example:

```
10 LET A = 0
20 LET A = A + 0.3
30 PRINT A
40 IF A = 3 THEN 60
50 GO TO 20
60 END
```

Add 0.3 to 0 ten times and you get 3, so the program will terminate after ten cycles through the loop, right? Wrong. What you're adding to A isn't 0.3 exactly, but some binary number very close to 0.3. Add that number to 0 ten times, and you won't get 3 exactly, though you'll be awfully close — probably so close that your computer will round the value to 3 before printing it out. Line 40, however, asks whether A is equal to exactly 3 (unlike 0.3, 3 is an integer and is representable exactly). And A will never hit 3 exactly — so line 40 never has any effect, and the program runs without end. (A few computers have rounding routines that will catch the discrepancy and make line 40 work the way you intended — but don't count on it.)

This leads to an important rule:

Never test whether two numbers are exactly equal unless both are integers and result from a process that can't possibly produce anything that isn't an integer. Instead, use "less-than-or-equal-to" or "greater-than-or-equal-to" (to catch numbers going over or under a limit), or test whether the difference between two numbers is sufficiently small.

For example, in the program above, we could change line 40 to:

```
40 IF A >= 3 THEN 60
```

This will make the program terminate when A reaches or exceeds 3. But that may not be quite what we want — we don't know whether our first attempt to get 3 will be a little low or a little high, and if it's a little low, the statement we've just formulated will not catch it. So we try this:

```
40 IF ABS(A-3) < 0.001 THEN 60
```

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Educational News

Orange Plus Educational News located at 23801 Calabasas Road/Suite 2050/Calabasas, CA 91302/(213) 999-5210

Legal Apple^{Type} Compatible

New Computer runs CP/M & Apple^{Type} Software

CALABASAS — Now instructors can teach Apple-type programs such as LOGO in one class and professional-style word processing in another without any hardware changes. Dual microprocessors (Z80-A & 6502, two computers in one case), with the radical new Orange Plus development the "EuroROM", allows the machine to read/write/work with Apple-type software as well as CP/M programs and access either CPU via the keyboard.

The **"ORANGE+TWO"**™ is a brand new direction in the evolution of the personal computer. ORANGEFORTH-83, a derivative of Fig-FORTH — a readily available public domain language, is resident in the ROM*. Also included is CP/M 3.0, Digital Research's latest CP/M version. There is also a built-in disk drive controller for two Apple-type drives, a cassette interface, joystick port, color graphics and ASCII keyboard with numeric keypad. For expert word processing, the keyboard features upper and lower case (lower case characters are true descenders) with auto repeat.

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SIRIUS

This will catch a number that comes within 0.001 of 3 in either direction.

We noted earlier that TI-99s were different. To be specific, the TI-99/4 is the only computer in widespread use (aside from certain large business computers) that does not convert its numbers into binary. Instead, it represents numbers internally with codes for decimal digits (or rather pairs of them, so that its actual base is 100 rather than 10). Hence, anything you type — with up to 14 significant digits — will be represented exactly. This is, in my opinion, one of the unsung virtues of the TI-99 — there are no errors of representation to worry about.

Calculations With Fields Of Various Lengths

Most home computers allow you the equivalent of about seven decimal digits of accuracy (sometimes rounded off to five or six digits for printing in order to conceal various slight errors). You get seven significant (nonzero) digits regardless of the position of the decimal point, so that, for example, 12345.67, 0.1234567, 12345670000, and 0.00001234567 are equally good. The computer keeps a separate record of where the decimal point goes, and it can be within or outside the string of digits that really count.

Seven digits are usually enough; after all, it's unlikely that you'll be doing calculations based on measurements that are accurate to better than one part in ten million, or dealing with eight-figure salaries, or anything like that. But problems can arise when you're calculating with numbers of widely differing sizes.

Suppose, for instance, you want to compute $0.000853 + 4256.3 - 4256.203$. First, the computer adds 4256.3 to 0.000853, giving 4256.300853. But this has too many digits, and the computer truncates it to 4256.300 (that is, 4256.3) — the addition of 0.000853 has had no effect at all. Then 4256.203 is subtracted, giving 0.097. But the correct answer is 0.097853. If you had performed the calculations in a different order, you would have the right answer: $4256.3 - 4256.203$ gives 0.097, and this added to 0.000853 gives 0.097853 without any problems. The rule here is:

Group your calculations so that, as far as possible, each addition works on numbers of nearly equal size, and operations on numbers of widely differing size are saved until last.

There really are no sure-fire rules about how to avoid numerical accuracy problems. It's often best to work through some typical cases with a hand calculator, looking at the size of the intermediate results and trying to imagine what could go wrong.



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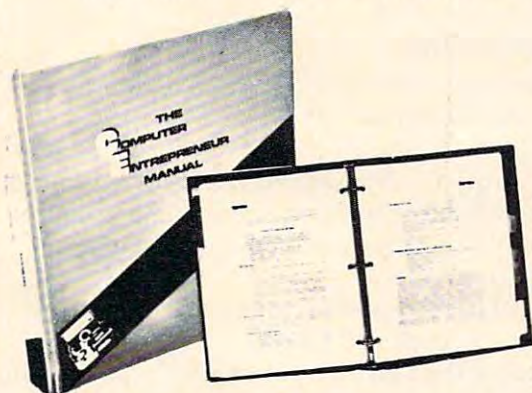
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CO1283

TI Word Processor

James D Baker

This menu-based word processor includes many of the basic features of commercial word processors: text creation, addition, deletion, modification, paragraphs, pagination, margin control, page overflow, and text centering. Written for the TI-99/4A with Extended BASIC, a disk drive and printer, the program runs with standard 16K memory.

Just like thousands of other TI users, I have added to my system since the original purchase of the computer and a TV set. After I had purchased Extended BASIC, the Peripheral Expansion Box, disk drive and controller, RS-232 interface, and a printer, my next choice was word processing capability. As the Texas Instruments package was not yet on the market and would also require 32K memory expansion, like all others available, I decided to write my own word processor.

This program runs with standard 16K memory because of *linked list* access for text files: Only one line of text is in memory at a time, with before and after indices pointing to the previous or following line of text.

With this design, addition and deletion of text lines are possible. The addition of a single line or an entire paragraph of text is possible and, therefore, updating text after the initial input process is easy.

Automatic pagination, margins (top, bottom, left, and right), page overflow, text centering, and text modification are also included features.

The program is written in two distinct sections: first, the create/edit section, then the print section. If additional features are added, it may be necessary to split the program into two separate programs in order to maintain the objective of minimal memory usage.

Let's look in detail at the program features.

Program Initialization

Upon initial execution of the program, the user will be asked for a filename (assumed on DSK1) where text is stored. The subroutine called in line 140 sets characters in lowercase.

Next, a screen menu is displayed with these options:

N — NEW DATA FILE
A — ADD TO END OF EXISTING FILE
C — CHANGE EXISTING FILE
P — PRINT FILE

New Data File

Upon selection of the first option, a header record is written to the opened disk file. This record is used to maintain a pointer to the last text record in the file. Initially, this record does not contain any meaningful information, but will be updated at the end of the program to contain the actual last record number.

Control is then passed to the routine for entering new text (lines 380 – 470). Original text is entered using the LINPUT statement, which limits the length of a single entry to 128 characters. However, this is not a severe limitation; the program will simply cause wraparound of the text from one record to the next. The computer will beep to remind you that you have exceeded the length of the input string, and you must then press ENTER to cause this record to be written to disk and begin entry of the next record. Also, note that during text entry all the standard control key operations are allowed, including cursor left or right, character delete or insert, erase, etc.

The pointers for previous and next record locations are then updated, and a check for one of the special control functions, /E/, is performed. This is used to indicate the end of text and must be entered as the last record of the text. If the record just entered is not the end marker (/E/), the program writes the text line to disk and returns for the next line of text.

When text entry is complete and the /E/ is entered, lines 490 – 510 update record 0 with the record number of the last record on file. Finally, the option of printing the text is offered. If you answer Y for yes, control is passed to the print routine (line 2400); otherwise the program ends.

COMPUTE!'s Programmer's Reference Guide to the TI-99/4A

Author: C. Regena
Price: \$14.95
On Sale: Now

Just about the best way to learn how to program a computer is to sit down with a patient friend who already knows how, and ask questions while you experiment with the computer. Owners of the popular Texas Instruments home computer will find that C. Regena is that kind of friend, and *Programmer's Reference Guide to the TI-99/4A* is that kind of book.

Regena carefully explains every BASIC command and function, and all the techniques needed to program TI graphics, sound, and speech. It's hard to think of a question that she doesn't answer simply and clearly, with hints about ways to write programs that do exactly what you want.

The book also provides dozens and dozens of programs, ranging from very short examples to full-length commercial-quality software. In effect, readers can look over Regena's shoulder as she goes through the programming process step by step, explaining what she's doing as she goes along. Not to mention the fact that the finished programs are valuable in their own right.

Even readers who are familiar with the computer will find this book valuable as a reference, where they can look up information they need and find the answers to particular questions.

Above all, *Programmer's Reference Guide to the TI-99/4A* is a book that lets readers use it however they like. You don't have to start at page one and read through, following someone else's plan for what you should learn first and what can wait until later. Instead, you can explore this book from any point of view, to solve almost any programming problem, and find the answer quickly and easily.

C. Regena is **COMPUTE!** Magazine's regular columnist on the TI-99/4A. She's an experienced and resourceful programmer. Like most of her readers, she taught herself how to program, and she hasn't forgotten what it's like to be a beginner, just starting out with the computer. And with *Programmer's Reference Guide*, TI users now have Regena to help them learn how to make their computer do exactly what they want it to do.

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Other special control functions are also included for editing. By entering /C/ as the first three characters of the text line, the print program will automatically center the text that follows on that line. By entering /P/ as the first three characters of a text line, the print program will automatically indent five spaces for a new paragraph. Also, by entering /N/ as the only three characters on a text line, the print program will automatically cause a top-of-page routine to be executed. These special control functions can be entered as upper- or lowercase letters.

Appending

When this second menu option is selected, control is passed to program line 600. This routine simply uses the pointer obtained from the first record on file to retrieve the last record on file (the /E/ record). Then the last actual text record is retrieved by using the previous record pointer from the /E/ record.

The last actual text record on file is then displayed, and control is passed to the routine used for original text entry.

Changing An Existing File

With this option, the program retrieves the first text record, using the pointer obtained from the first record on the file. This line of text and a change menu are then displayed:

1= NEXT LINE	5= ADD BEFORE
2= LAST LINE	6= ADD AFTER
3= FWD X LINES	7= CHANGE
4= BKW X LINES	8= DELETE
	9= QUIT

Next Line. This option displays the next text line. If selected, program execution is transferred to line 900. This routine first sets the number-of-records-forward counter to one. The loop in lines 940 – 980 follows the next record pointer through the file until the requested number of records forward has been read.

A check is made to insure that a read past the end of file does not occur. If this is attempted, the program displays the last line of text, a warning message, and returns to the main change menu. Upon completion of the loop, program control is returned to the main change menu.

It should be noted that the loop is not necessary in order to display the next line. However, it is also used to advance any number of records by using the third option discussed below.

Last Line. This option displays the previous line of text. The routine starting at line 1000 provides for stepping backward through the text file. This routine is the same as the prior routine except that the previous record pointer is used in order to proceed to the previous record.

FWD X Lines and BKW X Lines. Both of these

options (3 and 4) are handled in the routine beginning at line 1100. The program asks for the number of lines to be read either forward or backward. This value is then placed in the appropriate counter, and control is transferred to the Next Line or Last Line routine.

Add Before and Add After. These options (5 and 6), initially handled by the same routine (at line 1100), allow for adding text, the first before the current line, and the second after. The program displays the current record and, based on which type of add was requested, prompts you to add before or after.

The new line of text is then entered and the record pointers from the current record are saved. The /E/ is retrieved in order to determine the next available location in the file to store a record (next record pointer). This value is saved, and then the /E/ record is rewritten with the next record pointer incremented. Based on the type of add being done, control is transferred to the appropriate routine.

If you selected Add Before (option 5), control is passed to line 1350.

If you selected Add After (option 6), control is passed to line 1450.

Control is then transferred to line 1430 and processing continues as discussed above.

Change. This option allows you to change an existing line of text. The routine for this option begins at line 1540. The text line is broken into 14 lines of "equal" length. Using the DISPLAY AT and ACCEPT AT statements allows the setting of default values for each of the subtext lines to their initial string value. This eliminates the necessity of retyping the entire line to make a minor correction.

The length of each of the subtext lines is calculated and the first 13 lines are displayed. Note that a special character is added to the end of each line. This is done so a space is not lost at the end of the subtext line.

Line 1650 determines if there is any text remaining for the fourteenth line. This is necessary to avoid an error if the string happens to be less than 13 times the rounded length of a single subtext line length. The fourteenth line is then displayed in preparation for change.

The 14 lines are then "looped" through, allowing any changes desired. Note that the maximum length of any subtext line is limited to 26 characters and that if the special end character is accidentally deleted, the program will restore this character. The length of the new text line is recalculated since this length could now exceed the maximum string length permitted by the computer.

After the text has been changed, the new text length is checked to see if it exceeds 225 characters. If the length is less than 226 characters, the text line is reconstructed and control is transferred to

line 2050.

If the length of the new text line exceeds 225 characters, a menu offering two choices is displayed: either update as modified and create a new record on disk or reupdate the line. If the reupdate choice is selected, control is transferred to the beginning of the change routine with no changes made.

If the choice is made to update and create a new record, lines 1900 – 1940 establish two new text strings consisting of the first seven and last seven subtext lines respectively. The current record being changed is then replaced on disk by the first new text string created. The second new text string is then added to the file using the Add After routine. Note that the return switch has been set in line 1950 causing control to return to this routine after the add is completed.

The first of the new records is retrieved, and control is returned to display this as the current record and display the main change menu.

If the change process did not cause a new record to be added, lines 2050 – 2130 display the changed text and offer three choices: perform more updates, update the record as displayed, or exit with no updating.

Delete. The routine for this option, which allows you to delete a line of text, begins at line 2180. You will be asked for confirmation before the delete is executed. If the choice is made not to delete the line, control is passed back to line 780 where the current line is redisplayed and the main menu choices are available.

If you choose to delete the line, the previous and next record pointers from this "to be deleted" record are saved. The previous record is then read and updated with the next record pointer from the deleted record. The record after the deleted record is then read and updated with the previous record pointer from the deleted record. Note that the record just deleted is only deleted from the standpoint that the record pointers no longer allow access to the record.

A check is then made to insure that this delete has not caused all text to be deleted. If this is the case, the program displays a message to that effect and terminates. Otherwise, if a record still exists before the deleted record, control is passed to line 1000 and the previous record is displayed. If the record prior to the deleted record is the header record, control is passed to line 900, and the record following the deleted record is displayed.

Print File

The print routine begins at line 2400. Lines 2480 – 2540 establish the default values for top margin (TM), bottom margin (BM), left margin (LM), page length (PL), lines per page (LPP), and

maximum line length (MAXWID). Print control information is then requested, including mode of print (draft or final), spacing (single or double), and optional page numbering.

The input file is then "restored" to restart from the first record on file, and the printer output file is opened. Note that the parallel port is used in this program. If you are using the serial port for your printer, the OPEN statement in line 2730 will require appropriate changes.

The first record on file is read to retrieve the next record pointer for the first text record. The main print "loop" begins at line 2820 where the next text record is read using the next record pointer from the previous record.

If draft printing was requested, control is passed to that routine (line 2880). If the current record is a forced new page request (/N/), the subroutine at line 3900 causes a page eject and the top margin to be printed. Control is then returned to the main print loop.

Line 2850 passes control to the ending routine if this is the last text record. Otherwise, control is passed to the print final routine (line 2980).

Print Draft. This routine (lines 2870 – 2930) simply prints the lines of text in sequence exactly as entered. This includes printing any special print commands, but does not effect these commands. This is useful if you want to see what was entered for verification purposes and do not want pagination, etc. This print mode is also faster than final printing as the special print commands are not executed.

Print Final. This routine begins at line 2980 and prints as much text as will fit on the remainder of the print line, then prints character by character until a space is encountered.

The Print Final routine first checks for any special print commands. If a blank line, centered line, or new paragraph is requested, control is passed to the appropriate routine. If the last character on the text line is a period, two spaces are added to the end of the line to insure proper spacing.

The centering routine begins at line 3550 by printing any unfinished print line and checking for overflow. The length of the text to be centered (excluding the centering command) and the number of spaces required to center the text is then calculated. The line is then printed and control is passed to read the next record.

The routine to print a blank line begins at line 3700. This routine simply prints the preceding line, a blank line, checks for overflow and returns to read the next record.

The routines for top and bottom margins begin at line 3800 and simply loop for the necessary number of blank lines. Page numbering is handled on line 3940.

Lowercase Definition

Finally, the DATA statements in lines 3980 - 4240 represent lowercase letters. These values are assigned according to standard lowercase ASCII characters and are read using the loop in lines 4250 - 4290.

If you'd rather not type in the program, send \$3, a SASE, and a blank disk to:

James D. Baker
1562 SW Cynthia St.
Palm Bay, FL 32905

TI Word Processor

```
100 REM WORD PROCESSING
110 REM ENTRY/UPDATE PROGRAM
120 REM EXTENDED BASIC REQUIRED
130 DIM A$(14)
140 GOSUB 4250
150 CALL CLEAR
160 DISPLAY AT(10,7):"WORD PROCESSING"
170 DISPLAY AT(11,3):"- ENTRY/UPDATE PROGRAM -"
180 INPUT "FILENAME -DSK1.":F$
190 DISPLAY AT(6,8)ERASE ALL:"SELECT OPTION"
200 DISPLAY AT(9,6):"N - NEW DATA FILE"
210 DISPLAY AT(11,6):"A - ADD TO END OF"
220 DISPLAY AT(12,10):"EXISTING FILE"
230 DISPLAY AT(14,6):"C - CHANGE EXISTING"
240 DISPLAY AT(15,10):"FILE"
250 DISPLAY AT(17,6):"P - PRINT FILE"
260 DISPLAY AT(20,10):"CHOICE"
270 ACCEPT AT(20,17)BEEP VALIDATE("NACP"):C$
280 IF LEN(C$)=0 THEN 260
290 OPEN #1:"DSK1."&F$,RELATIVE,INTERNAL,UPDATE,FIXED 250
300 IF C$="P" THEN 2410
310 IF C$="N" THEN 320 ELSE 340
320 PRINT #1,REC 0:"EOF=";0;1
330 NXTREC=1 :: GOTO 400
340 RECNO=0
350 INPUT #1,REC RECNO:A$,EOFREC,NXTREC
360 IF C$="A" THEN 600 ELSE 670
370 REM
380 REM NEW ROUTINE
390 REM
400 CALL CLEAR
410 LINPUI A$
420 LSTREC=CURREC
430 CURREC=NXTREC
440 NXTREC=NXTREC+1
450 IF SEG$(A$,1,3)="/"E/" OR SEG$(A$,1,3)="/"e/" THEN PRINT #1,REC CURREC:A$;LSTREC:NXTREC :: EOFREC=CURREC :: GOTO 490
460 PRINT #1,REC CURREC:A$;LSTREC,NXTREC
470 GOTO 410
480 REM UPDATE HEADER
```

```
490 RECNO=0
500 INPUT #1,REC RECNO:A$,HRECNO,NXTREC
510 PRINT #1,REC RECNO:A$,EOFREC,NXTREC
520 DISPLAY AT(12,1)ERASE ALL:"DO YOU WANT TO PRINT THE"
530 DISPLAY AT(13,1):"REPORT NOW - Y/N"
540 ACCEPT AT(13,18)BEEP SIZE(1)VALIDATE("YNyn"):P$
550 IF P$="Y" OR P$="y" THEN 2410
560 CLOSE #1
570 END
580 REM
590 REM ADD ROUTINE
600 REM
610 INPUT #1,REC EOFREC:A$,CURREC,NXTREC
620 INPUT #1,REC CURREC:A$,LSTREC,DUDDY
630 CALL CLEAR
640 DISPLAY AT(10,1):"LAST RECORD ON FILE IS:"
650 DISPLAY AT(12,1):A$
660 LINPUI A$ :: LSTREC=CURREC :: CURREC=EOFREC :: GOTO 450
670 REM
680 REM UPDATE ROUTINE
690 REM
700 CALL CLEAR
710 RECNO=NXTREC
720 INPUT #1,REC RECNO:A$,LSTREC,NXTREC
730 DISPLAY AT(2,1):"CURRENT LINE"
740 FOR I=4 TO 13
750 DISPLAY AT(I,1):" "
760 NEXT I
770 DISPLAY AT(4,1):A$
780 DISPLAY AT(14,1):"SELECT CHOICE:"
790 DISPLAY AT(16,1):"1=NEXT LINE {4 SPACES}5=ADD BEFORE"
800 DISPLAY AT(17,1):"2=LAST LINE {4 SPACES}6=ADD AFTER"
810 DISPLAY AT(18,1):"3=FWD X LINES 7=CHANGE"
820 DISPLAY AT(19,1):"4=BKW X LINES 8=DELETE"
830 DISPLAY AT(20,16):"9=QUIT"
840 DISPLAY AT(22,1):"YOUR CHOICE:"
850 ACCEPT AT(22,13)BEEP VALIDATE("123456789"):C$
860 DISPLAY AT(24,1):" "
870 IF LEN(C$)=0 THEN 840
880 C=VAL(C$)
890 ON C GOTO 900,1000,1100,1100,1180,1180,1540,2180,490
900 REM
910 REM DISPLAY NEXT
920 REM
930 NBRFWD=1
940 FOR I=1 TO NBRFWD
950 IF NXTREC=EOFREC THEN DISPLAY AT(24,1):"LINE DOES NOT EXIST" :: DISPLAY AT(2,1):"LAST LINE OF TEXT" :: GOTO 740
960 RECNO=NXTREC
970 INPUT #1,REC RECNO:A$,LSTREC,NXTREC
980 NEXT I
```



```

990 GOTO 730
1000 REM
1010 REM DISPLAY LAST
1020 REM
1030 NBRBACK=1
1040 FOR I=1 TO NBRBACK
1050 IF LSTREC=0 THEN DISPLAY AT(24,1):"LINE DOES NOT EXIST" :: DISPLAY AT(2,1):"FIRST LINE OF TEXT" :: GOTO 740
1060 RECNO=LSTREC
1070 INPUT #1,REC RECNO:A$,LSTREC,NXTREC
1080 NEXT I
1090 GOTO 730
1100 REM
1110 REM FOWARD/BACK X LINES
1120 REM
1130 DISPLAY AT(22,16):"NBR LINES"
1140 ACCEPT AT(22,26)BEEP:NBRLNS
1150 IF C=3 THEN NBRFWD=NBRLNS :: GOTO 940
1160 NBRBACK=NBRLNS
1170 GOTO 1040
1180 REM
1190 REM ADD BEFORE/AFTER
1200 REM
1210 CALL CLEAR
1220 IF C=6 THEN PRINT "ADD NEW LINE AFTER:" ELSE PRINT "ADD NEW LINE BEFORE:"
1230 PRINT
1240 PRINT A$
1250 PRINT
1260 PRINT "ENTER NEW LINE" :: ::
1270 LINPUT AN$
1280 HREC=RECNO
1290 HLST=LSTREC
1300 HNXT=NXTREC
1310 INPUT #1,REC EOFREC:A$,LSTREC,ADDREC
1320 HADD=ADDREC
1330 PRINT #1,REC EOFREC:A$,LSTREC,ADDREC+1
1340 IF C=6 OR RETSW=1 THEN 1450
1350 REM
1360 REM ADD BEFORE
1370 REM
1380 PRINT #1,REC HADD:AN$,HLST,HREC
1390 INPUT #1,REC HLST:A$,LSTREC,NXTREC
1400 PRINT #1,REC HLST:A$,LSTREC,HADD
1410 INPUT #1,REC HREC:A$,LSTREC,NXTREC
1420 PRINT #1,REC HREC:A$,HADD,NXTREC
1430 NXTREC=HADD
1440 IF RETSW=1 THEN 2010 ELSE GOTO 700
1450 REM
1460 REM ADD AFTER
1470 REM
1480 PRINT #1,REC HADD:AN$,HREC,HNXT
1490 INPUT #1,REC HREC:A$,LSTREC,NXTREC
1500 PRINT #1,REC HREC:A$,LSTREC,HADD
1510 INPUT #1,REC HNXT:A$,LSTREC,NXTREC
1520 PRINT #1,REC HNXT:A$,HADD,NXTREC
1530 GOTO 1430
1540 REM
1550 REM CHANGE
1560 REM
1570 CALL CLEAR
1580 LENA1=INT(LEN(A$)/14)+1
1590 FOR I=1 TO 13
1600 A1$(I)=SEG$(A$,LENA1*(I-1)+1,LENA1)&"~"
1610 DISPLAY AT(I,1):"["
1620 DISPLAY AT(I,2):A1$(I)
1630 DISPLAY AT(I,28):"]"
1640 NEXT I
1650 IF LEN(A$)<=13*LENA1 THEN A1$(14)="~" :: GOTO 1670
1660 A1$(14)=SEG$(A$,LENA1*13+1,LEN(A$)-LENA1*13)&"~"
1670 DISPLAY AT(14,1):"["
1680 DISPLAY AT(14,2):A1$(14)
1690 DISPLAY AT(14,28):"]"
1700 LENA=0
1710 FOR I=1 TO 14
1720 ACCEPT AT(I,2)BEEP SIZE(-26):A1$(I)
1730 IF LEN(A1$(I))=0 THEN A1$(I)="~" ELSE IF SEG$(A1$(I),LEN(A1$(I)),1)<>"~" THEN A1$(I)=A1$(I)&"~"
1740 LENA=LENA+(LEN(A1$(I))-1)
1750 NEXT I
1760 IF LENA>225 THEN 1820
1770 A$=""
1780 FOR I=1 TO 14
1790 A$=A$&SEG$(A1$(I),1,POS(A1$(I),"~",1)-1)
1800 NEXT I
1810 GOTO 2050
1820 DISPLAY AT(16,1):"NEW LINE TOO LONG"
1830 DISPLAY AT(18,1):"SELECT CHOICE:"
1840 DISPLAY AT(19,1):"1=UPDATE/CREATE NEW LINE"
1850 DISPLAY AT(20,1):"2=RE-UPDATE"
1860 DISPLAY AT(22,1):"YOUR CHOICE"
1870 ACCEPT AT(22,13)BEEP VALIDATE("12"):C$
1880 IF LEN(C$)=0 THEN 1860
1890 IF C$="2" THEN 1540
1900 A2$="" :: A3$=""
1910 FOR I=1 TO 7
1920 A2$=A2$&SEG$(A1$(I),1,POS(A1$(I),"~",1)-1)
1930 A3$=A3$&SEG$(A1$(I+7),1,POS(A1$(I+7),"~",1)-1)
1940 NEXT I
1950 RETSW=1
1960 HLDCUR=RECNO
1970 A$=A2$
1980 PRINT #1,REC RECNO:A$,LSTREC,NXTREC
1990 AN$=A3$
2000 GOTO 1280
2010 INPUT #1,REC HLDCUR:A$,LSTREC,NXTREC
2020 RETSW=0
2030 CALL CLEAR
2040 GOTO 720

```



```

2050 CALL CLEAR
2060 DISPLAY AT(2,1):"CURRENT LINE"
2070 DISPLAY AT(4,1):A$
2080 DISPLAY AT(14,1):"SELECT CHOICE:"
2090 DISPLAY AT(16,1):"1=MORE UPDATES"
2100 DISPLAY AT(17,1):"2=UPDATE AS IS"
2110 DISPLAY AT(18,1):"3=EXIT-NO UPDATE"
2120 DISPLAY AT(22,1):"YOUR CHOICE:"
2130 ACCEPT AT(22,13)BEEP VALIDATE("123"):C$
2140 IF LEN(C$)=0 THEN 2080
2150 ON VAL(C$)GOTO 1540,2160,720
2160 PRINT #1,REC RECNO:A$,LSTREC,NXTREC
2170 GOTO 720
2180 REM
2190 REM DELETE LINE
2200 REM
2210 DISPLAY AT(24,1):"CONFIRM DELETE - Y/N"
2220 ACCEPT AT(24,22)BEEP VALIDATE("YyNn"):D$
2230 IF D$="N" OR D$="n" THEN DISPLAY AT(24,1):"LINE NOT DELETED"
      :: GOTO 780
2240 HLST=LSTREC
2250 HNXT=NXTREC
2260 INPUT #1,REC HLST:A$,LSTREC,NXTREC
2270 PRINT #1,REC HLST:A$,LSTREC,HNXT
2280 INPUT #1,REC HNXT:A$,LSTREC,NXTREC
2290 PRINT #1,REC HNXT:A$,HLST,NXTREC
2300 LSTREC=HLST
2310 NXTREC=HNXT
2320 DISPLAY AT(24,1):" "
2330 IF LSTREC>0 THEN GOTO 1000
2340 IF NXTREC=EOFREC THEN 2350 ELSE 900
2350 CALL CLEAR
2360 PRINT "TEXT NO LONGER EXISTS"
2370 PRINT
2380 CLOSE #1
2390 END
2400 REM
2410 REM WORD PROCESSING
2420 REM PRINT PROGRAM
2430 REM
2440 CALL CLEAR
2450 REM
2460 REM SET-UP DEFAULTS
2470 REM
2480 TM=6
2490 BM=6
2500 LM=1
2510 PL=66
2520 LC=0
2530 LPP=PL-BM
2540 MAXWID=68
2550 DISPLAY AT(10,7):"WORD PROCESSING"
2560 DISPLAY AT(11,6):"- PRINT PROGRAM -"
2570 DISPLAY AT(18,1):"FILENAME - DSK1.":F$
2580 DISPLAY AT(20,1):"PRINT MODE - D/F"
2590 DISPLAY AT(22,1):"SPACING - S/D"
2600 DISPLAY AT(24,1):"PAGE NUMBER (Y/N)"
2610 ACCEPT AT(20,20)SIZE(1)BEEP VALIDATE("DFdf"):M$
2620 IF LEN(M$)=0 THEN 2610
2630 IF M$="d" THEN M$="D"
2640 IF M$="f" THEN M$="F"
2650 ACCEPT AT(22,20)SIZE(1)BEEP VALIDATE("SDsd"):SPG$
2660 IF LEN(SPG$)=0 THEN 2650
2670 IF SPG$="s" THEN SPG$="S"
2680 IF SPG$="d" THEN SPG$="D"
2690 ACCEPT AT(24,20)SIZE(1)BEEP VALIDATE("YNyn"):PGNO$
2700 IF LEN(PGNO$)=0 THEN 2690
2710 IF PGNO$="y" THEN PGNO$="Y"
2720 RESTORE #1
2730 OPEN #2:"PIO"
2740 GOSUB 3800
2750 REM
2760 REM READ INITIAL RECORD
2770 REM
2780 INPUT #1:A$,LSTREC,NXTREC
2790 REM
2800 REM READ INPUT FILE
2810 REM
2820 INPUT #1,REC NXTREC:A$,LSTREC,NXTREC
2830 IF M$="D" THEN 2850
2840 IF SEG$(A$,1,3)="/N/" OR SEG$(A$,1,3)="/n/" THEN PRINT #2 :: LC=LC+1 :: GOSUB 3900 :: GOTO 2800
2850 IF SEG$(A$,1,3)="/E/" OR SEG$(A$,1,3)="/e/" THEN 2940
2860 IF M$="F" THEN 2980
2870 REM
2880 REM PRINT DRAFT
2890 REM
2900 PRINT #2:A$
2910 LC=LC+1
2920 IF LC=LPP THEN GOSUB 3900
2930 GOTO 2800
2940 PRINT #2
2950 GOSUB 3910
2960 CLOSE #1 :: CLOSE #2
2970 END
2980 REM
2990 REM PRINT FINAL
3000 REM
3010 IF LEN(A$)=0 THEN 3690
3020 IF SEG$(A$,LEN(A$),1)=". " THEN A$=A$&" "
3030 IF SEG$(A$,1,3)="/P/" OR SEG$(A$,1,3)="/p/" THEN 3140
3040 IF SEG$(A$,1,3)="/C/" OR SEG$(A$,1,3)="/c/" THEN 3540
3050 IF PC+LEN(A$)<=MAXWID THEN 3110
3060 NPOS=MAXWID-PC
3070 STRT=1
3080 INIT=NPOS+1
3090 IF INIT<1 THEN INIT=1
3100 GOTO 3300
3110 PRINT #2:A$;
3120 PC=PC+LEN(A$)

```



```

3130 GOTO 2800
3140 REM
3150 REM **NEW PARAGRAPH**
3160 REM
3170 IF PC>LM THEN PRINT #2 :: LC=L
C+1 :: PRINT #2:RPT$(" ",LM);
3180 IF SPG$="D" AND PC>LM THEN PRI
NT #2 :: LC=LC+1 :: PRINT #2:R
PT$(" ",LM);
3190 PC=LM
3200 IF LC>=LPP THEN GOSUB 3900
3210 PRINT #2:"{5 SPACES}";
3220 IF LEN(A$)+LM+2>MAXWID THEN 32
60
3230 PRINT #2:SEG$(A$,4,LEN(A$)-3);
3240 PC=LEN(A$)+2+LM
3250 GOTO 2800
3260 NPOS=MAXWID-5-LM
3270 STRT=4
3280 INIT=NPOS+4
3290 REM
3300 REM **PRINT PARTIAL LINE**
3310 REM
3320 IF PC>MAXWID THEN 3380
3330 PRINT #2:SEG$(A$,STRT,NPOS);
3340 PC=MAXWID
3350 REM
3360 REM **PARSE & PRINT**
3370 REM
3380 FOR I=INIT TO LEN(A$)
3390 PC=PC+1
3400 A2$=SEG$(A$,I,1)
3410 IF PC=1+LM AND A2$=" " THEN PC
=LM :: GOTO 3440
3420 IF A2$=" " THEN 3460
3430 PRINT #2:A2$;
3440 NEXT I
3450 GOTO 2800
3460 INIT=I :: PRINT #2 :: LC=LC+1
:: PRINT #2:RPT$(" ",LM);
3470 IF SPG$="D" THEN PRINT #2 :: L
C=LC+1 :: PRINT #2:RPT$(" ",LM
);
3480 IF LC>=LPP THEN GOSUB 3900
3490 PC=LM
3500 IF INIT=LEN(A$) THEN 2800
3510 IF SEG$(A$,INIT,1)=" " THEN IN
IT=INIT+1 :: GOTO 3500
3520 A$=SEG$(A$,INIT,LEN(A$)-INIT+1
)
3530 GOTO 3050
3540 REM
3550 REM CENTERING ROUTINE
3560 REM
3570 IF PC>LM THEN PRINT #2 :: LC=L
C+1 :: PRINT #2:RPT$(" ",LM);
3580 IF PC>LM AND SPG$="D" THEN PRI
NT #2 :: LC=LC+1 :: PRINT #2:R
PT$(" ",LM);
3590 PC=LM
3600 IF LC>=LPP THEN GOSUB 3900
3610 CLEN=LEN(A$)-3
3620 SP=INT((MAXWID-LM-CLEN)/2)
3630 PRINT #2:RPT$(" ",SP+LM);
3640 PRINT #2:SEG$(A$,4,LEN(A$))
3650 LC=LC+1 :: PRINT #2:RPT$(" ",L
M);
3660 IF SPG$="D" THEN PRINT #2 :: L
C=LC+1 :: PRINT #2:RPT$(" ",LM
);
3670 IF LC>=LPP THEN GOSUB 3900

```

```

3680 GOTO 2800
3690 REM
3700 REM PRINT BLANK LINE
3710 REM
3720 IF PC=LM THEN 3750
3730 PRINT #2 :: LC=LC+1
3740 IF SPG$="D" THEN PRINT #2 :: L
C=LC+1
3750 PRINT #2 :: LC=LC+1 :: PRINT #
2:RPT$(" ",LM);
3760 IF SPG$="D" THEN PRINT #2 :: L
C=LC+1 :: PRINT #2:RPT$(" ",LM
);
3770 IF LC>=LPP THEN GOSUB 3900
3780 PC=LM
3790 GOTO 2800
3800 REM
3810 REM PRINT TOP MARGIN
3820 REM
3830 FOR LC=1 TO TM
3840 PRINT #2
3850 NEXT LC
3860 LC=TM
3870 PRINT #2:RPT$(" ",LM);
3880 PC=LM
3890 RETURN
3900 REM
3910 REM PRINT BOTTOM & TOP MARGINS
3920 REM
3930 FOR LCT=LC+1 TO PL
3940 IF PGNO$="Y" AND LCT=PL-3 THEN
PGNO=PGNO+1 :: PRINT #2:RPT$(
" ",38);"PAGE ";PGNO ELSE PRIN
T #2
3950 NEXT LCT
3960 GOSUB 3800
3970 RETURN
3980 REM RE-DEFINE LOWER CASE CHARA
CTERS
3990 DATA 00000038043C443C
4000 DATA 0040407844444478
4010 DATA 0000003C4040403C
4020 DATA 0004043C4444443C
4030 DATA 000000384478403C
4040 DATA 0018242020702020
4050 DATA 0000304838082810
4060 DATA 0040404078444444
4070 DATA 0010001010101010
4080 DATA 0004000404042418
4090 DATA 0040485060504848
4100 DATA 0010101010101010
4110 DATA 0000002854444444
4120 DATA 0000007844444444
4130 DATA 00000038444444438
4140 DATA 0000704870404040
4150 DATA 00001C241C040404
4160 DATA 0000005864404040
4170 DATA 0000003C40380478
4180 DATA 0000207020202418
4190 DATA 0000004444444438
4200 DATA 0000004444442810
4210 DATA 0000004444546C44
4220 DATA 0000004428102844
4230 DATA 0000442418102040
4240 DATA 0000007C0810207C
4250 FOR I=97 TO 122
4260 READ A$
4270 CALL CHAR(I,A$)
4280 NEXT I
4290 RETURN

```


Son Of Lister For VIC And 64

Jim Butterfield, Associate Editor

This updated version of a previously published COMPUTE! program, "Lister," includes modifications for the VIC and 64. "Son Of Lister" translates tokens from other Commodore machines and produces a readable listing to facilitate program conversions.

"Lister," a program published in COMPUTE! (December 1982, p. 192), lists a BASIC program directly from disk — slowly. The only justification for its slowness is that the listing is neat and very readable.

One of the reasons for Lister was that many users couldn't read programs written for other models of Commodore machines because their machine didn't have the same vocabulary. For example, if a 4.0 program contained the command DCLOSE, other systems — not 4.0 — couldn't list the program without getting nonsense.

So Lister allowed us to get a neat listing — and to get a cross-listing of other machines' programs.

Out Go The Windows, In Come The Colors

That was all very well. At the time I wrote it, Lister could be all things to all people. Now there are a few new wrinkles.

First, the new colors used by the Commodore 64 call for new "cursor words" — but there's a twist. Some of the characters used for color in the 64 were used in the 80-column machines for entirely different purposes. We can no longer be universal — we must decide which computer's program we are translating.

It seems sensible to guess that a Commodore

64 is more likely to want to list a 64 program than a CBM 8032 program. In fact, VIC and 64 have much in common and it's likely that they will want to look at each other's programs fairly often. So, out goes the special 8032 window, scroll, and line clear commands. Make way for the new colors.

You can change this to suit your purposes, of course. If an 8032 listing is what you want, go for it — dig back to the December issue and replace the new colors with the 80-column commands.

Screen Width

On the PET/CBM, we had to deal with 80-column and 40-column screens, plus an 80-column printer. On the VIC/64, we must work with 22 or 40 columns, or (again) an 80-column printer. We must search for the screen width in a different way. No big deal — just a different type of programming.

Making a pretty listing on a VIC, with only 22 columns, is a tough task, of course. But the computer will try its best.

And A Challenge

What about extra keywords? The 4.0 machines have extra commands — like DLOAD, for example — which have no counterpart in the VIC/64. Or do they? Some of the "expanders" which add 4.0 commands are said to use the same tokens — in which case, usage will be the same as for 4.0. The program as given still recognizes the 4.0 set.

But that's only one approach. If you're a graphics nut, and have fitted a Super Expander to your VIC, you will be using new commands of your own, such as GRAPHIC or CIRCLE. In this case, you don't want the 4.0 commands — you

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want the special keywords your program uses. If so, try digging into the DATA statements in "Son Of Lister." Common sense will reveal the changes needed. Experiment — write programs, see how they list, and see what you need to change.

A Token Of Happiness

A word of explanation for beginners. Every time you use a keyword — PRINT, for example — the computer crunches it up into a single byte called a *token*. Only when you say LIST will the token be unfolded into its original form. That's why you can type in a line like 10 ? and have it list as 10 PRINT. Neither the question mark nor the PRINT word was stored as such — just a one-byte token which represents the command.

One of the ways that Son Of Lister works is to draw the program directly from the disk, and translate the tokens using its own BASIC program. In doing so, it can print out commands that might not even be available on the VIC or 64.

This way, you can read a program from some other Commodore machine — and try to figure out how to modify it for your own computer. And in the meantime, you get a neat listing — in both senses of the word.

Son Of Lister

```
90 REM LISTER..VIC/64
100 DATA 19,147,17,145,29,157,18,146,20,1
    48,141,32
110 REM 80-COLUMN CURSOR STUFF
120 DATA 129,149,150,151,152,14,142,153,1
    54
130 DATA 155
140 REM VIC STUFF
150 DATA 144,5,28,159,156,30,31,158
160 DATA 8,9,133,137,134,138,135,139,136,
    140
170 DATA HOME,CLEAR,DOWN,UP,RIGHT,LEFT,RV
    S,RVOFF,DEL,INST,RETURN,SPACE
180 DATA ORANGE,BROWN,L.RED,GRAY1,GRAY2,T
    EXT,GRAPHIC,L.GREEN,L.BLUE
190 DATA GRAY3
200 DATA BLACK,WHITE,RED,CYAN,MAGENTA,GRE
    EN,BLUE,YELLOW
210 DATA LOCK,UNLOCK,F1,F2,F3,F4,F5,F6,F7
    ,F8
220 DIMA(40),A$(40),K$(90)
230 FORJ=0TO39:READA(J):NEXTJ
240 FORJ=0TO39:READA$(J):NEXTJ
250 DATA END,FOR,NEXT,DATA,INPUT,D
    IM,READ,LET,GOTO,RUN,IF,RESTORE,GOSUB
260 DATA RETURN,REM,STOP,ON,WAIT,LOAD,SAV
    E,VERIFY,DEF,POKE,PRINT#,PRINT,CONT
270 DATA LIST,CLR,CMD,SYS,OPEN,CLOSE,GET,
    NEW,TAB(,TO,FN,SPC(,THEN,NOT,STEP
280 DATA +,-,*,/,↑,AND,OR,>,<,<,SGN,INT,A
    BS,USR,FRE,POS,SQR,RND,LOG,EXP,COS
290 DATA SIN,TAN,ATN,PEEK,LEN,STR$,VAL,AS
    C,CHR$,LEFT$,RIGHT$,MID$,GO,CONCAT
300 DATA DOPEN,DCLOSE,RECORD,HEADER,COLLE
    CT,BACKUP,COPY,APPEND,DSAVE,DLOAD
310 DATA CATALOG,RENAME,SCRATCH,DIRECTORY
320 FORJ=0TO90:READK$(J):NEXTJ
```

```
400 CLOSE1:INPUT"NAME OF PROGRAM FILE";G$
410 OPEN 1,8,3,G$+","P,R"
420 GET#1,A$,B$
430 IFA$<>CHR$(1)ANDAS$<>"GOTO400
440 IFA$=""THENAS$=CHR$(1):GET#1,X$
450 INPUT"LINE NUMBER RANGE{2 SPACES}-
    {3 LEFT}";Z$
460 L0=0:L1=0:L2=1E9
470 FORJ=1TOLEN(Z$):Y$=MID$(Z$,J,1)
480{2 SPACES}Y=ASC(Y$):IFY>=48ANDY<=57GOT
    O510
490{2 SPACES}IFY=32GOTO510
500{2 SPACES}L0=J:IFY<>45GOTO600
510 NEXTJ
520 IFL0<LEN(Z$)THENL2=VAL(MID$(Z$,L0+1))
    :IFL2=0THENL2=1E9
530 IFL0>1THENL1=VAL(Z$)
540 IFL0=0THENL1=L2
600 P3$="["P4$=""]":INPUT"LIST TO PRINTER
    {2 SPACES}N{3 LEFT}";Z$
610 P=3:IFASC(Z$)=89THENP=4:L$="{DOWN}":P
    3$=CHR$(219):P4$=CHR$(221)
620 P1$="["P2$=""]":INPUT"GRAPHICS OR TEX
    T{2 SPACES}G{3 LEFT}";Z$
630 PRINTCHR$(142);:IFASC(Z$)=84THENPRINT
    CHR$(14);:M$=L$:P1$=P3$:P2$=P4$
640 INPUT"TRANSLATE CURSOR MOVES
    {2 SPACES}N{3 LEFT}";Z$
650 IFASC(Z$)=89THENT7=1
660 OPEN4,P:F$=P1$
670 J=80:IFP<>3GOTO690
680 PRINT"{CLR}":J=PEEK(213)+1
690 L9=J:PRINT#4,"PROGRAM:{2 SPACES}";G$
700 REM NEW LINE
710 GOSUB2010:Q=0:T1=1:C1=-1:GET#1,A$,B$:
    IFST<>0GOTO3000
720 IFB$=""GOTO3000
730 GET#1,A$,B$
740 L=ASC(A$+CHR$(0))+ASC(B$+CHR$(0))*256
750 IFL<L1GOTO1080
760 IFL>L2GOTO3000
770 F2=1:PRINT#4,M$;P$:P$=STR$(L)+" "
800 REM START TEXT HERE
810 GET#1,A$:IFA$=""GOTO710
820 T=0:A=ASC(A$):IFA=32ANDF$=","GOTO840
830 IFQ=0OR(AAND127)>31ORT7=0GOTO900
840 FORJ=0TO40:IFA=A(J)THENB$=A$(J):GOTO8
    60
850 NEXTJ:GOTO1000
860 IFB$=B1$THENB=B+1:GOTO810
870 IFB>0THENAS$=MID$(STR$(B+1),2)+F$+B$:G
    OTO890
880 AS=F$+B$
890 B=0:B1$=B$:F$=",":F1=1:GOTO1010
900 A=A-128:IFA<0ORQ<>0GOTO1000
910 IFA=127THENAS$="↑":GOTO1000
920 T=1:A$=K$(A)
930 IFA=15THENQ=2
1000 GOSUB2010
1010 IFA$=CHR$(34)THENQ=1-Q
1020 REM C=-1 FOR ALPHANUMERIC
1030 C=ASC(LEFT$(A$,1)):C=(C<48ORC>57)AND
    (C<65ORC>90)
1040 IFT<>T1ORT1=1THENT1=T:IFNOTCANDNOTC1T
    HENP$=P$+" ":GOSUB2500
1050 C=ASC(RIGHT$(A$,1)):C1=((C<48ORC>57)
    AND(C<65ORC>90))ORA=37
1060 P$=P$+A$:GOSUB2500
1070 GOTO810
1080 REM SKIP TO NEXT LINE
1090 GET#1,A$:IFA$=""GOTO710
```


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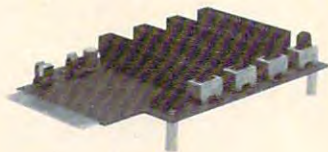
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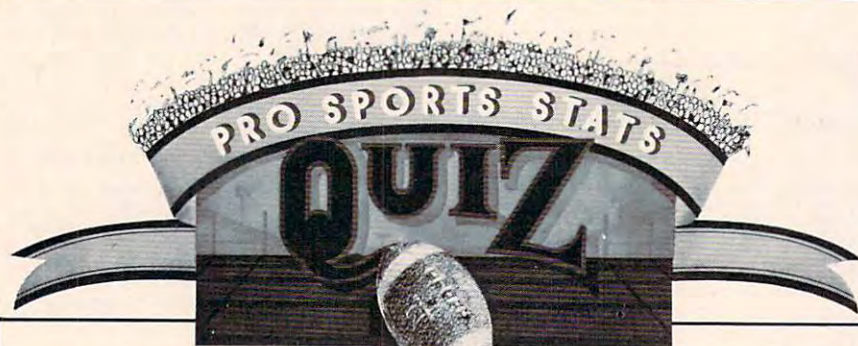

```

1100 GOTO1090
2000 REM CLOSE OFF CURSOR EXPRESSION
2010 IFF1=0GOTO2040
2020 IFB>0THENP$=P$+MID$(STR$(B+1),2):GOS
UB2500
2030 B=0:F1=0:B1$="":P$=P$+P2$:GOSUB2500:
F$=P1$
2040 RETURN
2500 IFLEN(P$)<L9GOTO2600
2510 FORJ=L9TOL9*.6STEP-1
2520 IFMID$(P$,J,1)="":GOTO2580
2530 NEXTJ:FORJ=L9-1TOL9*.6-1STEP-1
2540 P=ASC(MID$(P$,J))
2550 IFP=91GOTO2580
2560 IFP=59ORP=44ORP=93THENJ=J+1:GOTO2580
2570 NEXTJ:J=L9-1
2580 PRINT#4,M$;LEFT$(P$,J-1)
2590 P$="{4 SPACES}" + MID$(P$,J)
2600 RETURN
3000 IFLEN(P$)>0THENF2=1:PRINT#4,M$;P$
3010 IFF2=0THENPRINT"*** NO LINES FOUND ***"
3020 CLOSE1:GOSUB2000:CLOSE4

```

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Commas And Colons In Applesoft Strings: An Easy Way To Use Them

Donald W. Watson

Commas and colons are not allowed with Applesoft strings — and this can be troublesome at times. Here's a solution. Also included is a program for Apple II disk users.

The Keyboard Problem

INPUT X\$ is the convenient instruction for entering strings with an Applesoft II BASIC program; however, the string to be entered under the variable name X\$ may not contain commas or colons. If either is present, the string will be truncated at the first occurrence when the RETURN key is pressed. The comma or colon and all characters following will be lost, and Applesoft will send the ?EXTRA IGNORED message to the printer or to the screen.

In programs written for business use, it is often essential to include commas and colons in strings entered by the user. Programmers may not mind, but consider the user's frustration on learning that he or she cannot use commas or colons in places where they are normally required for acceptable format. For example, JONES, JAMES. J. is a common format for names in a list; RECEIPTS: might be a desirable heading for a list or group on a business report or ledger. In the latter example, the colon can be avoided by underlining the heading, but only at the expense of the user's choice, printer time, and perhaps report line space. Restricting alternatives is not in the user's interest. Here is a practical solution to the problem.

A Keyboard Solution

The Applesoft BASIC Programming Reference Manual is not much help on this subject although a clue to a solution is offered in Chapter 6 where the INPUT and GET instructions are defined and discussed. On page 68, a suggestion is made that "serious

programmers GET numbers" by using a GET X\$ instruction, where the keyboard response will be a string assigned to the string variable X\$ when the RETURN key is pressed.

"String Entry" allows the entry of strings which can contain *all* characters from the Apple II keyboard. But String Entry does much more. The program contains routines which duplicate the most important Apple II string-editing capabilities (right- and left-arrow functions). It also provides some useful entry control functions for convenience in writing, displaying, and deleting strings.

A Free Keyboard

Type the listing into memory and proofread it carefully. When you're sure it is correct, SAVE it to a disk with a short name like STRENT. Then type RUN (with the program still in memory). The instruction line will appear. Experiment with the string entry process, noting that you now have the full freedom of the keyboard. You can enter strings with any characters you like, and you have normal editing functions with entry and deletion control. Best of all, the ?EXTRA IGNORED message never appears, and nothing is ignored unless you choose to have it ignored.

Most of String Entry (it's about 600 bytes long) can be used, with slight modification, in a larger program. If used to control string entry for more than one or two fields, it must be generalized for use as a subroutine, mostly by using integer variables V% and H% in the calling routine. VTAB V% and HTAB H% instructions can then be used in the subroutine to allow complete freedom when choosing a location for the string display on the screen.

The Apple II Disk Problem

The keyboard problem with commas and colons to be used in strings has been solved by avoiding

the INPUT X\$ instruction and using a GET X\$ routine instead. But Apple II disk operations require the use of the INPUT X\$ instruction to retrieve string data from a disk text file. If the string to be retrieved contains commas or colons, the ?EXTRA IGNORED message will occur; the string will be truncated as if it were entered from the keyboard in response to INPUT X\$.

To correct this, try these two simple changes and some short additions to the String Entry program.

1. Delete: GOTO 1020 from the end of line 1190.
2. Add the lines below to the String Entry program.
3. SAVE the modified and expanded program String Entry under its abbreviated name, STRENT.

```

1300 REM WRITE S$ CONTENT TO DISK
1310 PRINT D$;"OPEN STRFILE"
1320 PRINT D$;"DELETE STRFILE"
1330 PRINT D$;"OPEN STRFILE"
1340 PRINT D$;"WRITE STRFILE"
1350 PRINT S$
1360 PRINT D$;"CLOSE STRFILE"
1400 REM RETRIEVE S$ CONTENT FROM DISK
1410 S$ = ""
1420 PRINT D$;"OPEN STRFILE"
1430 PRINT D$;"READ STRFILE"
1440 INPUT S$
1450 PRINT D$;"CLOSE STRFILE"
1500 REM DISPLAY RETRIEVED S$ CONTENT
1510 VTAB 20: HTAB 8: PRINT TAB( 39);
      : HTAB 9: PRINT S$: GOTO 1020

```

Save this expanded version to disk under the original filename STRENT.

Type RUN to execute the expanded program still in memory. The operator instruction line will appear. Using no commas and no colons, experiment with a few string entries. Each string entered will be stored on disk, and the program will echo the string by displaying it (as retrieved from the disk text file) a second time.

Now, perform a test. Enter a string containing a comma or colon, or both. Try NAME: JONES, JAMES J., for instance. When you have entered the string, it remains displayed at the string entry format line. It goes to the STRFILE at the disk under the permanent variable name S\$. S\$ in computer memory is nulled, S\$ is retrieved from STRFILE, and the retrieved content of S\$ is displayed on the screen.

But disaster strikes again. First, the dreaded ?EXTRA IGNORED message is displayed, and then the string is displayed in incomplete form. Read on for help.

An Apple II Disk Solution

The Apple II disk system (DOS 3.2 or DOS 3.3) will accept the contents of S\$ as a literal string if the contents begin with a quote (") mark. The disk

retrieval problem can be avoided by changing S\$ temporarily with the statement S\$ = CHR\$(34) + S\$.

To try this technique, just change line 1350 to the following:

```
1350 PRINT CHR$(34) + S$
```

SAVE the program once more under the filename STRENT and RUN it. Now, you will find that the test string NAME: JONES, JAMES J. can be correctly entered and correctly retrieved. And so can any string containing any characters from the Apple II keyboard, including commas and colons.

String Entry

```

1000 REM STRING ENTRY
1010 HOME : DIM C$(30):D$ = CHR$( 4)
1020 VTAB 15: HTAB 9: PRINT "TYPE ";
1025 INVERSE : PRINT "E";: NORMAL : PRINT
      " TO ENTER NEW STRING ";
1030 GET E$: VTAB 15: HTAB 9: PRINT TAB(
      39)
1040 VTAB 10: HTAB 8: PRINT "?": FOR
      X = 1 TO 25:C$(X) = " ": PRINT ". ";
      : NEXT X: HTAB 9:X = 1
1050 IF X > 25 THEN PRINT CHR$( 7): GOTO
      1160
1060 GET C$: IF X > 1 THEN 1090
1070 IF ASC (C$) = 13 THEN 1190
1080 IF ASC (C$) < 33 OR ASC (C$) >
      90 THEN S$ = " ": GOTO 1040
1090 IF C$(1) = "0" AND X = 2 AND ASC
      (C$) = 13 THEN S$ = " ": GOTO 1190
1100 IF ASC (C$) = 13 THEN 1160
1110 IF ASC (C$) > 31 AND ASC (C$) <
      91 THEN PRINT C$;:C$(X) = C$:X =
      X + 1: GOTO 1050
1120 IF ASC (C$) = 8 THEN X = X - 1: HTAB
      (8 + X): GOTO 1060
1130 IF ASC (C$) = 21 AND C$(X) < >
      "" THEN X = X + 1: HTAB (8 + X): GOTO
      1050
1140 IF ASC (C$) = 21 THEN HTAB (8 +
      X): GOTO 1060
1150 HTAB (8 + X): GOTO 1040
1160 ST$ = " ": FOR L = 1 TO X - 1:ST$ =
      ST$ + C$(L): NEXT L
1170 R$ = RIGHT$( ST$,1): IF ASC (R$)
      = 32 THEN ST$ = LEFT$( ST$, LEN
      (ST$) - 1): GOTO 1170
1180 S$ = ST$
1190 VTAB 10: HTAB 8: PRINT TAB( 39);
      : HTAB 9: PRINT S$: GOTO 1020

```

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ATARI CHARTMAKER

Tom R. Halfhill, Features Editor

Here's a relatively short but versatile program you can use to draw charts on the screen with your Atari — charts you customize to fit your own needs.

Why do you need charts? (That's what they used to say about computers, too.) Well, almost everybody has something to chart. I once used this program, for example, to chart weekly interest rates of the two money market mutual funds in which my spare cash was invested. But I purposely designed the program for easy modification so you can chart whatever you want: stock quotes and dividends, pork belly futures, bowling scores, jogging information, sunspot activity — even pounds lost on your diet.

Besides allowing you to draw charts to any scale to fit your own data, the program also includes a subroutine to display your own labels in GRAPHICS 0 text within the GRAPHICS 8 graphics window. And by experimenting with the program in ways described below, you can also learn something about statistical rhetoric — how clever statisticians can manipulate the scales of charts to influence the way you think.

Charts In Hi-Res

The program requires at least 16K, mainly because it uses GRAPHICS 8, which steals 7,900 bytes of RAM off the top before you even start. Another disadvantage of GRAPHICS 8 is that only one color besides the background default is available (disregarding special display list interrupts and other complexities we won't discuss here). It would be nice if different colored lines could be charted to keep track of different arrays of data. However, I used GRAPHICS 8 because it is the highest resolution mode and allows the greatest accuracy when charting lines.

The program draws the chart one point at a time by fetching numbers which you place in

DATA statements at the bottom of the program. If you want, you can substitute INPUT loops and numeric arrays for the DATA statements, but I've found it just as fast to add my weekly updates to the DATA rather than to fool around with separate data files and so forth. If your needs differ, replace the subroutine at lines 1500 – 1620 with your INPUT loops.

The scales are easily customized by changing the values of a few variables in lines 50 and 60. Changing only a few numbers in these lines allows you to define the number of points in the scales drawn along all four sides of the chart. In the example program, the vertical borders are divided into 20 points to plot stock prices from \$0 to \$20 per share. The horizontal borders are divided to represent the 52 weeks in a year. You also define additional markers; in this example, the share prices are subdivided into \$5 sections, and the 52 weeks are subdivided into four quarters.

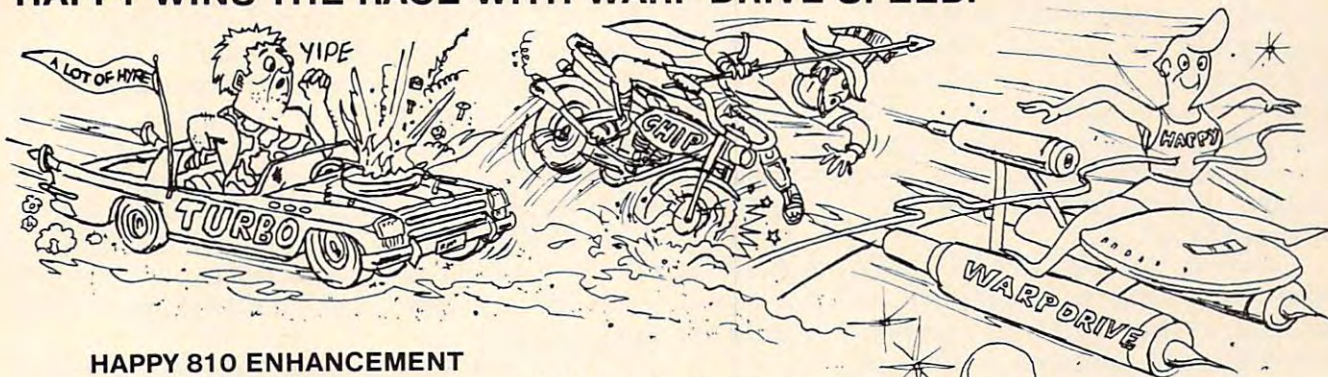
Customizing The Program

Modifying these scales is simple. Let's say you're charting the growth of an Individual Retirement Account from \$0 to \$10,000 in \$250 increments. You need to divide the vertical (Y axis) borders into 40 units ($10,000/250$). Just change the variable YSCALE in line 50 from 20 to 40. To further subdivide this scale with markers for every \$1,000, just change the variable YMARKERS in line 60 from 4 to 10 ($10,000/1,000$).

Now let's say you want to chart this growth monthly for two years, rather than weekly for one year, as in the example below. You need to divide the horizontal (X axis) borders into 24 units (2 years with 12 months each). Simply change the variable XSCALE in line 50 from 52 to 24. To subdivide this scale with additional markers for each quarter, change the variable XMARKERS in line 60 from 4 to 8 (4 quarters per year * 2 years).

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tute your own data for mine starting at line 2300. You can add as many of these DATA lines as you need to the bottom of the program. Two cautions, however. First, to avoid CURSOR OUT OF RANGE errors, don't try to plot a line off the screen. This means the largest number in your DATA statements must never exceed the value you assign to YSCALE, and likewise the number of data elements must never exceed the value assigned to XSCALE.

Second, to avoid OUT OF DATA errors, always make the very last data element a dummy element, a "flag." A flag is a number which signals something to a computer. In this case, the flag signals the Atari that there is no more data to be read. It then leaves the READ DATA subroutine and finishes the program. The flag is a number (any number) which exceeds the value you assigned to YSCALE (I just told you never to exceed YSCALE, but the program expects it in this case). In the example below, I chose the number 101 as my flag (YSCALE = 20).

The flag also serves another very important purpose. It permits you to draw more than one line at a time on your chart. Again, refer to the example program: It charts two lines for stock prices of two companies. To do this yourself, add a flag to the end of the last DATA statement which draws the first line, then add more DATA statements to chart the second line. Using my investment example, the rates for the first company are in DATA lines 2300 – 2340, and the rates for the second company are in DATA lines 2360 – 2400. You'll notice that each of these series of DATA lines ends with a flag of 101. For each line drawn on the chart, you also need a GOSUB 1500 near the top of the program. Mine are at lines 420 and 440.

You aren't lost, are you? Well, just in case, here's how I would add a third line to my chart. First, I would insert a GOSUB 1500 at line 470. Then, I would put the data in new DATA statements after line 2400, ended with a flag of 101.

To plot just one line, I would delete the GOSUB at line 440 and the DATA at lines 2360 – 2400. It's really very simple if you'll type in the example program and see how it works.

How To Fib With Statistics

Play with my example program a bit before modifying it for your own purposes. Make XSCALE = 104 (2×52) and XMARKERS = 8 (2×4) to draw a two-year chart with weekly and quarterly indices. Or, to draw a three-year chart, make XSCALE = 156 (3×52) and XMARKERS = 12 (3×4).

Incidentally, if your computer is hooked up to a regular TV instead of a monochrome computer monitor, you'll probably experience a phenomenon known as "artifacting" when you try to draw a two- or three-year chart. TV sets lack the resolu-

tion necessary to display very fine lines drawn very close together. The week markers along the top and bottom of the chart will merge and create unusual colors not normally possible in the one-color GRAPHICS 8 mode. Some programs use this effect — artifacting — to advantage. In this program, however, it will obscure the lines you're trying to draw. You can avoid this by plotting fewer markers: For a two-year chart, make XSCALE = 24 (2×12) to plot by the month rather than by the week. Even if artifacting obscures your indices, though, it will not affect the charted lines of data.

Now, before I explain how to dress up the chart with custom labels, take a few minutes to experiment with these values a moment longer, and you'll see how less-than-honest statisticians could tinker with chart scales to manipulate the unwary. For instance, change YSCALE to 18 and YMARKERS to 3.6 while using the same DATA numbers (ignore the "\$5", "\$10", and "\$15" labels, which now will be mislocated). RUN the program. See how steep the charted lines appear, with high peaks and low valleys? Looks like those stock prices are pretty undependable from week to week, right?

But now change YSCALE to 60 and YMARKERS to 12 (again ignoring the labels), and RUN. Now the lines magically flatten out, and it looks like the prices hardly changed all year.

We used the same DATA numbers, remember, and numbers don't lie — but they can mislead. For example, a politician running for sheriff can make a chart dramatizing that crime rates have sharply climbed during his opponent's term of office, while the opponent can plot the very same numbers on a compressed-scale chart and it will appear that the rates have hardly climbed at all. This program can animate such manipulations and make them graphically obvious.

Text On The Hi-Res Screen

Besides the text window title ("Price-Per-Share Stock Chart 1984" in this example), a special subroutine at line 1160 prints anything you want in GRAPHICS 0-style text anywhere inside the GRAPHICS 8 graphics window. (You may want to separately save this subroutine using the LIST command to use in your own programs.) Options built into this subroutine let you display your labels almost any way you want, horizontally and even diagonally.

Here's how to use this subroutine. First, define your label as ZA\$ in a line number that immediately follows the GOSUB 1500 which reads the associated DATA. Again, refer to the example program. The GOSUB at line 420 reads the first three lines of DATA for the first company's stock prices. Therefore, ZA\$ is defined in line 430 as

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Figure 1: A commercial screen-dump program was used to reproduce this one-year chart created with "Chartmaker."

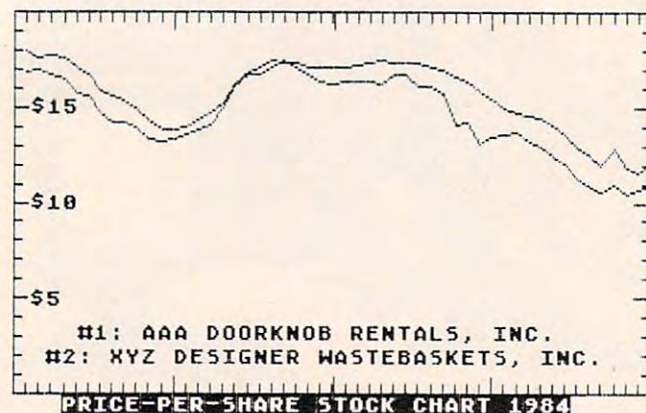
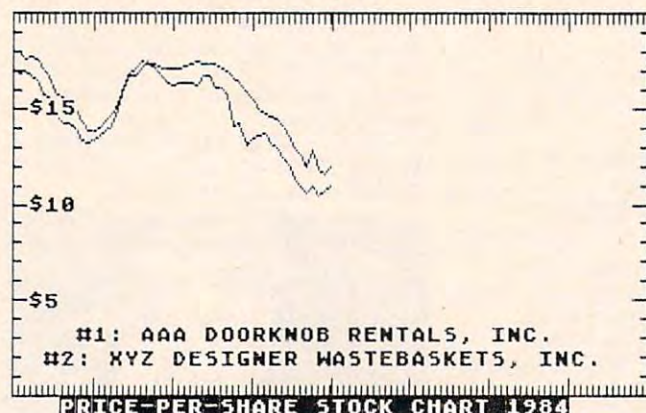


Figure 2: A two-year chart using the same data as the one-year chart.



"#1:AAA DOORKNOB RENTALS, INC." When RUN, the program writes this label just after the line of stock prices for this company is plotted.

Next, the GOSUB 1500 at line 440 plots the stock prices for the second company. Then, ZA\$ is redefined in line 460 as "#2: XYZ DESIGNER WASTEBASKETS, INC.", and this label is drawn. Lines 480, 500, and 520 redefine ZA\$ three more times to display dollar labels on the chart. The GOSUB 1160 added onto the ends of all these lines sends the program off to the text subroutine.

Options are chosen by the three variables which must always follow any definition of ZA\$. ZX positions the label horizontally on the screen (the X axis); this is a column number from 0 to 39. ZY likewise positions the label vertically on the screen (the Y axis); it is a number from 0 to 191. And, finally, ZZZ is the slant of the label. If ZZZ=0, as in the example program, the labels are written horizontally. If ZZZ=1 or if ZZZ=-1, the label is displayed with a right or left diagonal tilt.

By modifying this program in all these ways to display your own text labels and scales, you can adapt it to quite a wide range of uses.

Chartmaker

```

40 XCOORD=319:YCOORD=159
50 XSCALE=52:YSCALE=20
60 XMARKERS=4:YMARKERS=4
80 POKE 82,0:GRAPHICS 8:COLOR 1:POKE
  710,0:DIM ZA$(50)
120 PLOT 0,0:DRAWTO 0,YCOORD:DRAWTO
  XCOORD,YCOORD:DRAWTO XCOORD,0:DR
  AWTO 0,0:GOSUB 2000
400 POKE 752,1:"{3 SPACES}PRICE-PER
  R-SHARE STOCK CHART 1984"
420 GOSUB 1500
430 ZA$="#1: AAA DOORKNOB RENTALS, I
  NC.":ZX=4:ZY=130:ZZZ=0:GOSUB 116
  0
440 GOSUB 1500
460 ZA$="#2: XYZ DESIGNER WASTEBASKE
  TS, INC.":ZX=2:ZY=140:ZZZ=0:GOSU
  B 1160
480 ZA$="$15":ZX=1:ZY=36:ZZZ=0:GOSUB
  1160
500 ZA$="$10":ZX=1:ZY=76:ZZZ=0:GOSUB
  1160
520 ZA$="$5":ZX=1:ZY=116:ZZZ=0:GOSUB
  1160
1140 GOTO 1140
1160 REM *** DISPLAY TEXT IN GR.8 **
  *
1170 ZL=PEEK(560)+PEEK(561)*256
1180 ZM=PEEK(ZL+4)+PEEK(ZL+5)*256
1200 FOR ZW=1 TO LEN(ZA$)
1220 ZT=57344+((ASC(ZA$(ZW,ZW))-32)*
  8)
1240 ZC=ZM+ZY*40+ZX+(ZW-1)
1260 FOR ZR=0 TO 7
1280 POKE ZC+ZR*40,PEEK(ZT+ZR)
1300 NEXT ZR
1320 ZY=ZY+ZZZ
1340 NEXT ZW
1360 RETURN
1500 REM *** READ DATA, PLOT LINES *
  **
1510 I=0:X=0:Y=0
1520 READ Y
1540 IF Y>YSCALE THEN RETURN
1560 Y=YCOORD-Y*(YCOORD/YSCALE)
1580 X=X+XCOORD/XSCALE
1600 IF I=0 THEN PLOT X,Y
1620 DRAWTO X,Y:I=I+1:GOTO 1520
2000 REM *** DRAW SCALES ***
2040 FOR I=0 TO YCOORD STEP YCOORD/Y
  SCALE:PLOT 4,I:DRAWTO 0,I:NEXT
  I:REM LEFT
2060 FOR I=0 TO YCOORD STEP YCOORD/Y
  SCALE:PLOT 315,I:DRAWTO XCOORD,
  I:NEXT I:REM RIGHT
2080 FOR I=0 TO XCOORD STEP XCOORD/X
  SCALE:PLOT I,4:DRAWTO I,0:NEXT
  I:REM TOP
2100 FOR I=0 TO XCOORD STEP XCOORD/X
  SCALE:PLOT I,155:DRAWTO I,YCOORD
  D:NEXT I:REM BOTTOM
2120 REM *** DRAW X & Y MARKERS ***
2140 FOR I=0 TO YCOORD STEP YCOORD/Y
  MARKERS:PLOT 8,I:DRAWTO 0,I:NEX
  T I:REM LEFT
2160 FOR I=0 TO YCOORD STEP YCOORD/Y
  MARKERS:PLOT 311,I:DRAWTO XCOORD
  D,I:NEXT I:REM RIGHT
2180 FOR I=0 TO XCOORD STEP XCOORD/X
  MARKERS:PLOT I,7:DRAWTO I,0:NEX
  T I:REM TOP

```

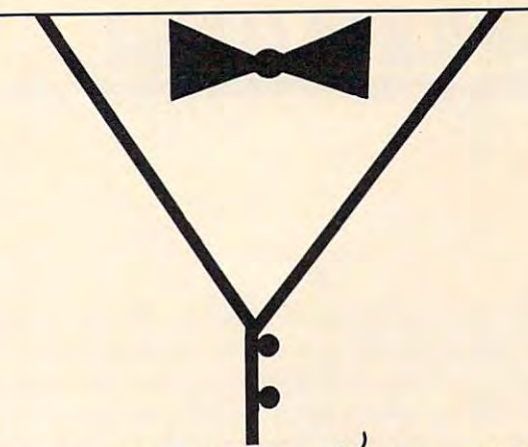


```

2200 FOR I=0 TO XCOORD STEP XCOORD/X
MARKERS:PLOT I,152:DRAWTO I,YCO
ORD:NEXT I:REM BOTTOM
2220 RETURN
2300 DATA 17.95,17.65,17.72,17.56,17
.07,16.72,15.84,15.55,15.38,15,
14.32,13.89,13.8,13.98,14.31,14
.71,15.26,16.17
2320 DATA 16.86,17.16,17.45,17.30,17
.30,17.06,17.12,17.12,17.12,17.
23,17.34,17.46,17.32,17.38,17.3
4,17.07,17.04,16.62
2340 DATA 16.38,15.88,15.45,14.99,14
.74,14.62,14.5,14.11,13.60,12.9
6,12.62,12.01,12.84,11.85,11.55
,11.92,101
2360 DATA 16.86,16.96,16.76,16.5,15.
78,15.62,14.67,14.27,14.2,13.98
,13.37,13.27,13.29,13.54,13.83,
14.09,15,16.04
2380 DATA 16.79,16.75,17.16,17.45,17
.12,16.72,16.32,16.21,16.32,16.
41,16.29,16.25,16.75,16.73,16.1
5,16.10,15.72,14.10
2400 DATA 14.25,13.05,13.47,13.61,13
.74,13.18,12.96,12.43,12.03,11.
36,10.89,10.62,10.89,10.49,10.6
9,10.96,101

```

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64 EXPLORER

Larry Isaacs

I have recently received a number of letters commenting on my review of the Cardco CARD/? printer interface (COMPUTE!'s Gazette, September 1983). These letters seem to indicate there is a strong need for more information about printers and printer interfaces. Perhaps this topic is worth a second look.

Keeping Up-To-Date

Unfortunately, when reviewing printers and printer interfaces, the reviewer has a special problem because this area is one of the most competitive and fastest changing in the computer industry. All printers these days have one or more microprocessors. This means that the manufacturer can add features in many cases simply by modifying or adding software in the printer.

Realistically, there are always limits, so each manufacturer must choose what features will be incorporated based on what current technology will allow. But with technology improving rapidly, printers have also been improved rapidly. This makes it tough for the reviewer to keep his comments up-to-date.

The rapidly changing world of printers also makes it tough on those trying to buy one. However, some basic information on printers always applies regardless. For microcomputers, there are two basic types of printers: The first is the *dot-matrix* printer, which prints each character as an array of dots; the second is the *letter-quality* printer, which prints fully formed characters like a typewriter. For the 64, you would typically want to go with a dot-matrix printer. Most newer dot-matrix printers can also print graphics images in addition to printing text. However, if you really needed your output to look as if it were typed, you might want to purchase a letter-quality (or daisy wheel) printer. However, many dot-matrix printers have a print mode which produces a very readable "correspondence" quality output. You will need to judge for yourself if the print quality is sufficient for your needs.

As I see it, printers are competing in three main areas: price, performance (primarily printing speed), and number of features. Today there are many printers available, ranging from low-priced units with slow speed and a few basic features to more expensive units with higher speed and added features.

What's Right For You?

To help decide what printer to buy, you need to form some idea of what your needs are. If you primarily need a printer for printing an occasional BASIC listing, you could certainly settle for a less expensive printer with simple features.

Perhaps a 40-column unit, which is typically less expensive than 80- or 132-column units, would meet your needs. If you plan to use your 64 for word processing, you might want to consider a printer with more features. You will also need to make sure the printer is compatible with the word processor you use. If you plan to do a lot of program development, speed and ruggedness are important features.

Deciding On Price

Once you have some idea of your needs, you should determine a price range. This will help narrow your choices a little further, and you can begin investigating specific printers. I recommend giving a little more consideration to the printers at the upper end of your price range since greater performance is more likely.

One of the most fundamental considerations you'll have is whether or not to buy a Commodore printer. There are several advantages to doing so. First, the printer is designed to work with the 64. Second, you can be pretty certain that any 64 software package that uses a printer will be compatible with a Commodore printer. And third, the printer can be serviced at the same place as your 64 and other Commodore peripherals.

The disadvantage of buying a Commodore printer is that since Commodore doesn't specialize in printers, other manufacturers may offer printers with more features or better prices. However, if you do choose a non-Commodore printer, there will be some compatibility problems, the extent of which depends on the printer. You must also consider that a printer interface will likely be needed to connect the printer to the 64 (more about this later). Fortunately, the popularity of the 64 provides strong encouragement to competing manufacturers to make printers compatible with the 64 and VIC-20.

Other Considerations

How much importance should you place on special features? Typically, the more features the

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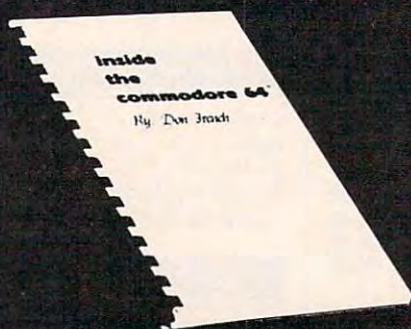
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better, though there may be some features you'll never use. Ultimately, you may have to determine how much the extra features will actually cost you and whether a less expensive printer with fewer features is more appropriate.

One of the most difficult yet most important considerations is the printer's reliability. In some cases, the printer might have problems with overheating or even breaking down if used for an extended period. The latter problem is much more common since it can be caused by minor imperfections in a couple of important components — imperfections hard to detect before purchase. But if you don't plan on generating that much output, this won't be of great concern.

Newer printers will likely offer advantages in price, performance, and features. The disadvantage is that they may not have a proven track record. One feature you will typically find only on newer printers is the ability to print different colors, but don't expect the colors you see on the 64 screen to appear automatically on the printer. It will take software to make that happen. If you want to be really daring, you could consider some of the relatively inexpensive (that is, under \$1000) ink-jet printers that are starting to appear. These form a dot-matrix character by guiding little dots of ink to the proper location on the paper.

If you decide to buy a non-Commodore printer, you will probably need a printer interface to connect the printer to the 64. With printer interfaces, you will mostly be comparing price versus number of features. The units with more features will have more ROM to hold extra software, hence a higher cost. When deciding on one, determine which has at least enough features to meet your needs.

When you are thorough with your investigation of printers, you should be able to make a wise choice. Finding a printer which serves your needs well will keep the grass from looking too much greener on the other side when new printers come along.

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COMPARING COMMODORE MACHINE LANGUAGE PROGRAMS

Harvey B. Herman, Associate Editor

This BASIC program compares two machine language programs on disk and displays the differences. Advanced programmers will find this a useful utility — as will beginners, who can refer to the explanatory REMs included in the program. For Commodore, but can be adapted to other computers.

I love to tinker. When someone sends me a machine language (ML) program which requires modifications to work effectively on my system, I wade right in and make changes. Writing an extensive ML program may be beyond me, but reworking someone else's is a piece of cake. The only problem I have is keeping track of which version has what modification.

If you love to tinker or are just curious about the difference between updates on commercial software, then the program discussed here should be helpful. It was written on a Commodore 8032 with a 2031 single disk drive, but should work with other Commodore equipment without much modification. You could probably make it work on other computers if your disk operating system allows GETting individual bytes of a machine language program.

The program, "Comparing ML Programs," is a BASIC program which displays the differences between two ML programs saved on disk. A sample output comparing two versions of an Invaders program is included. My "patch," jumping out of the code to unused locations, can be clearly seen. Of course, I could laboriously go through the disassembled listings of each version and find the modifications by inspection, but this computer program is designed to do that automatically, much faster than by hand, and with less eyestrain.

Program Operation

The program operation is not difficult to understand. It POKes both ML programs from disk(s) into high memory and then compares them byte for byte. Any differences are output to the screen or printer. I have included REMarks in the program listing to help the first-time user, but the following additional comments may be helpful:

1. Program a is stored from \$2000 – \$4FFF (max).
2. Program b is stored from \$5000 – \$7FFF (max).
3. The programs may be on different disks.
4. The programs do not need to start at the same address.
5. The first two bytes of programs give load address information and are not POKed into memory.
6. Load address information is, however, shown as part of the output.
7. If the programs are not the same size, the output of differences shows asterisks for the shorter program.
8. Timing data (TI\$) is output to the screen.

You may wonder at the last comment. The program, written as it is in BASIC, is comparatively slow — comparing the Invaders programs took almost 15 minutes. But this program is not used every day, only when you need it. More importantly, I have used it often to compare much smaller programs where execution time is not a significant factor. Some parts of the program could be sped up by ML segments, but I did not feel it was worth the trouble for me. Perhaps you would like to try this and share the results.

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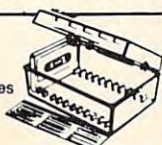


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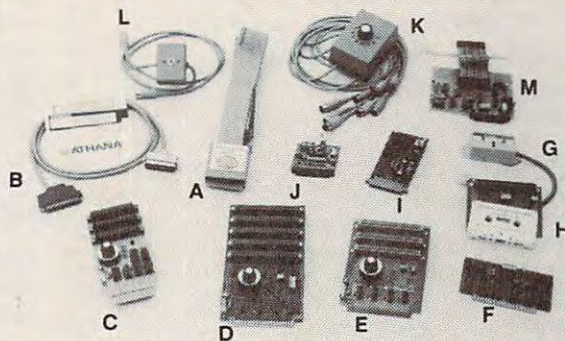
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Sample Output

```

INVADERS1 — START 0401  END 1FFF
INVADERS2 — START 0401  END 1FFF
INVADERS1  INVADERS2
1994 :0024      1994 :00C9
1995 :0024      1995 :0053
1996 :0024      1996 :00D0
1997 :0024      1997 :0003
1998 :0024      1998 :004C
1999 :0024      1999 :0016
199A :0024      199A :00FD
199B :0024      199B :004C
199C :0024      199C :00C0
199D :0024      199D :0016
19C1 :00C0      19C1 :0094
19C2 :0016      19C2 :0019

```

Comparing Machine Language Programs

```

140 POKE53,32:POKE52,0:CLR:REM PROTECT $2
    0000 UP
150 PRINT "{CLR}{RVS}COMPARE TWO FILES":PR
    INT
155 INPUT "OUTPUT - {RVS}S{OFF}CREEN OR
    {RVS}P{OFF}RINTER{3 SPACES}P{3 LEFT}"
    ;A$
160 IF LEFT$(A$,1)="S" THEN DE=3:GOTO 190
170 IF LEFT$(A$,1)="P" THEN DE=4:GOTO 190
    :REM PRINTER DEVICE 4
180 GOTO 150
190 PRINT "INSERT DISK WITH PROGRAM A - H
    IT ANY KEY"
200 GET A$:IF A$="" THEN 200
210 INPUT "FILE A NAME{2 SPACES}
    {SHIFT-SPACE}{3 LEFT}";B$(1):IF B$(1)
    ="{SHIFT-SPACE}" THEN 210
220 PRINT TI$
230 OPEN 1,8,3,"0:"+B$(1)+",P,R"
240 IF DS<>0 THEN PRINT DS$:STOP
250 OPEN2,DE:PRINT#2
260 N=2:GOSUB 680:S1=L1:E1=L1+(M-N*4096):
    REM FILE A STORED FROM 2*4096 UP
270 PRINT#2,B$(1);" - START ";
280 LL=S1:GOSUB 830:PRINT#2,"{2 SPACES}EN
    D ";:LL=E1:GOSUB 830:PRINT#2
290 PRINT TI$
300 PRINT "INSERT DISK WITH PROGRAM B - H
    IT ANY KEY"
310 GET A$:IF A$="" THEN 310
320 INPUT "FILE B NAME{2 SPACES}
    {SHIFT-SPACE}{3 LEFT}";B$(2):IF B$(2)
    ="{SHIFT-SPACE}" THEN 320
330 PRINT TI$
340 OPEN 1,8,3,"0:"+B$(2)+",P,R"
350 IF DS<>0 THEN PRINT DS$:STOP
360 N=5:GOSUB 680:S2=L1:E2=L1+(M-N*4096):
    REM FILE B STORED FROM 5*4096 UP
370 PRINT#2,B$(2);" - START ";
380 LL=S2:GOSUB 830:PRINT#2,"{2 SPACES}EN
    D ";:LL=E2:GOSUB 830:PRINT#2:PRINT#2
390 PRINT TI$
400 REM Q=MAX(E1-S1,E2-S2)
410 Q=-((E1-S1)>=(E2-S2))*(E1-S1)-((E2-S2)
    >=(E1-S1))*(E2-S2)
420 PRINT#2,B$(1);TAB(15+(DE=4)*LEN(B$(1)
    ));B$(2):PRINT#2
430 REM MAIN COMPARE

```

```

440 F=0:J=2*4096:K=5*4096
450 REM F=0/NO DIFFERENCE{2 SPACES}FILE A
    /$2000 UP{3 SPACES}FILE B/$5000 UP
460 FOR I=0 TO Q
470 A=PEEK(J):J=J+1
480 B=PEEK(K):K=K+1
490 IF S1+I<=E1 THEN 540
500 REM FILE B > FILE A
510 LL=S1+I:GOSUB 830:PRINT#2," : ";*****
    "{4 SPACES}";
520 LL=S2+I:GOSUB 830
530 PRINT#2," : ";:LL=B:GOSUB 830:PRINT#2
    :F=1:GOTO 640
540 IF S2+I<=E2 THEN 590
550 REM FILE A > FILE B
560 LL=S1+I:GOSUB 830:PRINT#2," : ";:LL=A
    :GOSUB 830
570 PRINT#2,"{4 SPACES}";
580 LL=S2+I:GOSUB 830:PRINT#2," : ";*****
    ":F=1:GOTO 640
590 IF A=B THEN 640
600 LL=S1+I:GOSUB 830:PRINT#2," : ";:LL=A
    :GOSUB 830
610 PRINT#2,"{4 SPACES}";
620 LL=S2+I:GOSUB 830:PRINT#2," : ";:LL=B
    :GOSUB 830
630 PRINT#2:F=1
640 NEXT I
650 IF F=0 THEN PRINT "***{RVS}NO DIFFERE
    NCE{OFF}***"
660 PRINT#2:CLOSE2:PRINTTI$:END
670 REM POKE FILE A/B TO MEMORY
680 M=N*4096:Q=M+3*4096:REM M/Q START/MAX
    LAST LOCATION
690 GET#1,L$:GET#1,H$
700 IF L$="" THEN L=0:GOTO 720
710 L=ASC(L$)
720 IF H$="" THEN H=0:GOTO 740
730 H=ASC(H$)
740 L1=256*H+L
750 GET#1,V$
760 IF V$="" THEN POKEM,0:GOTO 780
770 POKEM,ASC(V$)
780 IF ST<>0 THEN CLOSE 1:RETURN:REM END
    {SPACE}OF FILE
790 REM SAFETY CHECK FOR TOO LARGE FILES
800 M=M+1:IF M>Q THEN PRINT "FILE TOO LAR
    GE":CLOSE 1:STOP
810 GOTO 750
820 REM DECIMAL TO HEX
830 LL=LL/4096:FOR JJ=1 TO 4:LL%=LL:PRINT
    #2,CHR$(48+LL%-(LL%>9)*7);
840 LL=16*(LL-LL%):NEXT JJ:RETURN:REM JIM
    B.

```

Note To 64 Users

To use "Comparing ML Programs" with the 64, change the following lines:

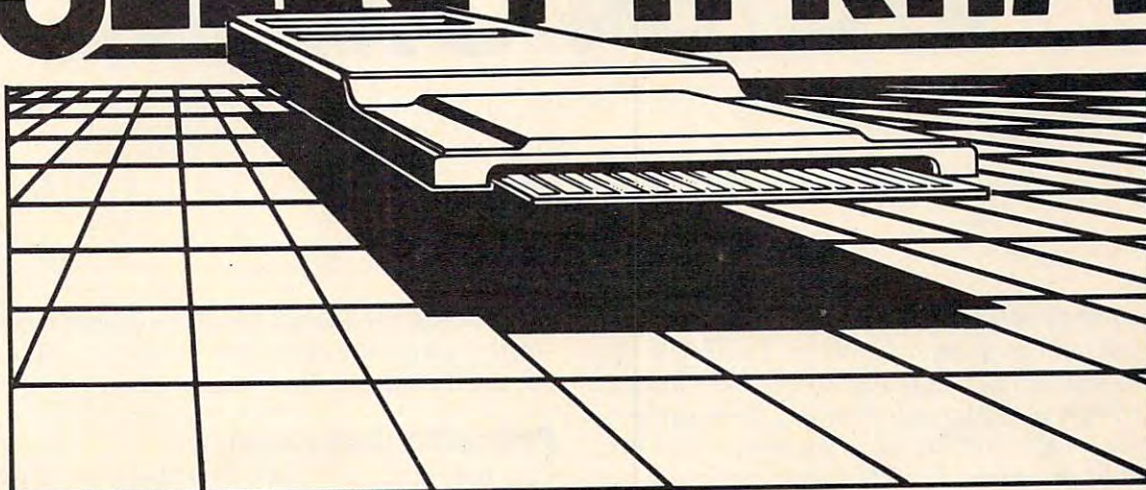
```

140 POKE53,64:POKE52,0:CLR
260 N=4:GOSUB680::S1=L1:E1=L1+(M-N*409
    6)
360 N=8:GOSUB680:S2=L1:E2=L1+(M-N*4096
    )
440 F=0:J=4*4096:K=8*4096
680 M=N*4096:Q=M+4*4096

```

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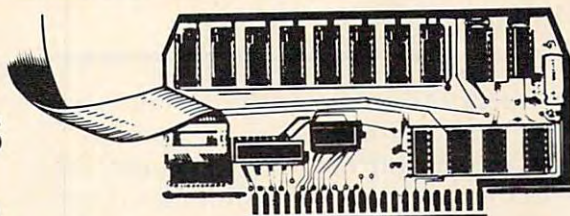
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VIC/64 Clock

Paul F. Schatz

The Commodore 64's CIA chip features a 24-hour time-of-day clock with programmable alarm. Unlike the jiffy clock, it cannot be interrupted by various I/O functions. The program here creates a clock in the corner of the screen which keeps working while you program or run other BASIC programs. For VIC users, see the accompanying article, "VIC Clock."

Since Commodore introduced the 64, much has been written on the 6566/6567 Video Interface Controller (VIC-II) chip and the 6581 Sound Interface Device (SID) chip. The 6526 Complex Interface Adapter (CIA) chip, another new integrated circuit, introduced with the 64, has largely been ignored. This chip supersedes the 6522 Versatile Interface Adapter (VIA) used in previous Commodore computers. The CIA has several additional features not in the VIA, one of them a 24-hour time-of-day (TOD) clock with programmable alarm.

How The Time-Of-Day Clock Works

The TOD clock consists of four memory registers organized into hours, minutes, seconds, and tenths of seconds. The CIA continuously updates these registers based on an external frequency source. Like most commercial digital clocks, the CIA chip uses the 60 cycles/second (60 Hz) frequency of the voltage in household electric power lines as a source.

The TOD clock is very different from the jiffy clock, which is referenced by the BASIC variables TI and TI\$. The jiffy clock is updated by a carefully timed sequence of instructions in the interrupt service routine of the computer. If the interrupt routine is suspended (as, for example, during cassette loads or saves) or altered, the jiffy clock loses its accuracy. On the other hand, the timing for the TOD clock is independent of the interrupt

routine and is as accurate as the external frequency source. (And the 60Hz line frequency of U.S. electric utilities is extremely accurate.)

Program Operation

This program, "64 Clock," creates a window in the upper-left corner of the screen in which the time is continuously displayed. The machine language program hooks into the interrupt routine, so the display is updated every 1/60 second. After the clock display has been set up and started, other BASIC programs can be run while the clock ticks away. The only limitation is that your program must alter the interrupt pointers.

There are two parts to the program. Lines 10 - 180 set up the machine language routine for the display window. Lines 200 - 530 set the time on the clock. When a number is written into the hours register (line 270), the TOD clock stops and does not restart until a number is written into the tenths-of-a-second register (line 370). The numbers in the TOD registers are in binary coded decimal (BCD) format. Lines 500 - 530 are a subroutine for converting the input data into the proper format for setting the TOD registers.

The default colors for the window display are standard screen color for the characters and white for the background. Thus, if the screen is white, the characters will not be visible. The background color can be changed by entering:

POKE 49263, <color>

where <color> is the number corresponding to one of the 16 colors available on the 64. The position of the window can be changed by entering:

POKE 49207, <column>

where <column> is the number of the column where the window starts. If <column> is 0, the window is in the upper-left corner. If <column> is

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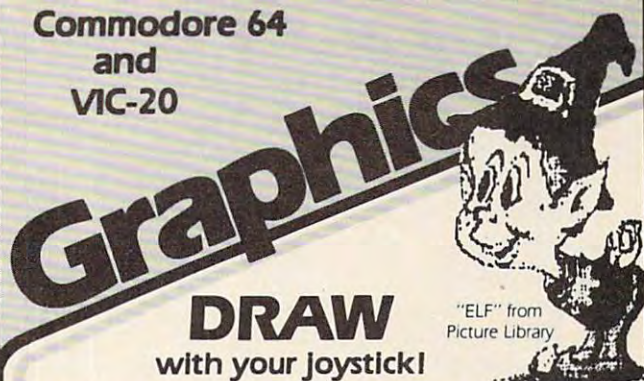
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VIC Clock

Charles Brannon, Program Editor

The Commodore 64's CIA chip is easily programmable for 24-hour time. The timekeeping is independent of any of the computer's other functions. The VIC-20 is equally capable of keeping time, but it has to be done with software.

Every 60th of a second, the VIC's own VIA chip causes an *interrupt*. An interrupt does what the name implies: The 6502 microprocessor stops whatever it's doing and goes on to execute a special interrupt routine. After the interrupt routine is finished, the interrupted program resumes.

During the interrupt, the VIC performs certain "housekeeping" functions. It reads the keyboard, converts the *keyscan code* to normal Commodore ASCII, then places this value in the keyboard buffer. The interrupt also flashes the cursor. And each time the interrupt is called, the interrupt routines increment the *realtime clock*.

The realtime clock uses three memory locations: 160, 161, and 162. The time is stored in sixtieths of a second, since the clock is updated every sixtieth of a second. But a memory location can only hold a value from 0-255, so three locations are used. Every time location 162 wraps around to zero (approximately every four seconds), location 161 is incremented, and when 161 wraps around to zero, location 160 is bumped up by one. Note that the order of the bytes is backward compared to the normal 6502 convention, where the *most significant byte* (the one that goes up after the least significant byte wraps around to zero) follows the least significant byte.

You can read the realtime clock in BASIC without worrying about the memory locations. Two *reserved variables*, TIME and TIME\$, always return the current time. The numeric variable TIME returns the time in sixtieths of a second, and is equivalent to $\text{PEEK}(160) + \text{PEEK}(161) * 256 + \text{PEEK}(162) * 65536$. You can divide it by 60 to get the time in seconds. You cannot change TIME directly, as in $\text{TIME} = 0$, but you can change TIME\$ and that will cause TIME to change.

TIME\$ is a string holding a six-digit

number. The format (as in $\text{TIME\$} = "041020"$) is HHMMSS, where HH is the hours, MM is minutes, and SS is seconds. You must "pad out" unused digits with a zero (01 for one hour). You can directly set TIME\$, and print out the time with $\text{PRINT TIME\$}$. TIME\$ is a 24-hour clock, as in military time, so any hour after noon has 12 added to it. To set the clock to 10:30 a.m. you would write: $\text{TIME\$} = "103000"$, but you would use $\text{TIME\$} = "172500"$ for 5:25 p.m. At midnight, TIME\$ wraps around to "000000". Once you set the time, it keeps counting automatically. Incidentally, you can abbreviate the variables to TI and TI\$.

A Few Caveats

There are a few things to look out for when using this software-updated clock. If the interrupt routine is disabled, then it doesn't have the opportunity to update the clock. Cassette input/output uses the VIA chip for its own purposes, preventing its use for the normal system interrupts. Therefore, the system clock stops during tape I/O and restarts after the tape access is finished. If you are using the clock to keep the time of day, it will lose as much time as the tape routines take. There is no way around this, so keep it in mind.

It may be convenient to have the time always displayed. Program 2, "VIC Clock," lets you do this. You have the option of starting the clock, stopping it, clearing it, and setting the time. The clock is always displayed in the upper left-hand corner of the screen, and nothing will erase it, not even screen scrolls or clears. The displayed clock is separate from the normal realtime clock variables, TI and TI\$, so you can still use them in your program. The clock is added to the interrupt routine discussed above (so it will not update during tape routines either). If you want to turn off the visible clock, just press RUN/STOP-RESTORE.

Look at Program 2 for some details on using the clock and function keys. You can stop the clock with $\text{POKE } 997, 1$ and start it with $\text{POKE } 997, 0$. You can also change the color of the clock digits by $\text{POKEing } 996$ with the same color as you would put into color memory, 0-7.

28, the window is in the upper-right corner. The display may be turned off and on without affecting the time. To turn on the display, enter SYS 49155. To turn off the display, enter SYS 49152. The dis-

play may also be turned off by pressing the RUN/STOP and RESTORE keys simultaneously.

Since there are two CIA chips built into the 64, it is possible to have two TOD clocks. It is also

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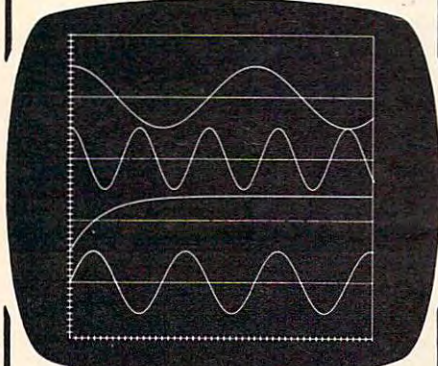
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possible to set an alarm on the TOD clock which triggers an interrupt. More information on the CIA chip and the TOD clock can be found in Appendix M of the *Commodore 64 Programmer's Reference Guide*.

Program 1: 64 Clock

```

10 A=0: FOR I = 49152 TO 49296: READ J: P
   OKE I, J: A = A+J: NEXT I
20 IF A<>16834 THEN PRINT "ERROR IN DATA
   {SPACE}STATEMENTS": END
30 PRINT "{CLR}{DOWN}{RVS}CLOCK FOR C64
   {OFF}"
40 PRINT: PRINT "TO SET THE CLOCK - RUN 2
   00"
50 PRINT "TO CHANGE THE COLOR - POKE 4926
   3,COLOR"
60 PRINT "TO BLANK CLOCK DISPLAY - SYS 49
   152"
70 PRINT "TO ACTIVATE DISPLAY - SYS 49155
   "
80 SYS 49155
90 END
100 DATA 76, 30,192,120,173, 20, 3,141, 2
   8,192,169, 45,141, 20, 3,173, 21
110 DATA 3,141, 29,192,169,192,141, 21, 3
   , 88, 96, 49,234,120,173, 28,192
120 DATA 141, 20, 3,173, 29,192,141, 21, 3
   , 88, 96,173, 24,208, 41,240, 74
130 DATA 74,133,254,169, 0,133,253,160, 0
   ,173, 11,220, 72, 41,127,162,186
140 DATA 32,120,192,173, 10,220, 32,120,1
   92,173, 9,220,162,174, 32,120,192
150 DATA 173, 8,220, 32,137,192,104, 16, 3
   ,169,144, 44,169,129, 32,141,192
160 DATA 169,141,145,253,169,216,133,254,1
   69, 1,145,253,136, 16,251,108, 28
170 DATA 192, 72, 32,133,192,104, 32,137,1
   92,138, 32,141,192, 96, 74, 74, 74
180 DATA 74, 41, 15, 9,176,145,253,200, 9
   6
200 REM CLOCK SETTING ROUTINE
210 PRINT "{CLR}{DOWN}{RVS}SET THE CLOCK
   {SPACE}": PRINT
220 POKE 56335, PEEK(56335) AND 127: REM
   {SPACE}SET TIME OF DAY CLOCK
230 INPUT "AM OR PM"; A$
240 A=128: IF LEFT$(A$,1)="A" THEN A = 0
250 INPUT "HOUR"; A$: IF LEN(A$)>2 THEN P
   RINT "ERROR": GOTO 250
260 GOSUB 500: IF N>18 THEN PRINT "ERROR"
   : GOTO 250
270 POKE 56331, A+N: REM SET HOURS
280 INPUT "MINUTES"; A$: IF LEN(A$)>2 THE
   N PRINT "ERROR": GOTO 280
290 GOSUB 500: IF N>89 THEN PRINT "ERROR"
   : GOTO 280
300 POKE 56330, N: REM SET MINUTES
310 INPUT "SECONDS"; A$: IF LEN(A$)>2 THE
   N PRINT "ERROR": GOTO 310
320 GOSUB 500: IF N>89 THEN PRINT "ERROR"
   : GOTO 310
330 POKE 56329, N: REM SET SECONDS
340 PRINT "WHEN YOU ARE READY TO START TH
   E CLOCK,"
350 PRINT "PRESS ANY KEY."
360 GET A$: IF A$="" THEN 360

```

```

370 POKE 56328,0: REM START CLOCK
380 END
500 IF LEN(A$)=1 THEN T=0: GOTO 520
510 T = VAL(LEFT$(A$,1))
520 U = VAL(RIGHT$(A$,1))
530 N=16*T+U: RETURN

```

Program 2: VIC Clock

by Charles Brannon, Program Editor

```

100 PRINT "{CLR}{RVS}PLEASE WAIT"
110 FOR I=828TO995:READA:POKEI,A:CK=CK+A:N
   EXT
120 IFCK<>20518THENPRINT "{HOME}ERROR IN D
   ATA STATEMENTS":END
125 SYS828
130 PRINT "{CLR}{4 SPACES}{4 DOWN}CHOOSE:
   {DOWN}"
140 PRINT "{4 SPACES}{RVS}{YEL}F1{OFF}:
   {BLU}STOP CLOCK"
150 PRINT "{DOWN}{4 SPACES}{RVS}{RED}F3
   {OFF}{BLU}:START CLOCK"
160 PRINT "{DOWN}{4 SPACES}{RVS}{PUR}F5
   {OFF}{BLU}:CLEAR CLOCK"
165 PRINT "{DOWN}{4 SPACES}{RVS}{GRN}F7
   {OFF}:{BLU}SET TIME"
170 GETA$:IFA$<CHR$(133)ORA$>CHR$(136)THE
   N170
180 ON ASC(A$)-132 GOTO 190,240,250,200
190 POKE 997,1:GOTO 170
200 POKE997,1:INPUT "{CLR}{2 DOWN}HOURS? 0
   0{4 LEFT}";H$:IFLEN(H$)<>2THEN200
210 INPUT "MINUTES? 00{4 LEFT}";M$:IFLEN(M
   $)<>2THEN210
220 INPUT "SECONDS? 00{4 LEFT}";S$:IFLEN(S
   $)<>2THEN220
230 T$=H$+M$+S$+"00":FORI=1TO8:POKE998+I,
   ASC(MID$(T$,I)):NEXT:GOTO130
240 POKE997,0:GOTO170
250 SYS851:POKE997,1:GOTO170
828 DATA 173,020,003,141,226,003
834 DATA 173,021,003,141,227,003
840 DATA 120,169,098,141,020,003
846 DATA 169,003,141,021,003,169
852 DATA 048,162,009,157,230,003
858 DATA 202,208,250,142,229,003
864 DATA 088,096,173,229,003,208
870 DATA 053,162,008,024,189,230
876 DATA 003,105,001,141,228,003
882 DATA 201,058,208,005,169,048
888 DATA 141,228,003,138,041,001
894 DATA 240,012,173,228,003,201
900 DATA 054,208,005,169,048,141
906 DATA 228,003,173,228,003,157
912 DATA 230,003,202,240,007,201
918 DATA 048,208,249,076,105,003
924 DATA 162,008,160,011,173,002
930 DATA 144,010,169,000,133,251
936 DATA 042,010,133,252,133,254
942 DATA 173,005,144,074,074,074
948 DATA 005,252,133,252,169,000
954 DATA 133,253,165,254,009,148
960 DATA 133,254,173,240,003,145
966 DATA 253,189,230,003,009,128
972 DATA 145,251,138,041,001,240
978 DATA 010,136,169,058,145,251
984 DATA 173,240,003,145,253,136
990 DATA 202,208,225,076,049,234

```


A Beginner's Guide To Typing In Programs

What Is A Program?

A computer cannot perform any task by itself. Like a car without gas, a computer has *potential*, but without a program, it isn't going anywhere. Most of the programs published in **COMPUTE!** are written in a computer language called BASIC. BASIC is easy to learn and is built into most computers (on some computers, you have to purchase an optional BASIC cartridge).

BASIC Programs

Each month, **COMPUTE!** publishes programs for many machines. To start out, type in only programs written for your machine, e.g., "TI Version" if you have a TI-99/4. Later, when you gain experience with your computer's BASIC, you can try typing in and converting certain programs from one computer to yours.

Computers can be picky. Unlike the English language, which is full of ambiguities, BASIC usually has only one "right way" of stating something. Every letter, character, or number is significant. A common mistake is substituting a letter such as "O" for the numeral "0", a lowercase "l" for the numeral "1", or an uppercase "B" for the numeral "8". Also, you must enter all punctuation such as colons and commas just as they appear in the magazine. Spacing can be important. To be safe, type in the listings *exactly* as they appear.

Brackets And Special Characters

The exception to this typing rule is when you see the curved bracket, such as "{DOWN}". Anything within a set of brackets is a special character or characters that cannot easily be listed on a printer. When you come across such a special statement, refer to the appropriate key for your computer. For example, if you have an Atari, refer to the "Atari" section in "How to Type **COMPUTE!**'s Programs."

About DATA Statements

Some programs contain a section or sections of DATA statements. These lines provide information needed by the program. Some DATA statements contain actual programs (called machine language); others contain graphics codes. These lines are especially sensitive to errors.

If a single number in any one DATA statement is mistyped, your machine could "lock up," or "crash." The keyboard, break key, and RESET (or STOP) keys may all seem "dead," and the screen

may go blank. Don't panic – no damage is done. To regain control, you have to turn off your computer, then turn it back on. This will erase whatever program was in memory, so always **SAVE** a copy of your program before you **RUN** it. If your computer crashes, you can **LOAD** the program and look for your mistake.

Sometimes a mistyped DATA statement will cause an error message when the program is **RUN**. The error message may refer to the program line that **READs** the data. *The error is still in the DATA statements, though.*

Get To Know Your Machine

You should familiarize yourself with your computer before attempting to type in a program. Learn the statements you use to store and retrieve programs from tape or disk. You'll want to save a copy of your program, so that you won't have to type it in every time you want to use it. Learn to use your machine's editing functions. How do you change a line if you made a mistake? You can always retype the line, but you at least need to know how to backspace. Do you know how to enter inverse video, lowercase, and control characters? It's all explained in your computer's manuals.

A Quick Review

- 1) Type in the program a line at a time, in order. Press RETURN or ENTER at the end of each line. Use backspace or the back arrow to correct mistakes.
- 2) Check the line you've typed against the line in the magazine. You can check the entire program again if you get an error when you **RUN** the program.
- 3) Make sure you've entered statements in brackets as the appropriate control key (see "How To Type **COMPUTE!**'s Programs" elsewhere in the magazine.)

*We regret that we are no longer able to respond to individual inquiries about programs, products, or services appearing in **COMPUTE!** due to increasing publication activity. On those infrequent occasions when a published program contains a typo, the correction will appear on the **CAPUTE!** page, usually within eight weeks. If you have specific questions about items or programs which you've seen in **COMPUTE!**, please send them to Readers Feedback, P.O. Box 5406, Greensboro, NC 27403.*



How To Type COMPUTE!'s Programs

Many of the programs which are listed in **COMPUTE!** contain special control characters (cursor control, color keys, inverse video, etc.). To make it easy to tell exactly what to type when entering one of these programs into your computer, we have established the following listing conventions. There is a separate key for each computer. Refer to the appropriate tables when you come across an unusual symbol in a program listing. If you are unsure how to actually enter a control character, consult your computer's manuals.

Atari 400/800

Characters in inverse video will appear like: **INVERSE-VIDEO**. Enter these characters with the Atari logo key, {A}.

When you see	Type	See
{CLEAR}	ESC SHIFT <	↵ Clear Screen
{UP}	ESC CTRL -	↑ Cursor Up
{DOWN}	ESC CTRL =	↓ Cursor Down
{LEFT}	ESC CTRL +	← Cursor Left
{RIGHT}	ESC CTRL *	→ Cursor Right
{BACK S}	ESC DELETE	␣ Backspace
{DELETE}	ESC CTRL DELETE	␣ Delete character
{INSERT}	ESC CTRL INSERT	␣ Insert character
{DEL LINE}	ESC SHIFT DELETE	␣ Delete line
{INS LINE}	ESC SHIFT INSERT	␣ Insert line
{TAB}	ESC TAB	␣ TAB key
{CLR TAB}	ESC CTRL TAB	␣ Clear tab
{SET TAB}	ESC SHIFT TAB	␣ Set tab stop
{BELL}	ESC CTRL 2	␣ Ring buzzer
{ESC}	ESC ESC	␣ ESCape key

Graphics characters, such as CTRL-T, the ball character ● will appear as the "normal" letter enclosed in braces, e.g. {T}.

A series of identical control characters, such as 10 spaces, three cursor-lefts, or 20 CTRL-R's, will appear as {10 SPACES}, {3 LEFT}, {20 R}, etc. If the character in braces is in inverse video, that character or characters should be entered with the Atari logo key. For example, {■} means to enter a reverse-field heart with CTRL-comma, {5■} means to enter five inverse-video CTRL-U's.

Commodore PET/CBM/VIC/64

Generally, any PET/CBM/VIC/64 program listings will contain words within braces which spell out any special characters: {DOWN} would mean to press the cursor down key. {5 SPACES} would mean to press the space bar five times.

To indicate that a key should be *shifted* (hold down the SHIFT key while pressing the other key), the key would be underlined in our listings. For example, S would mean to type the S key while holding the shift key. If you find an underlined key enclosed in braces (e.g., {10 N}), you should type the key as many times as indicated (in our example, you would enter ten shifted N's). Some graphics characters are inaccessible from the keyboard on CBM Business models (32N, 8032).

For the VIC and 64, if a key is enclosed in special brackets, [>], you should hold down the *Commodore key* while pressing the key inside the special brackets. (The Commodore key is the key in the lower left corner of the keyboard.) Again, if the key is preceded by a number, you should press the key as many times as indicated.

Rarely, you'll see in a Commodore 64 program a solitary letter of the alphabet enclosed in braces. These characters can be entered by holding down the CTRL key while typing the letter in the braces. For example, {A} would indicate that you should press CTRL-A.

About the *quote mode*: you know that you can move the cursor around the screen with the CRSR keys. Sometimes a programmer will want to move the cursor under program control. That's why you see all the {LEFT}'s, {HOME}'s, and {BLU}'s in our programs. The only way the computer

can tell the difference between direct and programmed cursor control is the quote mode.

Once you press the quote (the double quote, SHIFT-2), you are in the quote mode. If you type something and then try to change it by moving the cursor left, you'll only get a bunch of reverse-video lines. These are the symbols for cursor left. The only editing key that isn't programmable is the DEL key; you can still use DEL to back up and edit the line. Once you type another quote, you are out of quote mode.

You also go into quote mode when you INSerT spaces into a line. In any case, the easiest way to get out of quote mode is to just press RETURN. You'll then be out of quote mode and you can cursor up to the mistyped line and fix it.

Use the following tables when entering special characters:

When You Read:	Press:	See:	When You Read:	Press:	See:
{CLEAR}	SHIFT CLR/HOME	↵	{GRN}	CTRL 6	⬆
{HOME}	CLR/HOME	⬅	{BLU}	CTRL 7	⬅
{UP}	SHIFT ↑ CRSR	↑	{YEL}	CTRL 8	⬆
{DOWN}	↓ CRSR	↓	{F1}	f1	⬆
{LEFT}	SHIFT ← CRSR	←	{F2}	f2	⬆
{RIGHT}	→ CRSR	→	{F3}	f3	⬆
{RVS}	CTRL 9	⬆	{F4}	f4	⬆
{OFF}	CTRL 0	⬆	{F5}	f5	⬆
{BLK}	CTRL 1	⬆	{F6}	f6	⬆
{WHT}	CTRL 2	⬆	{F7}	f7	⬆
{RED}	CTRL 3	⬆	{F8}	f8	⬆
{CYN}	CTRL 4	⬆			⬆
{PUR}	CTRL 5	⬆			⬆

All Commodore Machines

Clear Screen {CLR}	Cursor Left {LEFT}
Home Cursor {HOME}	Insert Character {INST}
Cursor Up {UP}	Delete Character {DEL}
Cursor Down {DOWN}	Reverse Field On {RVS}
Cursor Right {RIGHT}	Reverse Field Off {OFF}

Apple II / Apple II Plus

All programs are in Applesoft BASIC, unless otherwise stated. Control characters are printed as the "normal" character enclosed in brackets, such as {D} for CTRL-D. Hold down CTRL while pressing the control key. You will not see the special character on the screen.

Texas Instruments 99/4

The only special characters used are in PRINT statements to indicate where two or more spaces should be left between words. For example, ENERGY {10 SPACES} MANAGEMENT means that ten spaces should be left between the words ENERGY and MANAGEMENT. Do not type in the braces or the words 10 SPACES. Enter all programs with the ALPHA LOCK on (in the down position). Release the ALPHA LOCK to enter lowercase text.

CAPUTE!

Modifications Or Corrections To Previous Articles

64 Blockhead

The program we use to generate listings caused several typographical errors in the 64 version of this game (August 1983, p. 106). The corrections are as follows:

```
770 PRINT"{HOME}{3 DOWN}{7 RIGHT}{BLK}OOP
    S1":SC=SC-5:FOR T=1 TO 100:NEXT T:PRINT"
    {HOME}{7 RIGHT}{3 DOWN}{5 SPACES}"
820 PRINT"{HOME}{15 RIGHT}{BLK}SCORE";"
    {5 SPACES}";
830 PRINT"{HOME}{15 RIGHT}{BLK}SCORE";SC
```

Atari Blockhead

Readers who have had difficulty typing in the characters in line 51 of Program 1 (p. 102) may prefer to substitute the following lines, which build B\$ from DATA statements:

```
51 RESTORE 53
52 FOR I=1 TO 36:READ C:B$(I,I)=CHR$(
    C):NEXT I
53 DATA 104,165,89,133,215
54 DATA 165,88,133,214,169,0
55 DATA 133,212,133,213,162,0
56 DATA 160,0,177,214,201,84
57 DATA 208,1,232,200,152,201
58 DATA 0,208,243,138,133,212,96
```

VIC Mystery Spell

The VIC version (Program 3) of this educational game (September 1983, p. 126) allows you to enter your own word practice lists but resets to the original list after the first word. To allow additional words from your own lists, Raymond Neiford suggests adding the following lines:

```
102 COUNT=0:WR=0
103 GOSUB 1120
5012 IF M$="Y" THEN 102
```

Sprite Editor For TI

Reader Jim Van Scyoc suggests the following changes to correct minor flaws in the sprite editor utility (September 1983, p. 258) and make it easier to use:

```
110 DIM B(16,16):: SC=8
265 KCHAR=100
1005 CALL SCREEN(8)
```

Coupon File For Atari And TI

For the BASIC discount coupon filing program from the October 1983 issue (p. 52) to work properly on the Atari, the following additional line is required:

```
505 DIM K$(1),A$(3),B$(20),C$(20),D$(10),
    E$(20)
```

The program as presented will work on the TI-99 only in Extended BASIC. In console BASIC, THEN can be followed only by a line number. Changing the IF-THEN GOTO statements involves only removing the GOTO command, but replacing the IF-THEN GOSUB lines requires replacing the RETURNS with appropriate GOTOS.

64 Spiralizer

The 64 version of this graphics program from the October 1983 issue (Program 6, p. 196) contains a number of errors. The B's in line 30 should be replaced with SHIFTed B's. The A\$ in line 145 should be replaced with X\$. In line 203, change SYS 50012 to SYS 50039. In line 205, change SYS 50120 to SYS 50147. Thanks to Bill Crouch of the Central Florida Commodore Users Group for pointing this out.

Mosaic Puzzle

Users of all versions of this game from the October 1983 issue (p. 90) should be aware that not all goal patterns can be reached from a given starting pattern. In particular, if you reach a point where you need only switch the position of two tiles to match the goal and those two remaining tiles are side by side, then the goal pattern cannot be reached.

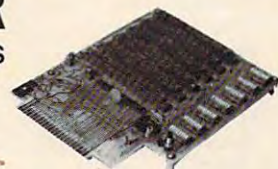
Program 2 from October, which should have been the 64 version, was actually a repeat of the VIC version. See the article "64 Mosaic Puzzle" in this issue for the correct Commodore 64 program.

64 Character Creator

This program (October 1983, p. 312) fails to fill color memory. This causes no problems on older 64s, but will render the character design grid drawn in the lower right of the screen invisible on newer models. Reader Patrick Malloy suggests the following corrections and addition to provide a simple fix:

```
29 IFL>0ORF=1THEN38
38 POKE 53281,14:PRINT CHR$(147);:POKE 53
    281,6
39 PRINT SPC(20)"IN MULTI-COLOR MODE" ©
```

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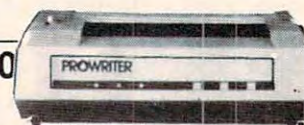
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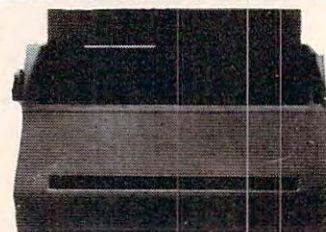
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NEWS & PRODUCTS

Buffered Programmable Printer Interface

Advanced Interface Devices has produced the Interfast-I, a 4K buffered programmable printer interface for Atari computers.

The device is compatible with the Atari 850 Interface Module printer port and requires no modification to the computer. The data transfer rate from the computer to the Interfast-I is comparable to disk transfer rates. Many program listings and text files can be dumped to the device in a few seconds, then the computer is free to work while the Interfast-I handles the printing.

The interface, which sells for \$169.95, also can be programmed for advanced printing applications on printers with graphics capabilities.

Advanced Interface Devices, Inc.
P.O. Box 2188
Melbourne, FL 32902



The Interfast-I is a programmable printer interface for Atari computers.

Home Automation With A VIC

The VIC 20 Connection, a Sybex book by James W. Coffron, discusses the techniques necessary to interface a VIC-20 with home appliances.

The 260-page book examines computer input/output, analog-to-digital conversion, and other elements necessary in connecting appliances to a computer. Applications discussed in the book include a home security system, a temperature control system, and voice synthesis.

The book sells for \$7.95. Add \$2 for shipping and handling.

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Arithmetic Tutor

Merritt Software has released *MathWiz*, a math tutorial pro-

gram for Commodore computer systems.

The program provides instruction and drill in borrowing from whole numbers, finding common factors, and reducing common fractions.

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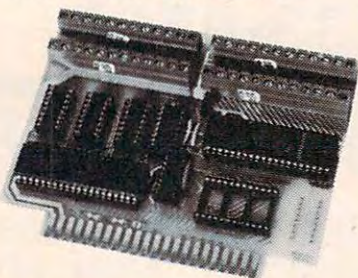
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More Power To BASIC

Amper-Magic is a program for the Apple II that allows BASIC programmers to add new commands to Applesoft without knowing machine language.

The program uses the ampersand (&) function to access machine language routines by name, without the need to know their addresses. *Amper-Magic* routines become part of your program; no separate BLOAD instructions are required.

The first volume of the program, which sells for \$75, provides 23 machine language routines. Volume Two, available for \$35, adds 27 more commands, including a flexible PRINT USING command.

Anthro-Digital, Inc.
P.O. Box 1385
Pittsfield, MA 01202
(413) 448-8278

Word And Number Programs For VIC, 64

Baned Software has produced a package of five programs designed to help 10- to 12-year-olds learn the parts of speech and math facts.

The programs are available for the VIC with 8K expansion or the Commodore 64 for \$9.95 each, or \$34.95 for the complete set.

Nouns and Verbs and *Adjectives and Adverbs* teach the parts of speech in isolation or in context. *Rocket Launch* is a game that teaches spelling and vocabulary skills. *Add Speed* enhances addition skills, and *Math Squares* in-

volves patterns of numbers in a three-by-three matrix with one entry missing.

The programs can be played by one to four players at varying levels of difficulty.

Baned Software
113 Tenth St.
West Keansburg, NY 07734

Typing Tutor For Keyboard Novices

Sprint Typer, a typing tutor for the unexpanded VIC-20, is available from Computer Software Associates.

The program was designed for the novice typist who wants to learn touch-typing. *Sprint Typer* generates a sentence which the user types. The computer then reports typing speed and the number of errors.

The program, which is available on tape, sells for \$19.95.

MicroSoftware International Inc.
50 Teed Drive
Randolph, MA 02368
(617) 961-5700

Atari Strategy Game

Devil's Dare is a skill and strategy game for Atari computers from Jay Gee Programming.

The game, played on a simulated checkerboard, involves getting five tokens in a row before the computer does. It can be played by one to four persons, each of whom must have a joystick.

Devil's Dare includes 12 board sizes and 3 skill levels. Players can choose to play against each other, or they can gang up and take on the computer as a team.

The game is available for \$19.95 plus \$3 for shipping and handling.

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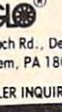
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Omnimon! is a monitor for the Atari 400/800 computers that comes on a PC board and is installed permanently into the computer. Because it resides in the unused \$C000 page, it takes no user memory.

Omnimon! can be entered at any time, and will display the program counter, registers, and stack pointer. The program has flexible disk input/output operations that are independent of DOS. It includes a complete set of debugging tools, and it allows you to dump memory off to disk or to a printer.

Omnimon! is available for \$99.95.

CDY Consulting
421 Hanbee
Richardson, TX 75080
(214) 235-2146

Atari Renumbering Program

S M Fabac has released a *BASIC Renumbering Program* for Atari 400 and 800 computers.

The program occupies 1280 bytes of RAM and can be located anywhere at the time it is loaded.

The program is supplied on tape for \$19.95, and it can be transferred to disk if available.

S M Fabac Company
910 East Fifth Terrace
Lee's Summit, MO 64063

Computer Animation Software

MovieMaker is a program that allows Apple or Atari users to create animated computer movies.

The program, which is designed to be used by the non-programmer, sells for \$60.

The Atari version includes a data disk filled with preprogrammed shapes. A 16K Atari ROM cartridge version is expected to be available by year's end for \$40.

Reston Computer Group
11480 Sunset Hills Road
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Investment Techniques For The 64

The Wizards has introduced *How to Make Good Investments*, an instructional program on investment and financial analysis.

The program, which includes a 50-page text and program cassette, is designed for the beginning or occasional investor. More advanced courses

are expected to follow.

How to Make Good Investments is available for \$39.95.

The Wizards
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Casino Roulette is a betting game from Powerline Software. The program produces a roulette board display and distributes chips as bets are placed.

Options for American or European play are available, and the game will accommodate up to five players. Each player may wager as many as 60 bets.

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Powerline Software
P.O. Box 635
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The *Orion BASIC Programming* package is a series of four disks which include instruction in computer use and BASIC programming.

The package, for the Apple II and Apple IIe computers, also features an interactive, self-paced design, easy selection of any module within a lesson, help screens, and a quiz module that is scored and evaluated by the computer.

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Drive 1, complete with filer DOS 3.3, controller, cable, and documentation, sells for \$399.95.

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1530 South Sinclair
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The L-Monitor, a microammeter, attaches between your Timex/Sinclair computer and your cassette recorder. The device assures first-time program LOADs, and monitors SAVEs.

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L-Monitor
819 Kenyon Lane
Newark, DE 19711



The L-Monitor, a microammeter used to improve transfer of data to or from cassette tape, comes in an assembled version, left, or in kit form.

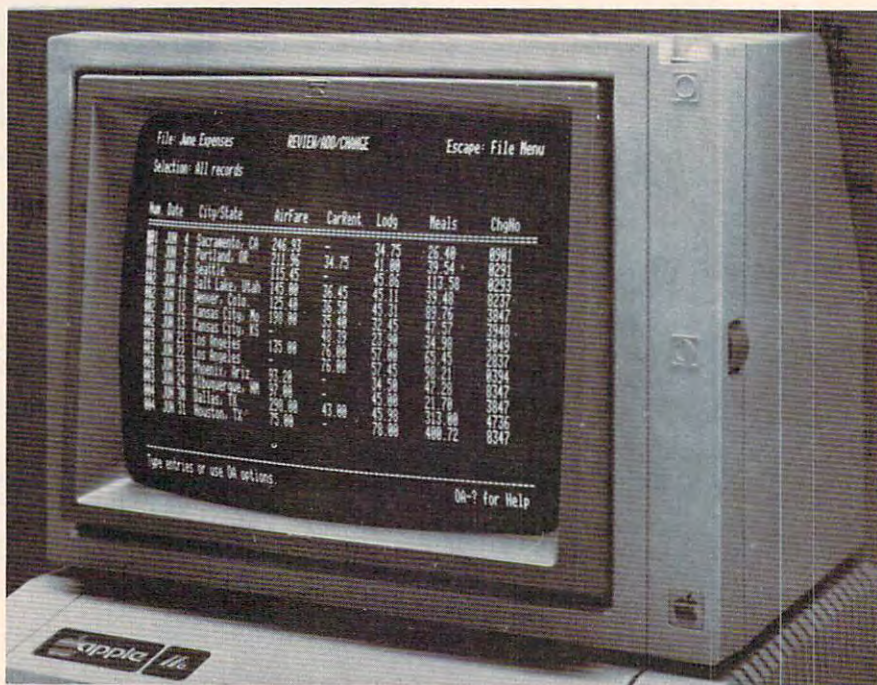
Monitor For Apple II

Apple has produced a new-monochrome monitor for the Apple II family of computers.

The new monitor features improved resolution for 80-column text and graphics display, an anti-reflective, high-contrast screen, and a tilt mechanism for adjusting the screen's angle.

The 12-inch monitor displays 24 lines of 80 characters in high-resolution P31 green phosphor. The monitor carries a suggested retail price of \$229.

Apple Computer, Inc.
10260 Bandley Drive
Cupertino, CA 95014
(408) 996-1010



Apple's new 12-inch monochrome monitor includes a tilt mechanism to adjust the angle of the screen.

Software For The Schoolhouse

Melcher Software has produced a series of programs applicable to schoolwork, in both the administrative offices and the classroom.

The programs, available for the Commodore PET or 64, include the following.

Compugrade is a gradebook program that can handle letter

grades (plus and minus permissible) and a variety of other options. A number of classes can be entered at one time, and reports are available on screen or printer. The price of the program ranges from \$16.95 to \$24.95 depending on available memory and recording medium.

Stat is designed to help teach statistics. The program includes several subprograms, including a bar graph generator, binomial frequencies, confidence inter-

vals, comparison of means, chi-square, correlation coefficient, linear regression equation, the Central Limit Theorem, and analysis of variance. *Stat* is available for \$24.95.

Comp is an arithmetic drill program that includes four levels of difficulty, arranged as follows:
1. No decimals, no negative numbers; 2. Decimals, no negative numbers; 3. Negative numbers, no decimals; and 4. Decimals and negative numbers.

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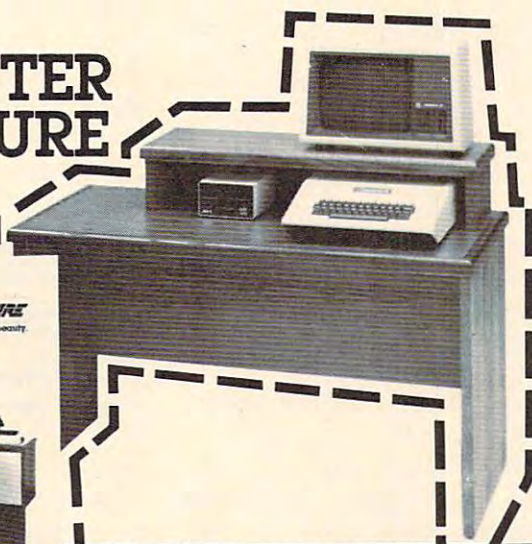
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Besides choosing a difficulty level, the player can choose any one of the four standard arithmetic operations or a combination of all. The program is available for \$14.95 on tape, \$19.95 on disk.

For the younger student, or even the preschooler, *Letters for Little Ones* provides a pair of educational games. *Spell With Clues* asks questions at random from a series of easy-to-customize questions, and *Speed Letters* is a game designed to develop eye coordination and letter recognition. The program sells for \$9.99 on tape, \$14.99 on disk.

The Attendance Master is an administrative program that can keep attendance records for up to 39 students per class and an unlimited number of classes. The program sells for \$39.95. Another administrative program, *Log*, is an easy-to-use event logging aid. All events for a given date can be listed, all events pertaining to a single person can be listed, or all events can be listed. *Log*, which sells for \$9.95, is available for the Apple II and Apple IIe as well as the PET and Commodore 64.

Add \$2 shipping and handling for any Melcher Software program.

Melcher Software
P.O. Box 213
Midland, MI 48640

CP/M For The TI

Morning Star Software has announced production of a CP/M processor for the TI-99/4A.

The processor, which slips into the expansion box like any expansion card, comes with 64K RAM plus an 8K operating system. Suggested price for the processor is \$595.

Morning Star Software
4325 109th Ave.
Beaverton, OR 97005
1-800-824-2412

Game Controller

Wico has introduced The Boss joystick, a low-priced game controller compatible with a number of computer systems.

The Boss, which sells for \$19.95, is constructed of high-impact plastic, and includes a thumb-action fire button and nonskid rubber feet for table-top play.

The joystick works without modification on the Atari, Commodore 64, and VIC-20 computers. With adapters, it is compatible with the TRS-80 Color Computer, Texas Instruments, and Apple computers.

Wico Corporation
6400 W. Gross Point Road
Niles, IL 60648

Commodore 64 Mailing List

Mail Now from Cardco is a Commodore 64 mailing list program that is designed to be used with the *Write Now* word processor.

The all machine language program is menu-driven; can print single, double, or triple labels; includes an optionally printable 30-character comment line; handles up to 600 entries; and sorts by zip code, category, last name, or state. The search function includes a wildcard option.

Mail Now is available for \$39.95.

Write Now, Cardco's word processing program, is available on cartridge for the VIC and 64. Its features include optional justification and text centering, multiple-line headers and footers, tape or disk storage, text scrolling, block commands, and global searches.

Write Now also allows special characters to be sent to the printer, and will number pages in either Arabic or Roman numerals. The Commodore 64 ver-

sion is available for \$49.95, the VIC-20 version sells for \$39.95.

Cardco, Inc.
313 Mathewson Ave.
Wichita, KS 67214

Learning Games

Sierra On-Line has introduced four new learning games for the Apple, Atari, VIC-20, and Commodore 64 computers.

Learning With Leeper is designed to teach basic skills to children below reading age. Among the games provided in the program are *Dog Count*, in which bones are fed to hungry dogs; *Balloon Pop*, in which shapes are matched; and *Leap Frog*, in which the child helps a lost frog through a maze.

Bop-a-Bet is an action game that teaches letter recognition and alphabetization. The speed of the game increases as the child becomes more proficient.

Dragon's Keep and *Troll's Tale* are adventure games with vocabularies designed for second and third graders respectively. Both games provide practice in reading comprehension and mapping.

Sierra On-Line, Inc.
Coarsegold, CA 93614
(209) 683-6858

Karate Simulation For Commodore 64

Attack of the Phantom Karate Devils, an arcade-style martial arts simulation game, is available from Phantom Software.

The player uses a joystick to control the hero as he uses punches, flying kicks, and jumps to fend off the marauding ninjas.

The game, available for the Commodore 64, sells for \$34.95.

Other Commodore 64 games forthcoming from Phantom include *Surf*, a surfing simulation, and *Particle Beam War*, a space



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VIC Expansion

PC Specialties has released a six-slot expander board and a memory expansion board for the VIC-20.

The VM101 expander board includes a rotary switch that can shut off the eight data lines from three of the slots, leaving auto-start game cartridges plugged in.

The board's other three slots feature an octal bus transceiver that buffers all data lines into and out of memory expansion or I/O interfaces. It also includes a reset switch to regain keyboard control when RUN/STOP-RESTORE won't.

The cost of the board is \$87.

The VM201 memory expander is available in 8K, 16K, or 24K configurations. The 8K board sells for \$59, and additional memory can be added for \$28 per 8K block.

PC Specialties
P.O. Box 23
Fleming, PA 16835

BASIC Enhancement And Assembler For Commodore 64

Pro-Line Software has introduced *PAL 64*, a full-featured 6502 assembler which uses only 4K of memory, and *Power 64*, which adds versatility to the BASIC language.

PAL 64 source programs are typed in using the standard

BASIC editor. The program includes symbol reassignment, source file chaining, conditional assembly, a recursive expression evaluator, and automatically relocatable programs. The program sells for \$99.95.

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Programs With Everything

Sim Computer Products has introduced a series of programs called "Inside BASIC" for the VIC-20 and Commodore 64.

Described as "programs with the works," each title comes with complete documentation including a programming overview, suggested changes, line-by-line program descriptions, listings, and variable charts.

The first four titles are: *Kentucky Derby*, a horse racing and betting game; *Number Jotto*, a

number guessing game; *Form Generator*, a program that allows you to set up custom forms from labels to invoices; and *Quiz Me*, in which the computer presents information, then asks questions and gives you a score.

Kentucky Derby and *Form Generator* sell for \$19.95. *Quiz Me* and *Number Jotto* sell for \$14.95. Add \$5 for disk versions.

Forthcoming programs in the Inside BASIC Series include *Appointments*, *Task Organizer*, *Data Filer*, *Math Graph*, *Word Match*, and *Vektron*.

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Statistical System For VIC And 64

Com-Stat is a statistical system that allows data to be entered, edited, and stored.

Once entered, the data can be analyzed by any of several statistical procedures: means or standard deviations, bivariate statistics, multiple regression, stepwise regression, scatter plots, contingency table analysis, one-way analysis of variance, or paired or unpaired t-tests.

The menu-driven system sells for \$59.95.

Dr. Jerry L. Hintze
865 East 400 North
Kaysville, UT 84037
(801) 546-0445

Computer Bible Study

Bible Trip, a Smoky Mountain Software program for the Commodore 64, tests your knowledge of Bible history and geography.

Your spaceship has been caught in a time warp and you find yourself in Palestine during the first century. The computer asks you to locate Bible characters. If you know your way around Palestine, you accomplish your mission quickly.

Bible Trip is available on tape for \$9.95, or on disk for \$14.95.

Another program available from Smoky Mountain is *The*

Grade Manager, a full-featured grade book management program for the VIC and 64.

The program can sort student files, keep track of assignments and grades, calculate averages, and provide reports to a printer or the screen.

The program is available on disk for \$34.95, or on tape for \$29.95. The VIC version requires 8K memory expansion.

Smoky Mountain Software
54 West Main St.
Brevard, NC 28712
(704) 883-2595

Data Base Management

Flex File 2.1 is a data base management system for the VIC and 64 by Michael Riley. It offers the same features available in earlier versions for larger Commodore machines.

A whole disk can be used for files. Records can have up to 20 fields and 254 characters. The program includes 16 menu-driven subprograms totaling about 97K.

Advanced editing features include replicate, goto, browse, snapshot, and wipe. Records may be selected by testing any field against any combination of up to 20 of any nine equality types — equals, less than, greater than, precedes, follows, etc. Wild cards also are supported.

The \$110 program provides extensive user control over printed format.

Webber Software
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Check The Time

C-64 World Clock is a program which plots a high-resolution graphic map of the world and

calculates world times. The program corrects for Daylight Saving Time and plots the apparent position of the sun relative to the earth.

C-64 World Clock is available for the Commodore 64 on tape for \$7.95, or on disk for \$10.95. Add \$2 for shipping and handling.

RAK Electronics
Box 1585
Orange Park, FL 32067

VIC And 64 Games

Three games for the unexpanded VIC-20 and one for the Commodore 64 are available from Microdigital.

Gridder is an arcade-style, grid-chase game. The player controls a painter whose job is to paint squares in a maze grid. The painting task is complicated by the presence of chasers, who attempt to end the painter's work.

Pinball Wizard features one or two players in a pinball game that looks and operates like the real thing.

Skramble! is an air-strike game which requires a player to fight for survival against eight different enemy defenses.

Each of these games is programmed in machine language for the VIC-20. Tape versions are available for \$19.95; disk versions cost \$24.95.

Snakman, a popular VIC-20 game, is now available for the Commodore 64. The 64 version of this maze-chase game makes full use of sprite graphics and music. The machine language game gets faster and faster as the score builds. *Snakman* for the 64 is available on disk or tape for \$24.95.

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Numeric Keypad For VIC And 64

Computer Place has designed a numeric keypad for the Commodore 64 and VIC-20 computers. The keypad is designed with low-profile key switches for smooth, reliable data entry. The \$69.95 pad connects in parallel with the existing keyboard connector.

Also available from Computer Place is a VIC-20 expansion board that includes four connector slots, a system reset switch, individual slot on/off switches, an external power supply hookup, and a fuse for overload protection. The expansion board sells for \$54.95.

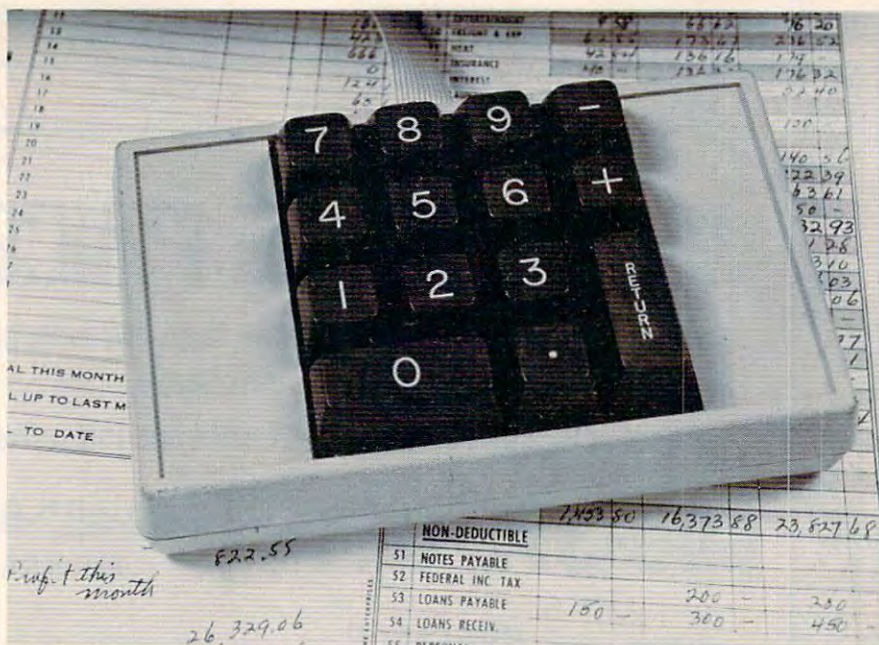
Computer Place
23914 Crenshaw Boulevard
Torrance, CA 90505
(213) 325-4754

Video Pinball, War Simulation

Strategic Simulations, Inc., has released a new game, *Queen of Hearts*, and a Commodore 64 version of *Knights of the Desert*.

Queen of Hearts, a video pinball game with hi-res graphics and arcade-style action, features sequential scoring like real pinball games, a variety of flippers, a "tilt," and a scoreboard that handles up to four players. It also keeps an all-time high score. Available on 48K disk for the Apple II, II+, IIe, III, and the Atari 400/800/1200 for \$39.95.

A Commodore 64 version of *Knights of the Desert* is now available. Previously released for the Apple, Atari, and TRS-80, this World War II simulation recreates the North African campaign in which British troops held off the advance of Rommel's Panzer Divisions. The game is for two players or one player battling the computer (the



The CP Numeric Keypad is available for both the VIC and 64.

British). Several phases per player movement are required. *Knights of the Desert* comes with rulebook, map, and disk or tape for \$39.95.

Strategic Simulations, Inc.
883 Stierlin Road, Bldg. A-200
Mountain View, CA 94043
(415) 964-1353

Atari Programming Lessons

Educational Software, Inc., has added to its "Tricky Tutorial" line of programs for Atari computers.

The new programs, which sell for \$19.95 to \$39.95, include *Character Graphics*, *GTIA Graphics*, *Sound Effects*, *Memory Map Tutorial*, *BASIC Programming Tools*, and *Advanced Programming Tools*.

Educational Software, Inc.
4565 Cherryvale Ave.
Soquel, CA 95073

Holiday Games For TI And 64

KIDware has produced a pair of winter holiday games for young

children.

Santa's Reindeer, which includes music and colorful graphics, is a concentration-type game for children ages 5 to 9. Players are asked to help Santa remember where he left his reindeer. In *Build a Snowman*, up to four players race to see who can complete a snowman first.

Both games, which are available for Commodore 64 and the TI-99/4A computers, are supplied on a single tape for \$10.95. The TI version that includes speech can be ordered if a speech synthesizer and Terminal Emulator II module are available.

KIDware
Box 1664
Idaho Falls, ID 83401

Educational Games

Three new educational programs from Learning Well have been released. *Space Math*, for children in grades one through six, creates an outer space scenario in which the Zorlyns are attacking Earth. A correct answer to a variety of addition, subtraction, multiplication, and division problems lets

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the student shoot at the invaders. Available for \$49.95 for the Atari 800/1200 and the Apple II/Ile.

Jungle Rescue Spelling is for elementary (grades one to four) or middle (grades five to eight) school children. A correct spelling lets the student rescue a monkey from a blazing jungle with the aid of a helicopter. The program allows either multiple choice or typing in the correct spelling. For up to six players, the game is written for the Apple II/Ile and available for \$49.95.

That's My Story, a creative writing program for one or more student authors, creates the beginning of a story which students then continue. Many extra features are included. The package contains two double-sided disks for use on Apple II/Ile computers and is available for \$59.95.

Learning Well
200 South Service Road
Roslyn Heights, NY 11577
(516) 621-1540

World War II Strategy For Atari

Bröderbund Software has released *Operation Whirlwind*, a military strategy game for Atari computers.

A typical game, which lasts between one and three hours, involves moving your battalion through several skirmishes. The orders at your disposal include command, movement, combat, assault order, and assault. Your victory, should you achieve it, can be designated in one of five ways: questionable, marginal, tactical, strategic, or breakthrough.

Operation Whirlwind, which includes sound effects and graphics, is designed to appeal to both novice and advanced game players. The game sells for \$39.95.

Bröderbund Software
1938 4th St.
San Rafael, CA 94901

New Color Computers

Radio Shack has introduced its 64K Extended BASIC Color Computer and its 16K Color Computer 2.

The 64K Color Computer, described as the heart of a disk-based color graphics system, sells for \$399.95. Unexpanded the computer can address 32K. With the addition of the Color 2 Disk Kit (\$399.95) and the OS-9 operating system (\$69.95), the full 64K of memory can be used.

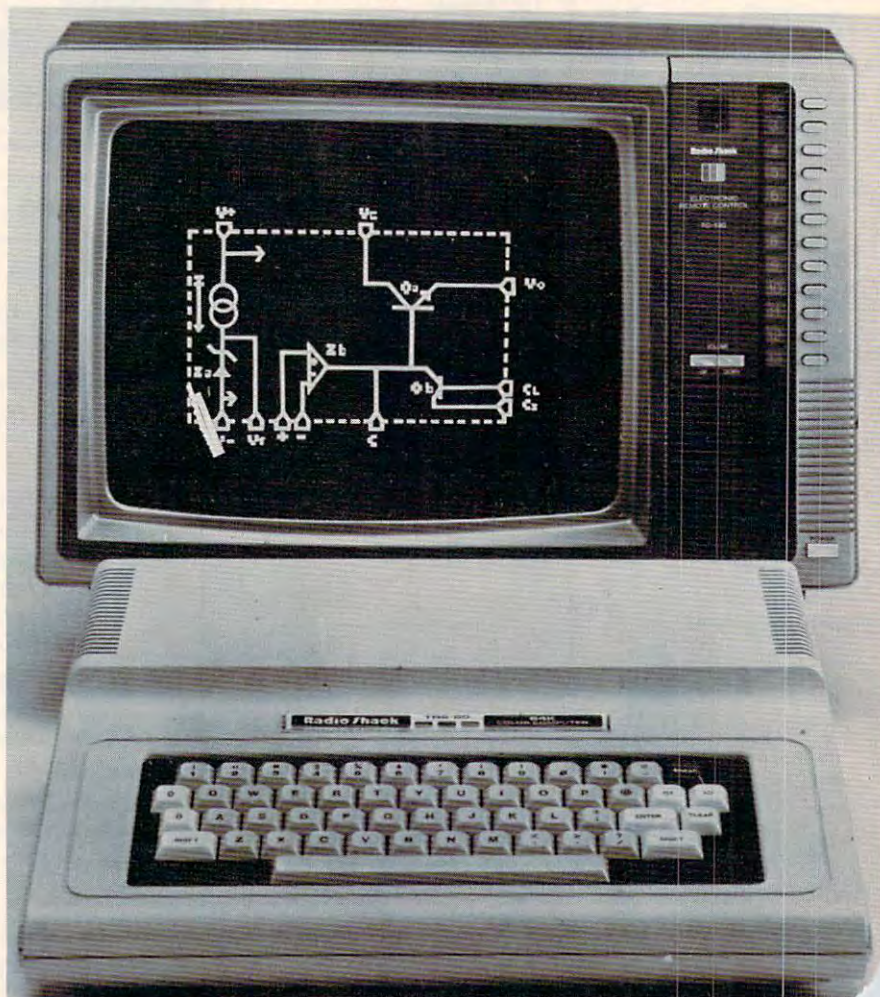
The 64K Color Computer comes in a white case with an electric typewriter-like keyboard. Programming features include multicharacter variable names, string arrays of up to 255 characters, trace, floating point 9-digit

accuracy, trigonometric functions, user-definable keys, and PEEK, POKE, and USR commands. Up to four disk drives can be attached to the computer.

The Color Computer 2, also encased in white with a full-stroke keyboard, is available in two versions. The standard version sells for \$239.95, and the extended version sells for \$319.95. Both models are designed for use with a cassette recorder as a mass storage device.

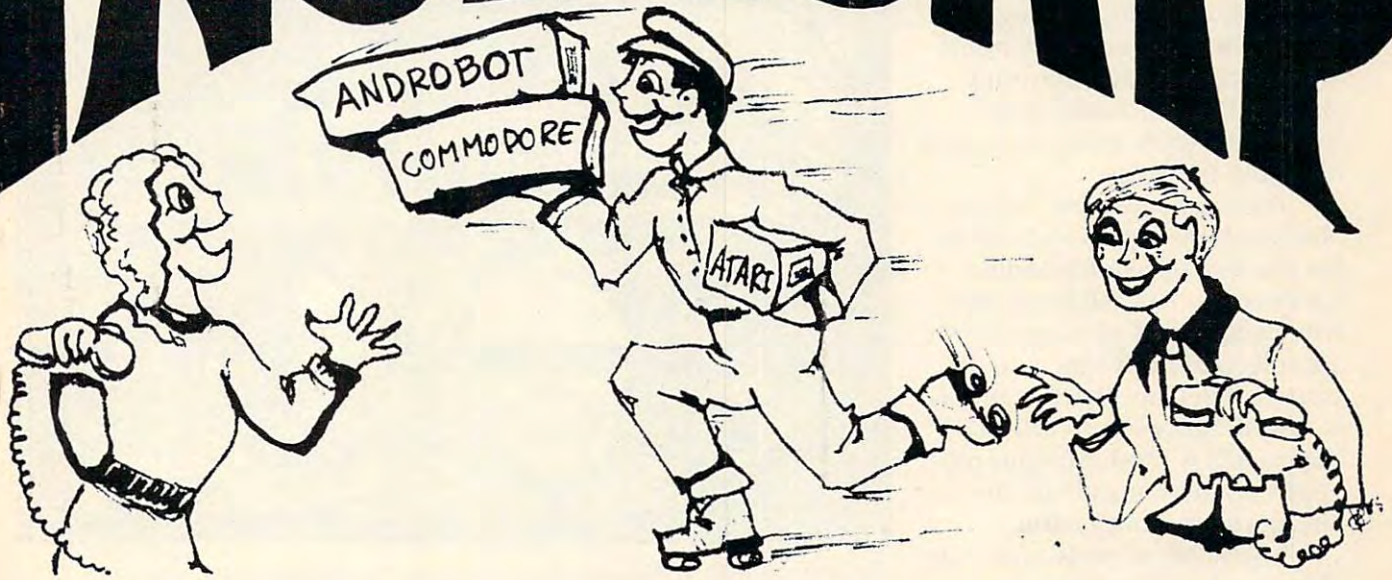
The Extended Color Computer 2 offers additional programming capabilities, including PEEK, POKE, and USR commands, multicharacter variable names, and one-line commands for creation of high-resolution graphics.

Tandy Corporation/Radio Shack
1800 One Tandy Center
Fort Worth, TX 76102



Radio Shack's 64K Color Computer comes in a white case with a redesigned keyboard.

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Surviving The Slot Machine

Randomn, an action-strategy game in which your opponents are determined by a spinning slot machine, is available for \$39.95 for Apple computers from Magnum Software.

As you begin, the "Mystic Slot Machine" spins and selects for you one of seven possible adversaries. At each level, the wheels turn and new opponents are selected. Each time you advance a level, another antagonist is added. Since the selection of opponents is random, your foes might be all identical, all different, or any combination.

The random decisions of the "Mystic Slot Machine" take you through seven worlds of seven levels, each including a graveyard, Stonehenge, and outer space.

Magnum Software
21115 Devonshire St., Suite 337
Chatsworth, CA 91311
(213) 700-0510

New Games For The Color Computer

Two new games, *Reactoid* and *Gomoku/Renju*, have been released by Radio Shack. Both are written for the TRS-80 Color Computer with at least 16K memory.

Reactoid is a futuristic action game in which the player finds himself at the world's first nuclear fusion reactor, where the automatic system has failed. With a joystick, the player must guide stray energy particles, which are slowly melting the core of the reactor, to the appropriate energy posts. All the posts must be lit up to advance to the next round.

Gomoku/Renju, based on ancient oriental strategy games, has eight levels of play. Each game (Renju is more difficult)



The title screen from *Randomn* shows the unfriendly faces you're likely to meet if you take on the "Mystic Slot Machine."

can be played against the computer or another person.

The games sell for \$19.95 each.

Tandy Corporation/Radio Shack
1800 One Tandy Center
Forth Worth, TX 76102

Timex/Sinclair Games

Four new games for 16K Timex/Sinclair computers have been produced by JPR Software. Each of the games is available on tape for \$12.95.

In *Megawurm*, a machine language game, you guide a rapidly growing worm through a maze without allowing it to hit its tail. Earn bonus points by eating food left throughout the maze, but as the worm eats, its tail becomes longer.

In *The Assassin*, you have been hired to protect a terrorized king from assassins. Success depends on solving riddles during realtime play.

Orgs & Ogres is an adventure game in which you face a series of monsters while attempting to

collect 1000 gold pieces or slay a dragon.

In *The Dark Empire*, a space adventure, you lead a rebellion of nobles against the tyrant Pyrinx on the planet Rion.

JPR Software, Inc.
Box 4155
Winter Park, FL 32793
(305) 646-9125

Software For Youngsters

Counterpoint Software has added three titles to its "Early Games" series, and has produced a quiz game designed for family play. The programs are: *Early Games Piece of Cake*, *Early Games Fraction Factory*, *Early Games Matchmaker*, and *Quizagon*.

In *Piece of Cake*, children learn basic arithmetic by keeping track of cakes and pastries in a magic bakery. Should a child encounter difficulty, the bakers help explain what to do.

Fraction Factory teaches elementary and junior high students to understand and work with fractions. Concepts covered

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include finding equal values, adding fractions, subtracting fractions, and multiplying whole numbers by fractions.

Matchmaker is a reading-readiness program for pre-schoolers. The six games included in the program involve matching colors, shapes, sizes, lines and directions, facial expressions, and reversible letters. The game is designed to be played by children two years old and up.

Each of the three above programs is available for \$29.95. Disk versions are available for Apple IIe, Atari, IBM, and Commodore 64. Tape versions are available for Atari, Commodore 64, and Texas Instruments.

Quizagon is a computer quiz game for all ages. It includes more than 6,000 questions covering science, geography, sports, entertainment, history, and words. The game, which sells for \$39.95, is available on disk for Apple IIe, Commodore 64, and IBM PC.

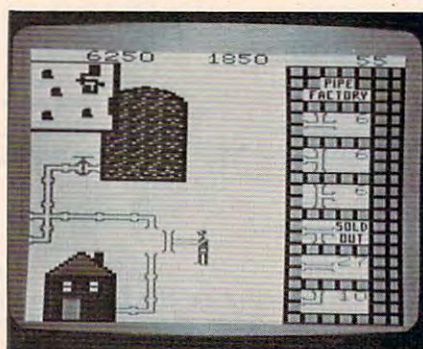
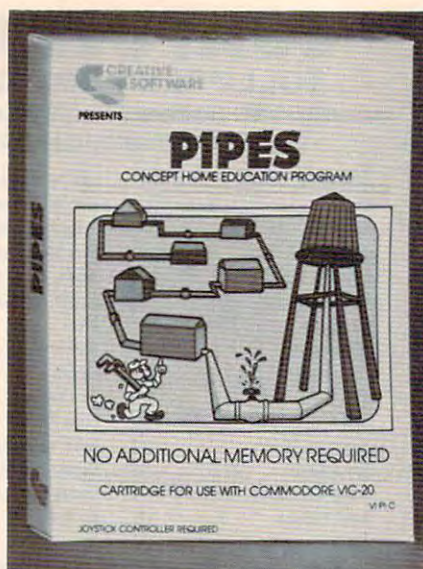
Counterpoint Software, Inc.
4005 West 65th St.
Minneapolis, MN 55435
(800)328-1223

Games Converted For 64

Creative Software has converted *Astroblitz*, a space shoot-em-up, and *Pipes*, an educational program, to Commodore 64 format.

In *Astroblitz*, the player must evade spinners, saucers, seekers, and radar dishes in an effort to save the planet Nahad from destruction.

In *Pipes*, a game that teaches spatial relationships and economics, the player directs Arlo the Plumber as he selects from a bank of pipes, elbow joints, T-joints, and valves to connect the town's houses to the water supply. The object is to connect all the houses using the least amount of material—with-



Arlo the Plumber makes the final fitting in Creative Software's *Pipes*.

out any leaks.

Both games are available on cartridge for \$34.95.

Creative Software
230 East Caribbean Dr.
Sunnyvale, CA 94089
(408) 745-1655

Games For Atari, 64, VIC, And Color Computer

First Star Software has produced a trio of new games that play on a handful of popular microcomputers.

In *Bristles*, a game for up to four players, the assignment is to paint a building while avoiding a variety of obstacles including the building superintendent's young daughter, who enjoys putting her handprint on wet walls. While playing the 48-level

game, participants can choose to be one of eight characters, each of which is programmed with its own theme music.

Flip and Flop is a three-dimensional, two-player game. The first player, a kangaroo, must turn over tiles on a multi-screened, scrolling, stepped platform maze—with a zookeeper in hot pursuit. For the second player, a monkey, the playfield turns upside down. The monkey then swings from tile to tile while trying to elude the zookeeper and reach the circus. The game includes 36 levels of play, a scrolling playfield, and six animations.

Bristles and *Flip and Flop* are available on disk, tape, or cartridge for Atari and Commodore 64 computers. Prices range from \$29.95 to \$39.95 depending on version.

Panic Button is a game for the VIC-20 and TRS-80 Color Computer. In the game, you work on an assembly line, building a variety of products. Things get difficult when the conveyor belts speed up and unused parts begin flying around the factory. Color Computer versions are \$24.95 for tape, \$39.95 for cartridge. Versions for a VIC-20 expanded to 8K are \$24.95 for tape, \$34.95 for cartridge.

First Star Software
22 East 41st Street
New York, NY 10017
(212) 532-4666

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The guidelines below will permit your good ideas and programs to be more easily edited and published:

1. The upper left corner of the first page should contain your name, address, telephone number, and the date of submission.

2. The following information should appear in the upper right corner of the first page. If your article is specifically directed to one make of computer, please state the brand name and, if applicable, the BASIC or ROM or DOS version(s) involved. In addition, *please indicate the memory requirements of programs.*

3. The underlined title of the article should start about 2/3 of the way down the first page.

4. Following pages should be typed normally, except that in the upper right corner there should be an abbreviation of the title, your last name, and the page number. For example: Memory Map/Smith/2.

5. All lines within the text of the article must be double- or triple-spaced. A one-inch margin should be left at the right, left, top, and bottom of each page. No words should be divided at the ends of lines. And please do not justify. Leave the lines ragged.

6. Standard typing paper should be used (no erasable, onionskin, or other thin paper) and typing should be on one side of the paper only (upper- and lowercase).

7. Sheets should be attached together with a paper clip. Staples should not be used.

8. If you are submitting more than one article, send each one in a separate mailer with its own tape or disk.

9. Short programs (under 20 lines) can easily be included within the text. Longer programs should be separate listings. *It is essential that we have a copy of the program, recorded twice, on a tape or disk.* Please use high quality 10 or 30 minute tapes with the program recorded on both sides. The tape or disk should be labeled with the author's name, the title of the article, and, if applicable, the BASIC/ROM/DOS version(s). Atari tapes should specify whether they are to be LOADED or ENTERED. We prefer to receive Apple programs on disk rather than tape. On the other hand, tapes are preferred for the Radio Shack computer. Tapes are fairly sturdy, but disks need to be enclosed within plastic or cardboard mailers (available at photography, stationery, or computer supply stores).

It is far easier for others to type in your program if you use CHR\$(X) values and TAB(X) or SPC(X) instead

of cursor manipulations to format your output. For five carriage returns, FOR I=1 TO 5:PRINT:NEXT is far more "portable" to other computers with other BASICs and also easier to type in. And, instead of a dozen right-cursor symbols, why not simply use PRINT SPC(12)? A quick check through your program – making these substitutions – would be greatly appreciated by your editors and by your readers.

10. A good general rule is to spell out the numbers zero through ten in your article and write higher numbers as numerals (1024). The exceptions to this are: Figure 5, Table 3, TAB(4), etc. Within ordinary text, however, the zero through ten should appear as words, not numbers. Also, symbols and abbreviations should not be used within text: use "and" (not &), "reference" (not ref.), "through" (not thru).

11. For greater clarity, use all capitals when referring to keys (RETURN, TAB, ESC, SHIFT), BASIC words (LIST, RND, GOTO), and three languages (BASIC, APL, PILOT). Headlines and subheads should, however, be initial caps only, and emphasized words are not capitalized. If you wish to emphasize, underline the word and it will be italicized during typesetting.

12. Articles can be of any length – from a single-line routine to a multi-issue series. The average article is about four to eight double-spaced, typed pages.

13. If you want to include photographs, they should be either 5x7, black and white glossies or color slides.

14. We do not consider articles which are submitted simultaneously to other publishers. If you wish to send an article to another magazine for consideration, please do not submit it to us.

15. **COMPUTE!** pays between \$50 and \$600 for published articles. In general, the rate reflects the length of the article. Payment is made upon acceptance of an article. Following submission (Editorial Department, **COMPUTE!** Magazine, P.O. Box 5406, Greensboro, NC 27403) it will take from four to eight weeks for us to reply. If your work is accepted, you will be notified by a letter which will include a contract for you to sign and return. *Rejected manuscripts are returned to authors who enclose an SASE.*

16. If your article is accepted and you have since made improvements to the program, please submit an entirely new tape or disk and a new copy of the article reflecting the update. We cannot easily make revisions to programs and articles. It is necessary that you send the revised version as if it were a new submission entirely, but be sure to indicate that your submission is a revised version by writing "Revision" on the envelope and the article.

17. **COMPUTE!** does not accept unsolicited product reviews. If you are interested in serving on our panel of reviewers, contact the Review Coordinator for details.

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Home and Educational COMPUTING! (Fall 1981 and Summer 1981 — count as one back issue): Exploring The Rainbow Machine, VIC As Super Calculator, Custom Characters On The VIC, Alternative Screens, Automatic VIC Line Numbers, Using The Joystick (Spacewar Game), Fast VIC Tape Locator, Window, VIC Memory Map.

May 1981: Named GOSUB/ GOTO in Applesoft, Generating Lower Case Text on Apple II, Copy Atari Screens to the Printer, Disk Directory Printer for Atari, Realtime Clock on Atari, PET BASIC Delete Utility, PET Calculated Bar Graphs, Running 40 Column Programs on a CBM 8032, A Fast Visible Memory Dump, Cassette Filing System, Getting To A Machine Language Program, Epidemic Simulation.

June 1981: Computer Using Educators (CUE) on Software Pricing, Apple II Hires Character Generator, Ever Expanding Apple Power, Color Burst for Atari, Mixing Atari Graphics Modes 0 and 8, Relocating PET BASIC Programs, An Assembler In BASIC for PET, Quadra PET: Multitasking?, Mapping Unknown Machine Language, RAM/ROM Memory, Keeping TABs on a Printer.

July 1981: Home Heating and Cooling, Animating Integer BASIC Lo-res Graphics, The

Apple Hires Shape Writer, Adding a Voice Track to Atari Programs, Machine Language Atari Joystick Driver, Four Screen Utilities for the PET, Saving Machine Language Programs on PET Tape Headers, Commodore ROM Systems, Using TAB, SPC, And LEN.

August 1981: Minimize Code and Maximize Speed, Apple Disk Motor Control, A Cassette Tape Monitor for the Apple, Easy Reading of the Atari Joystick, Blockade Game for the Atari, Atari Sound Utility, The CBM "Fat 40," Keyword for PET, CBM/PET Loading, Chaining, and Overlaying, Adding A Programmable Sound Generator, Converting PET BASIC Programs To ASCII Files.

October 1981: Automatic DATA Statements for CBM and Atari, VIC News, Undeletable Lines on Apple, PET, and VIC; Budgeting on the Apple, Atari Cassette Boot-tapes, Atari Variable Name Utility, Atari Program Library, Train Your PET to Run VIC Programs, Interface a BSR Remote Control System to PET, A General Purpose BCD to Binary Routine, Converting to Fat-40 PET.

December 1981: Saving Fuel \$\$ (multiple computers), Unscramble Game (multiple computers), Maze Generator (multiple computers), Animating Applesoft Graphics, A Simple Atari Word Processor, Adding High Speed Vertical Positioning to Atari P/M Graphics, OSI Supercursor, A Look At SuperPET, Supermon for PET/CBM, PET Mine Maze Game, Replacing The INPUT# Command, Foreign Language Text on The Commodore Printer, File Recovery.

January 1982: Invest (multiple computers), Developing a Business Algorithm (multiple computers), Apple Addresses, Lowercase with Unmodified Apple, Cryptogram Game for Atari, Superfont: Design Special Character Sets on Atari, PET Repairs for the Amateur, Micromon for PET, Self-modifying Programs in PET BASIC, Tinymon: a VIC Monitor, VIC Color Tips, VIC Memory Map, ZAP: A VIC Game.

May 1982: VIC Meteor Maze Game, Atari Disk Drive Speed Check, Modifying Apple's Floating Point BASIC, Fast Sort For PET/CBM, Extra Atari Colors Through Artifacts, Life Insurance Estimator (multiple computers), PET Screen Input, Getting The Most Out Of VIC's 5000 Bytes.

August 1982: The New Wave Of Personal Computers, Household Budget Manager (multiple computers), Word Games (multiple computers), Color Computer Home Energy Monitor, A VIC Light Pen For Under \$10, Guess That Animal (multiple computers), PET/CBM Inner BASIC, VIC Communications, Keyprint Compendium, Animation With Atari, VIC Curiosities, Atari Substring Search, PET and VIC Electric Eraser.

September 1982: Apple and Atari and the Sounds of TRON, Commodore Automatic Disk Boot, VIC Joysticks, Three Atari GTIA Articles, Commodore Disk Fixes, The Apple Pilot Language, Sprites and Sound on the Commodore 64, Peripheral Vision Exerciser (multiple computers), Banish INPUT Statements (multiple computers),

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January 1983: Sound Synthesis And The Personal Computer, Juggler And Thunderbird Games (multiple computers), Music And Sound Programs (multiple computers), Writing Transportable BASIC, Home Energy Calculator (multiple computers), All About Commodore WAIT, Supermon 64, Perfect Commodore INPUTs, VIC Sound Generator, Copy VIC Disk Files, Commodore 64 Architecture.

March 1983: An Introduction To Data Storage (multiple computers), Mass Memory Now And In The Future, Games: Closeout, Boggler, Fighter Aces, Letter And Number Play (all for multiple computers), VIC Music, Direct Atari Disk Access, Automatic Commodore Program Selector, PET Quickplot, A Commodore Gotcha, VIC and Atari Memory Management, Friendly VIC INPUTs.

April 1983: Selecting The Right Word Processor, Air Defense (multiple computers), Commodore Structure BASIC, Retirement Planner (multiple computers), Dr. Video For Commodore, Atari Filefixer, Video 80:80 Columns For The Atari, VIC-word, Magic Commodore BASIC, A BASIC Hex Editor For VIC, VIC Music Theory.

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VIC, PET and 64, VICSTATION: A "Paperless Office," The Atari Musician, Puzzle Generator (multiple computers), Instant 64 Art, 64 Odds And Ends, Versatile VIC Data Acquisition, POP For Commodore.

June 1983: How To Buy The Right Printer, The New, Low-cost Printers, Astrostorm (multiple computers), The Hawkmen Of Dindrin (multiple computers), MusicMaster For The Commodore 64, Commodore Data Searcher, Atari Player/Missile Graphics Simplified, VIC Power Spirals, Un NEW For The VIC and 64, Atari Fast Shuffle, VIC Contractor, Commodore Supermon Q & A.

July 1983: Constructing The Ideal Computer Game, Techniques For Writing Your Own Adventure Game, SpeedSki And Time Bomb (VIC), Castle Quest And Roadblock (Atari), RATS! And Goblin (64), How To Create A Data Filing System (multiple computers), How To Back Up Disks For VIC And 64, Atari Artifacts, All About The Commodore USR Command, TI Mailing List.

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September 1983: Games That Teach, Caves Of Ice, Diamond Drop, Mystery Spell, and Dots

(multiple computers), VIC Pilot, Ultrasort (VIC, 64, PET), Easy Atari Page Flipping, Computer Aided Design On The TI, Relative Files On the VIC/64, Atari Fontbyter, TI Sprite Editor, All About Interrupts (multiple computers), Cracking The 64 Kernal, Making Change On The Timex/Sinclair, Build Your Own Random File Manager (multiple computers).

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AUGUST 1983: Your First Hour With A Computer, Should You Join A Users Group, Guide To Commodore Users Groups, The Viper, Cylon Zap, product reviews, VIC/64 Mailing List, Word Spell, Global Scan For VIC/64, Machine Language For Beginners, VIC Title Screens, 64 Hi-Res Graphics Made Easy, VIC/64 Four-Speed Brake, Disk Menu, Using A 1540 Disk Drive With The 64, Playing Computer Music, Simple Answers To Common Questions, HOTWARE, VICreations — Caring For Disk Drives/Cassettes, 64 Explorer, News & Products.

SEPTEMBER 1983: Telecomputing Today, Telecomputing Glossary, Commodore's Nationwide Party Line, Commodore Bulletin Boards, Demon Star For VIC/64, Potholes, product reviews, Checkbook Reporter, States & Capitals Tutor For VIC/ 64, MiniTerm-20, TeleTerm 64, POKEing Graphics, Machine Language For Beginners, 64 Searcher, Better Commodore Input, Using The Function Keys, Simple Answers To Common Questions, HOTWARE,

VICreations — Understanding Random Numbers.

OCTOBER 1983: The Anatomy of Computers, Telegaming Today And Tomorrow, Commodore's Public Domain Programs, Oil Tycoon, Re-Beep, product reviews, Aardvark Attack, Word Match, A SHIFTy Solution: The WAIT Command, Program Transfers, Machine Language For Beginners, Improved Paddle Reader Routine, How To Use Tape And Disk Files, Understanding 64 Sound — Part 1, Speeding Up The VIC, Simple Answers To Common Questions, HOTWARE, Horizons 64 — Improving 64 Video Quality, VICreations — Using The VIC's Clock, News & Products.

NOVEMBER 1983: Binary Numbers — Part 1, Getting Started With A Disk Drive — Part 1, Chicken Little, Martian Prisoner, product reviews, Munchmath, VIC Super Expander Graphics, 64 Aardvark Attack, 64 Timepiece, Connect The Dots, Custom Characters For VIC/64, Making Custom Characters On The 64, Making Custom Characters On The VIC, VIC/64 Program Lifesaver, Understanding 64 Sound — Part 2, Merging Programs On The 64, Tutorial On DATA, READ, RESTORE Statements, One-Touch Commands For The 64, VIC/64 Disk Defaulter, Machine Language For Beginners, Simple Answers To Common Questions, HOTWARE, VICreations — Animation With Custom Characters, Horizons 64 — Software And Hardware Reviews, News & Products, Automatic Proofreader.

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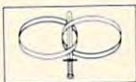
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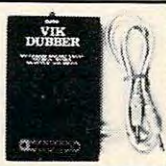
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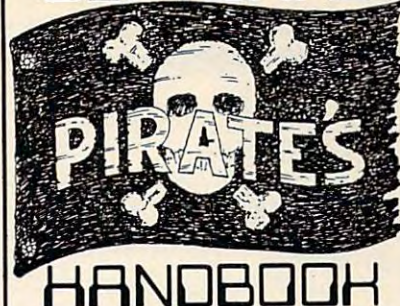
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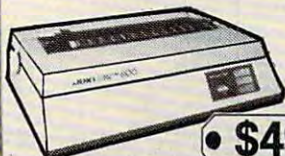
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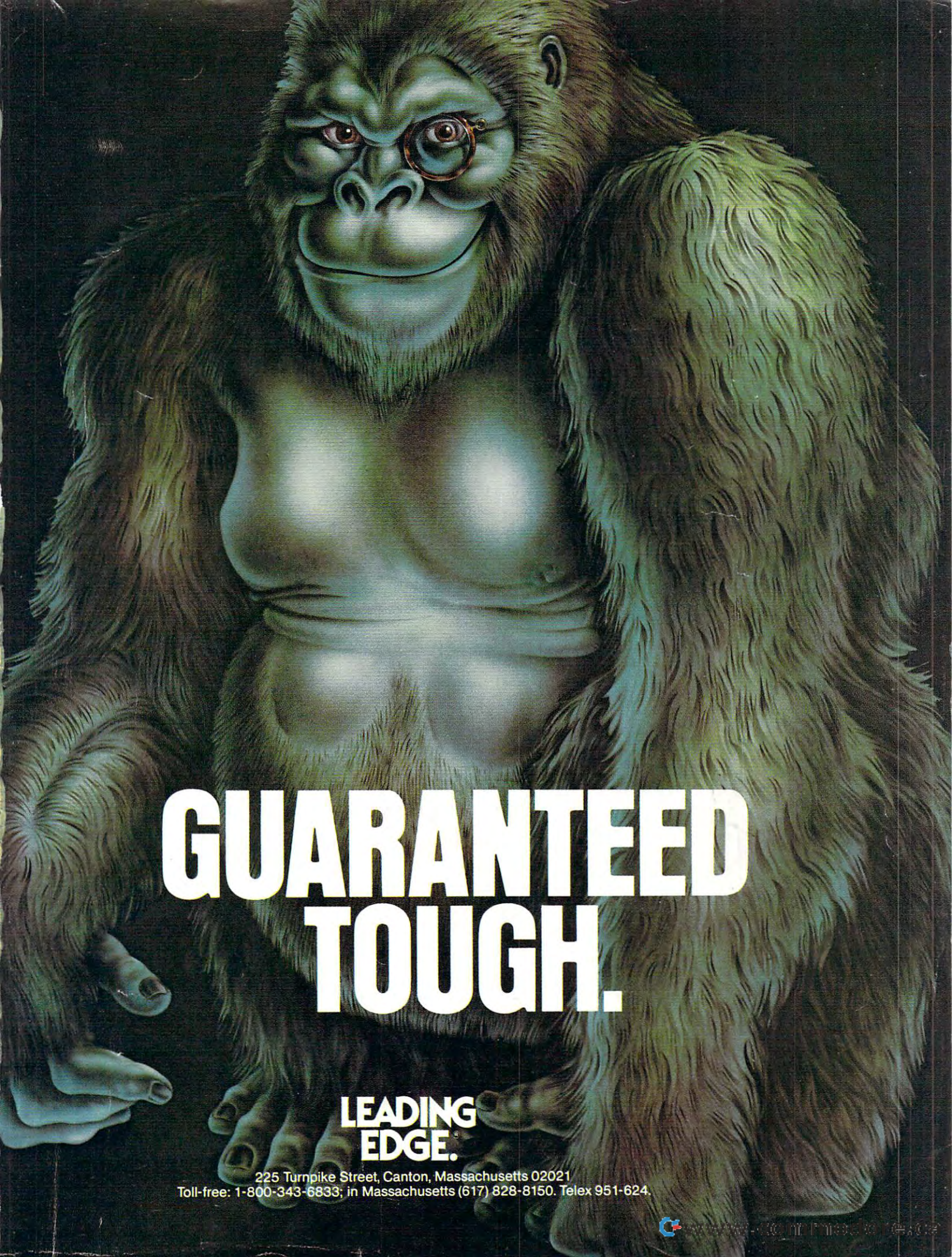
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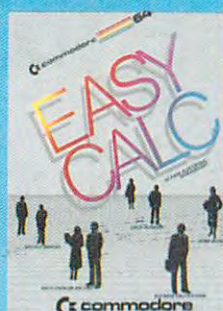
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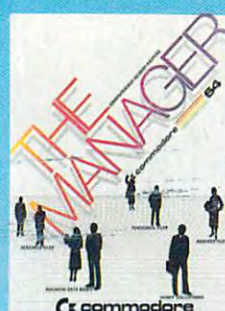
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