THE PROGRAM STORE T.M.

Thousands of Programs Through the Mail

THE PROGRAM STORE T.M.

LOST COLONY

By David Feitelberg from Acorn

You are the Economic Manager of the world's first space colony. The next support ship from Earth isn't due for another **15 years**, and you have instructions to make things go better or get out of office in shame. You must allocate labor, explore new territories, decide on production quotas, determine pay scales and taxes for the most productivity. You're armed with maps and charts. 10 levels of difficulty; "save the game" feature on disk.

16K Tape or 32K Disk, Now thru June 1 You Pay only $23.96

Sale

ZORK I, II, or III

From Infocom

You can communicate ***in complete English sentences*** in these interactive adventures, with a vocabulary of over 600 words! Each of these literate games will keep you entertained for 50 hours or more.

Zork I, The Great Underground Empire: Discover 20 treasures, and fight for your life! **Zork II**, The Wizard of Frobozz: The Wizard will attempt to confound your quest with his capricious powers. **Zork III**: Brand New Adventure!

32K Disk $39.95

GORF

From Roklan

A unique sight and sound adventure in the interstellar war against the Gorfian Empire. You must repel attacks by Droids, Anti-Gravity Bonks, Anti-Particle Lasers, Gorfian fighters and torpedos, etc. Four levels from an Astrobattle to a full-fledged Space War. Requires joystick.

ROM Cartridge, $44.95 16K Required
Disk, $39.95 24K Required

REPTILLIAN

From Synapse

Fight bravely, Time Gladiator. Destroy each part of the Reptile before it links up with other crushing segments to destroy the tracking station. The hopes of an entire galaxy fly with you! Requires joystick.

16K Tape or Disk $34.95 20% Off Now Thru June 1 You Pay Only $27.96

Sale

FORT APOCALYPSE

From Synapse Software

The Warlords of Kraltha have constructed a prison deep inside Earth — the terrifying FORT APOCALYPSE. All those who have tried to rescue their slave/captives have vanished without a trace. ***Now it's your turn!*** Can you descend thru the Kralthian disruptor fields and penetrate the vast underground Vaults of Draconis? Can your Rocket-Copter fight off the Wormlings, Servo-Tank Interceptors and Robo-Choppers? Multi-player game with arcade action; requires joysticks.

32K Tape or Disk, $34.95

SHADOW WORLD

From Synapse

Confederates defend pod cities in the atmosphere of dangerous Jantor from Rigillian ships violating the mining treaties. Attacks for strategic minerals! Threats from mutoid life! Match your skills and reflexes to the enemies superior numbers. 1 or 2 players with dual independent screen display, requires joystick.

16K Tape or Disk $34.95

Programmer's Corner

BASIC COMPILER

by Special Software Systems from DataSoft

Your programs in BASIC can easily be transformed into ultra-fast machine language object code. Includes a free run time package and a tutorial on how to program effectively with the Basic Compiler.

32K Disk $99.95 20% Off Now Thru June 1 You Pay Only $79.96

Sale

SHOOTING ARCADE

From DataSoft

The most colorful, captivating amusement park attraction — get a bang out of Shooting Arcade! Aim at stampeding elephants, waddling ducks and jumping bunnies. Hold the gun steady and pull the trigger — just don't run out of bullets. The animation of the moving gallery targets is the highlight.

16K Tape or Disk $29.95

CANYON CLIMBER

From DataSoft by Tim Ferris

You're at the bottom of the Grand Canyon, trying to scale the world's toughest wall. If that's not enough of a problem, there are three challenges to face along the way: angry sheep, theatening Indians and attacking birds. Action-packed arcade game you'll really enjoy. Requires joystick.

16K Tape or Disk, $29.95

Family Features

HOME ACCOUNTANT

From Continental Software

Powerful home finance package manages your money simply! Track 100 budget categories for 5 different checking accounts and all the credit cards you have. Watch the program print checks, balance sheet, net worth statements and produce trend analyses, bar or line graphs. The time saving transaction history lets you customize your own financial package. Great for realistic budgeting!

Disk $74.95

COMPUTER FACTS IN FIVE

From Avalon Hill

Entertaining game of knowledge with educational merit for the entire family. 1, 2, or more players select from more than 1,000 popular and academic areas associate answers with 5 classes and categories. You must be fast — provide correct answers as you race the sand clock timer.

48K Disk $25.95

Bookshelf

ATARI SOFTWARE 1983

From The Book Company

Hundreds of incisive reviews on business, education, word processing and game programs. Concise descriptions with 6 letter rating system. Select your favorites from the only consumer guide written exclusively for Atari owners!

Softcover book $19.95

Programs for TRS-80, ATARI 400/800, APPLE & IBM.

For Information Call: 1(202) 363-9797

THE PROGRAM STORE T.M.

Call for FREE VIC 20 Catalog

To Order Call Toll-Free:
800-424-2738

VISA MasterCard

MAIL ORDERS: Send check or money order for total purchase price, plus $2.00 postage & handling. D.C., MD. & VA.: add sales tax.
Charge Cards: Include all embossed information.

Visit our other stores: Seven Corners Center, Falls Church, VA • W. Bell Plaza, 6600 Security Blvd., Baltimore, MD • 829 Bethel Rd., Columbus OH • White Flint Mall, Rockville, MD • Coming Soon to Boston, Philadelphia and Pittsburgh.

THE PROGRAM STORE · Dept. 10-05-3 · Box 9582 · 4200 Wisconsin Avenue, N.W. · Washington, D.C. 20016

Item Tape/Disk/Book Price

Postage $2.00

Total__________

☐ CHECK ☐ VISA

☐ MASTERCARD

Computer__________

Name__________

Address__________

City__________ State__________ Zip__________

Card #__________ Exp__________

capability, nearly complete compatibility with the 400/800 systems, four function keys and a "help" key, two status LEDs.

- *Minuses*: One cartridge slot (on the side, and you *can* remove the cartridge with power on even though you shouldn't), two (not four) joystick ports (both on the same side of the case; consider getting a joystick cord extender for two-person games), no memory board slots, no external expansion capabilities.
- *Implications*: Goodbye, 80-column boards. Goodbye, RAMDISKs and the like. Goodbye, CORVUS hard disk drive (which, I believe, interfaces via joysticks three and four).
- *Unfounded rumors*: There is *not* an RS-232 interface built in. There is certainly *no* parallel printer port. In fact, there is no hardware other than what I have described.

Some "features" of the machine are less obvious: none of the current Atari software will take advantage of the expanded RAM. When you bank select the RAM, all of the OS software, including the interrupt handlers, goes away, so you must provide at least a minimal OS substitute. Because the I/O space is from $D000 to $D800 (as on the 400/800), there is no way around having a "hole" in your otherwise contiguous RAM. There is no way to get at the RAM which is "under" the cartridge (this flaw is left over from the 400/800; it is a real deficiency). It uses the same old slow floating point routines.

So how do I rate the 1200XL in overall features and performance? Quite honestly, it depends entirely on what the price of the machine is. At anything under $450, it's a terrific bargain. I feel that, given the obvious cost-cutting Atari was able to achieve, it should be able to sell for half the cost of the 800. However, the indications are that the price of the 800 will be dropped and that the 1200 will cost more than the 800. If so, buy an 800 quick!

The exception to this suggestion is if you will write in machine language or be using non-Atari languages that can take advantage of the extra 14K of RAM (now *where* would you get a language like that?). If you *need* the extra RAM, then you may have to seriously consider the 1200. Of course, by the time you read this, the price of the 1200 and the new price of the 800 should be public knowledge, so you will be able to see how accurate my forecasting is.

BAIT, Part 2

In March, we started the process of writing a pseudo-BASIC interpreter, which I called "BAIT." If you don't have that article, this month's work will make virtually zero sense, so don't even attempt to follow the rest of this column.

This month, as promised, we add the expression evaluator and the "PRINT" statement to BAIT. Note that the listing published here is *not* complete. It is meant to be added to the March listing. In a few cases, this month's lines will overwrite (be the same number as) those from March. For example, we have replaced lines 4010 through 4040 and deleted line 4050.

Before we get into the explanation of the actual listing, we need to extend our discussion of just how an interpreter – and, in particular, BAIT – works.

There are two major parts to most language interpreters: the program editor and the program executor. The March column presented BAIT's editor. It is not fundamentally different from most BASIC editors. True, only a few BASICs that I know of use a line number table, as we did for BAIT (some that do include Cromemco 32K Structured BASIC, which we wrote, and Data General's Business BASIC, both designed for relatively large machines). But, to be fair, BAIT cheats by using a very small fixed number of possible line numbers.

The editor used by Atari BASIC and BASIC A+ (and Cromemco and DG BASICs) does, however, differ markedly from BAIT's editor in one important apsect. In these more sophisticated BASICs, the user's program line is scanned for correct syntax as it is entered and automatically converted to more usable internal "tokens." Of course, BAIT should not be chided for any deficiency here: most microcomputer BASICs (including, for example, Microsoft BASICs) do *not* do any syntax checking at entry (nor do they tokenize anything except, perhaps, recognized keywords). In any case, BAIT's editor seems quite adequate to me.

This month, we begin the second major part of an interpreter: the program executor. Not surprisingly, the program executor is much larger and more complex than the editor. In fact, we need to break the executor down into manageable hunks. I think an outline would be useful here.

I. Program Editor
II. Program Executor
    A. Initialization
    B. Execution by Line
        1. Execution by Statement
        2. Execution of Statements
            a. Display statement
            b. Print statement
            ... (various statements)
    C. Execution of a direct statement or line
    D. Error handler

This month, we will add parts C, D, and B to BAIT. (Note that we did part A in March and faked C.) Actually, part C and part B are so intimately entwined in BAIT that it is hard to see where one begins and the other leaves off, but that doesn't make our outline any less valid.

Executing Expressions In BAIT

Not shown in the above outline are the major routines which are common to the execution of most statements. To illustrate, first consider these two BAIT statements:

```
L A=7*13      (Let A=7*13)
P A+5         (Print A+5)
```

What do these two statements have in common? An expression. From BAIT's viewpoint, the two expressions here are "7*13" and "A+5". A major portion of BAIT (and, indeed, a major portion of *any* language) is the subroutine known as "EXecute EXPression," which resides in lines 5000 through 5999 in the accompanying listing. Actually, EXEXP in BAIT is fairly simple when compared to that of Atari BASIC. Remember the rules from last month? No functions, no precedence of operators, no arrays, no strings.

Not surprisingly, almost all BAIT statements call the EXEXP subroutine. In turn, EXEXP calls a couple of routines, including GETNC (GET Next Character – lines 8100 to 8160). GETNC is perhaps the lowest level routine of the program execution phase of BAIT. It simply scans the program memory for the next non-space character, tests to see if it is an alphabetic character, and protests when the line runs out of characters.

EXEXP uses GETNC (line 5100) to find any ALPHAbetic characters in an expression; such characters are assumed to be variables (lines 5300, 5310). If instead, GETNC found a numeric character (line 5110), EXEXP backs up and scans for the entire number (lines 5400 to 5450). Only digits and a decimal point are allowed (line 5430); but there is a flaw (read that as *bug*) here that allows, but ignores, more than one decimal point and the digits which might follow. Finally, if the character is neither alphabetic nor numeric, BAIT assumes that it is an operator and figures out which one (lines 5120 to 5230). If it is not an operator, and if the expression was valid, EXEXP returns to its caller (line 5160).

Note that in the case of either a variable or a numeric literal, EXEXP assumes that it has received the second argument of an expression of the form "arg1 op arg2" (lines 5500 through 5530). Of course, in the case of the very first argument in any expression, there has been no preceding argument. But EXEXP takes care of that by providing a dummy argument ("0") and a dummy operator ("+") in its initialization code (line 5010). Incidentally, if EXEXP detects two operators or two arguments in a row, it rules the expression invalid (lines 5210, 5220, and 5510). Similarly, null expressions and expressions ending in an operator are illegal (lines 5230, 5530, and 5160).

Finally, the actual operators of BAIT are "simulated" via Atari BASIC in lines 5610 through 5680. Note that BAIT allows BASIC's operators "+", "-", "*", "/", ">", "<", and "=". BAIT simplifies the inequality sign to "#", instead of BASIC's "<>". (But did you know that many, many of the early BASICs used or allowed "#" as an alternative to "<>"?)

Normally, I wouldn't be so bold as to suggest changing an entire section of code, but I think the clumsiness of EXEXP deserves at least one alternative idea. If you are using BASIC A+ (or any BASIC with a "FIND" or "SUBSTRing" function), you could replace lines 5120 to 5128 with a single line of code:

```
5120 OP=FIND( "+-*/><=#" , C$ , 0 ) : IF OP
     THEN 5200
```

Of course, one could have achieved similar results with a string and a FOR/NEXT loop under Atari BASIC, but that would have slowed down EXEXP even more than it already is.

BAIT's Print Statement

Lines 10200 through 10330 comprise the execution of "Print" under BAIT. Notice that DOPRINT also uses GETNC (line 10210). Here, we are looking to see whether a quoted string (line 10220), an expression (line 10240), or nothing at all (line 10210) follows the "P" keyword. (Or should we call it a key-letter?)

Literal strings are fairly simple to handle. Starting at the character after the quote mark, we simply loop through the buffered line printing characters as we go and looking for an ending quote (lines 10300 and 10310). If no matching quote is found, it is *not* an error, just as with Atari BASIC (end of line 10310). If the quote is found, we adjust the character pointer and look for a trailing semicolon or comma (lines 10320, 10330, then 10250 to 10280).

And, strangely enough, arithmetic expressions are the easiest of all things to print. We simply call EXEXP and display the calculated result (line 10240), falling through to the trailing semicolon and comma check. (Of course, if we were writing in assembly language, we would have to write the "display a numeric result in ASCII" routine, but even here the Atari OS ROMs would help us.)

What Else Was Added

Finally, we must comment on the other code that was added this month. Most of it, of course, was needed to support the EXEXP and DOPRINT routines. However, some of it certainly is obscure enough to bear explanation. As we did in March, we will comment on the code by line number(s).

1100. C$ is used to capture the next character by GETNC. The array VARIABLES is designed to hold 26 variables (A-Z). One could easily amend this to any multiple of 26 and allow variable names of the form A1, A2, etc.

1110. This is kind of silly. In the final code, all variables will be initialized to zero. However, since we do not yet have a "Let" statement, I wanted to give each variable a unique value so we could use it in "Print". Hence, A=1, B=2, C=3, etc.

1120. Simply a place to stuff an error message.

1520 to 1550. The line numbers of some of our more important routines.

1710. I hate using "TRAP 40000". I like "TRAP UNTRAP" much better.

2360. The only line I actually corrected from the March listing. Do you see what the bug was?

3320. Just changed the comment to make more sense.

4010 to 4040. The beginnings of our "Line execution" control routine. We get the starting and ending positions of the current line. If the line doesn't exist, we try for the next line. If this is a direct line, we flag it for later detection (line 4040).

4210. As things sit now, if we get here we are ready to execute the direct statement. It had better be the "P" (Print) key-letter.

4220. Why call line 4900? Why not do it in-line right here? Wait until next month.

4610. If we didn't just execute a direct line, we go do another line. (Won't happen this month.)

4620 to 4640. This code was at lines 4010 to 4040 last month. It just cleans up the program buffer for use by the editor.

4910. Read line 4920.

5010 to 8160. Described in the text above.

8200 to 8290. Why do this several places when a single routine will do? Note line 8240: Atari BASIC does a similar thing with the 6502's CPU stack when it encounters an error. Why try to recover through who knows how many subroutine calls when one can simply reset the stack to the top and ignore them?

10200 to 10330. Described in the text above.

Using What We Have

Again, BAIT seems to work as designed up to this point. You can type in program lines (with preceding line numbers) or you can type in a direct statement. Unfortunately, all direct statements are assumed to be "Print," but just wait until next month.

And just what can you "Print"? Virtually any numeric expression that uses the BAIT operators and literal numbers. Of course, you can also use the variable letters "A" through "Z," but this month you will get the artificial values they contain. To get you started, here are some statements to try when you get BAIT's "ready" prompt:

```
P "HI THERE"
P "HI THERE",
P "HI THERE";
P 1+2+3+4
P 1  +  2  +  3  +  4
P A+B+C+D
P 4›5
P 4‹5
P 1/3
P 1/2=0.5
P 1/2  #  0.5
P 1/3;
```

And one last P.S., a kind of taste of what's to come. Once you have the listing working and saved, try adding one line:

```
4905 IF C$="D" THEN GOTO DODISPLAY
```

If you don't see what it allows, then wait for next month.

Next Month

Naturally, we will have Part 3 of BAIT. We will actually begin running BAIT programs, and we will add about half of the remaining BAIT statements to our vocabulary.

Unless something else hits me in the next week or two, I think I will respond to my own challenge and begin talking about how to write self-relocatable assembly language.

```
1100 DIM C$(1),VARIABLES(26)
1110 FOR ALPHA=0 TO 26:VARIABLES(ALPHA)=AL
     PHA:NEXT ALPHA
1120 DIM ERR$(40)
1520 LET GETNC=8100
1530 SYNTAX=8300:ERROR=8200:EXEXP=5000
1550 DODISPLAY=10100:DOPRINT=10200
1700 REM MISCELLANY
1710 UNTRAP=40000
2360 IF LINE$(1,1)="?" THEN LINE$=LINE$(2)
     :GOTO 2350
3320 REM NOTE THAT CURLINE=0 AS WE FALL TO
      LINE 4000
4010 LENGTH=LINES(CURLINE):IF LENGTH=0 THE
     N 4600
4020 CURLOC=INT(LENGTH/1000):LENGTH=LENGTH
     -1000*CURLOC
4030 CUREND=CURLOC+LENGTH-1
4040 IF CURLINE=0 THEN CURLINE=-1
<<< DELETE LINE 4050>>>
4100 REM READY TO EXECUTE A LINE
4200 REM EXECUTE THE STATEMENT
4210 GOSUB GETNC:IF NOT ALPHA THEN GOTO SY
     NTAX
4220 GOSUB 4900
4600 REM COME HERE FOR NEXT LINE
4610 CURLINE=CURLINE+1:IF CURLINE>0 THEN 4
     000
4620 BUFFER$(INT(LINES(0)/1000))="*"
4630 LINES(0)=0
4640 GOTO PROMPT
4900 REM THE STATEMENT CALLER
```

```
4910 GOTO DOPRINT
4920 REM LINE 4910 IS TEMPORARY !!!!
5010 EVAL=0:LASTOP=-1
5020 VALID=0
5100 GOSUB GETNC:IF ALPHA THEN 5300
5110 IF C$>="0" AND C$<="9" THEN 5400
5120 REM WHICH OPERATOR?
5121 IF C$="+" THEN OP=1:GOTO 5200
5122 IF C$="-" THEN OP=2:GOTO 5200
5123 IF C$="*" THEN OP=3:GOTO 5200
5124 IF C$="/" THEN OP=4:GOTO 5200
5125 IF C$=">" THEN OP=5:GOTO 5200
5126 IF C$="<" THEN OP=6:GOTO 5200
5127 IF C$="=" THEN OP=7:GOTO 5200
5128 IF C$="#" THEN OP=8:GOTO 5200
5160 IF VALID THEN RETURN
5170 GOTO 5900
5200 REM GOT AN OPERATOR
5210 IF LASTOP>0 THEN 5170
5220 IF LASTOP<0 AND OP>2 THEN 5170
5230 LASTOP=OP:VALID=0:GOTO 5100
5300 REM GOT A VARIABLE
5310 VAL2=VARIABLES(ALPHA):GOTO  5500
5400 REM GOT A NUMERIC
5410 CURLOC=CURLOC-1:REM BACKUP TO FIRST N
     UMERIC
5420 FOR LL=CURLOC TO CUREND:C$=BUFFER$(LL
     )
5430 IF (C$>="0" AND C$<="9") OR C$="." TH
     EN NEXT LL
5440 VAL2=VAL(BUFFER$(CURLOC,LL-1))
5450 CURLOC=LL
5500 REM VAR OR NUMERIC
5510 IF LASTOP=0 OR ABS(LASTOP)>8 THEN 590
     0
5520 GOSUB 5600+10*ABS(LASTOP)
5530 LASTOP=0:VALID=1:GOTO 5100
5600 REM EXECUTE OPERATORS
5610 EVAL=EVAL+VAL2:RETURN
5620 EVAL=EVAL-VAL2:RETURN
5630 EVAL=EVAL*VAL2:RETURN
5640 EVAL=EVAL/VAL2:RETURN
5650 EVAL=(EVAL>VAL2):RETURN
5660 EVAL=(EVAL<VAL2):RETURN
5670 EVAL=(EVAL=VAL2):RETURN
5680 EVAL=(EVAL<>VAL2):RETURN
5900 ERR$="INVALID EXPRESSION":GOTO ERROR
8100 REM GETNC
8110 IF CURLOC>CUREND THEN C=-1:C$=CHR$(15
     5):GOTO 8140
8120 C=ASC(BUFFER$(CURLOC)):C$=CHR$(C)
8130 CURLOC=CURLOC+1
8140 IF C=32 THEN GOTO GETNC
8150 ALPHA=(C$>="A" AND C$<="Z")*(C-64)
8160 RETURN
8200 REM ERROR ROUTINE
8210 PRINT :PRINT "***";ERR$;"***";
8220 IF CURLINE>0 THEN PRINT " AT LINE ";C
     URLINE
8230 PRINT :TRAP 8250
8240 POP :POP :POP :POP :POP :POP :POP :PO
     P
8250 TRAP UNTRAP
8290 GOTO PROMPT
8300 REM SYNTAX ERROR
8310 ERR$="SYNTAX ERROR":GOTO 8200
10200 REM ==EXECUTE PRINT==
10210 GOSUB GETNC:IF C<0 THEN PRINT :RETURN
10220 IF C=34 THEN 10300
10230 CURLOC=CURLOC-1
10240 GOSUB EXEXP:PRINT EVAL;
10250 IF C$=";" THEN RETURN
10260 IF C$="," THEN PRINT ,:RETURN
10270 IF C<0 THEN PRINT : RETURN
10280 GOTO SYNTAX
10300 FOR LL=CURLOC TO CUREND:C$=BUFFER$(LL
      )
10310 IF ASC(C$)<>34 THEN PRINT C$;:NEXT LL
      :PRINT :RETURN
10320 CURLOC=LL+1:GOSUB GETNC
10330 GOTO 10250
```

©

Use the handy reader service cards in the back of the magazine for information on products advertised in **COMPUTE!**

ATARI®

PAYROLL SOFTWARE FOR THE ATARI® 800™

Miles Payroll System™ is an advanced and comprehensive payroll accounting system designed for businesses today. Cumulative totals are maintained for each employee, as well as complete reporting, check writing, and W-2 reporting. Some features include:

- Random access file organization for fast updating of individual records.
- Allows weekly, biweekly, semimonthly or monthly pay periods.
- Completely menu-driven and user-friendly.
- Regular, Overtime, Double time, Sick, Holiday, Vacation, Bonus and Commission earning categories.
- Payroll deductions include Federal W/H Tax, State W/H Tax, City W/H Tax, FICA, SDI, Group Insurance and 3 user-defined deductions.
- Tax sheltered annuity deduction capability for IRAs and other tax shelters.
- State and Federal Unemployment Insurance maintained.
- Complete file viewing and editing capability.
- Maintains up to 50 employees.
- Up to 10 user-defined Worker's Compensation classifications.
- Federal Tax tables may be changed in only 15 minutes each year by user when IRS changes tax.
- Table method used for State and City Tax, allowing compatibility with any state's or city's tax.
- Produces 15 different reports, including W-2 Forms Report.
- Checks calculated and printed automatically.
- PROGRAM ENABLING MODULE™ protects valuable payroll information from unauthorized users.
- 3 user-defined payroll deductions to accommodate customized needs such as savings, profit sharing, tax shelters, pensions, etc.
- Pay period, monthly, quarterly and yearly cumulative totals maintained for each employee.
- Automatic input error detection and recovery protects system from user-generated errors.
- Easy-to-follow, detailed, and comprehensive user's manual and tutorial leads the user step by step allowing anyone with little computer experience to easily operate the package. Includes index.
- Color, sound, and graphics utilized for user ease.
- Maintains employee pay history.
- Allows for manual payroll check writing.
- Packaged in a handsome 3-ring deluxe pocketed binder with 3 diskettes and manual.
- Reasonable price.

See your local store, or contact Miles Computing.

Miles™

MILES COMPUTING
7136 Haskell Ave. #204
Van Nuys, CA 91406
(213) 994-6279

Atari is a registered trademark of Atari, Inc.
Miles Computing, MILES PAYROLL SYSTEM, PROGRAM ENABLING MODULE are trademarks of Miles Computing, Van Nuys, California. Not affiliated with Atari, Inc.
$179.95. Requires 32K and two Atari® 810™ disk drivers. Payment in U.S. funds required with order. California residents add 6.5% sales tax. C.O.D. or prepayment only. Dealer inquires welcome.

www.commodore.ca

Part IV

Commodore 64 Video – A Guided Tour

Jim Butterfield, Associate Editor

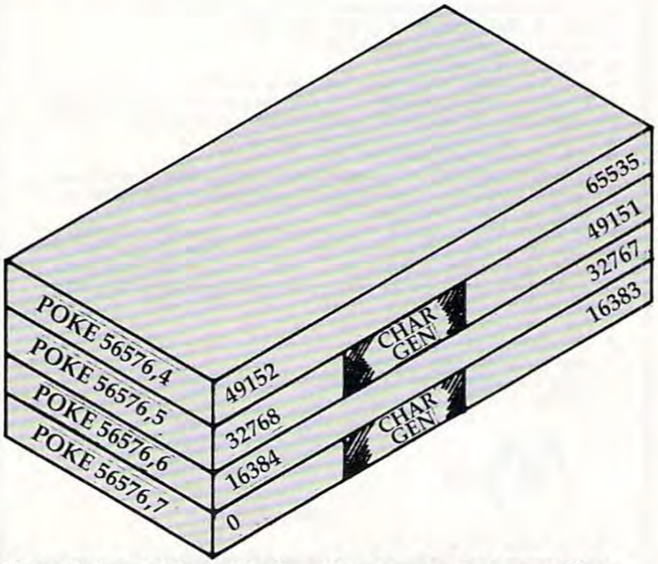
In Part 4 of this guided tour of the impressive video capabilities of the Commodore 64, we take a look at the video structure itself and explore program design considerations.

The story so far: we're touring the 6566 chip, which gives the Commodore 64 its video. We have noted that the chip goes to memory for its video information, but can only reach 16K; the computer controls which 16K bank via control lines in 56576 (hex DD00). Then we looked through the functions of the video control words – sprite and non-sprite – at 53248 to 53286 (hex D000 to D026).

We've examined all the bits in the video chip control registers. Now let's ease back and look at the 64's video structure. We'll talk a bit about program design considerations.

A Single 16K Slice

In Part 1 of this series (February 1983), we discussed how the video chip gets its screen information directly from memory. We indicated that the chip must dig out all of its information from a single 16K slice. We might draw this as a diagram (see the figure).



The video chip obtains its screen information from one of four 16K memory "slices." Two of the slices contain the ROM character generator.

We can control which slice we want by manipulating the two low bits in address 56576 (hex DD00). Normally, the processor picks the slice from 0 to 16383.

Once we've picked a 16K block, we must get all screen data from this block: the "screen memory," the character set, and the sprites. We cannot get the screen data from one block, the character base from another, and sprites from still another. Because we are restricted, we must do a little planning, and design our video information into our program.

After we have picked the 16K slice, we must set the video matrix (screen memory) to some point within it. We may pick any multiple of 1024 as a starting address. The normal 64 configuration is set to a value of one, meaning we take the screen information from memory starting at address 1024. The video matrix, you may remember, is stored in the high nybble (that means multiply it by 16) of 53272 (hex D018).

We must pick our character base next. If we're in normal resolution, we may pick any even multiple of 1024 as a starting address: i.e., 0, 2048, 4096, etc. If we're in high resolution mode, we must pick only values of zero and eight, meaning that the hi-res starting address will be either 0 or 8192. The normal 64 configuration is set to four or six for either graphics or text mode, meaning we take our character set from 4096 or 6144. You probably remember that the character base is stored in the low nybble of 53272.

So we'd expect a normal 64 to place into address 53272: a video matrix of one, times 16, plus a character base of four or six, yielding a total of 20 or 22. You may in fact see 21 or 23 if you PEEK the location, but the extra bit doesn't matter – it's not used. And if we switch to high resolution without changing anything else, our character base of four or six will be trimmed back to zero – explaining why we saw zero page when we tried POKE 53265,48 in Part 1 of this series.

Let's try a few specific design jobs.

Now the VIC 20 and 64 can communicate with PET peripherals

VIC and 64 users

Would you like to be able to access **any** of these peripherals from your computer?

- ⅓ megabyte disks (Commodore 4040 drive)
- 1 megabyte disks (Commodore 8050 drive)
- 10 megabyte disks (Commodore 9090 hard disk)
- Printers including a wide range of inexpensive IEEE and RS232 matrix and quality printers
- IEEE instruments such as volt meters, plotters etc.

Now you are no longer limited by the VIC or the 64's serial bus. Simply by attaching INTERPOD you can vastly increase the power of your VIC 20 and when used with the new 64, INTERPOD turns the computer into a really powerful system.

With INTERPOD the VIC and 64 become capable of running really professional quality software such as Word-processing, Accounting, Instrument control and many more.

INTERPOD will work with any software. No extra commands are required and INTERPOD does not affect your computer in any way.

Using INTERPOD is as easy as this:

Simply plug INTERPOD into the serial port of your computer, power-up and you are ready to communicate with any number of parallel and serial IEEE devices and any RS232 printer.

INTERPOD costs $180

INTERPOD

Limbic Systems Inc. 986 Tower Place, Santa Cruz, CA 95062

Task 1: Simple Graphics

We're quite satisfied with the screen and character set, but we'd like to add a few sprites to liven things up. Fine, the normal 64 configuration leaves room for about four sprite drawings (numbers 11, 13, 14, and 15), provided we don't need to use cassette tape during the program run. This may be enough for a lot of animation; all eight sprites could use a single drawing, if that suited the task.

If we needed more than four drawings, we might be tempted to move the start-of-BASIC pointer to a higher location, making room for the extras. That can work quite well, but it will probably call for two programs: a configuring program and a final program. It's hard for a program to reconfigure itself and survive.

Task 2: New Character Sets

If we wish to use the regular character set as well as new characters that we might devise, we'll want to stay in the memory blocks from 0 to 16383 or 32768 to 49151. These two blocks contain the ROM character generator at offset 4096 to 8191. If we don't need regular characters at all (if we intend to use our own) it may be more convenient to switch to either of the other two blocks: 16384 to 32767 or 49152 to 65535. Since there's nothing but RAM in these two, we may find more room.

Note that some of these RAM addresses are "hidden" beneath ROMs – BASIC from 40960 to 49151, and the Kernal from 57344 to 65535. The video chip sees only the RAM; but in a normally configured 64 system, programs will see only the ROM. You can POKE or store to the RAM beneath, but when you PEEK or load from these addresses, you'll get the ROM. That's OK; the video chip sees the RAM locations you have POKEd. Result: something for nothing! You can build a character base into RAM, and not lose any memory from your system.

Task 3: Emulating A PET

This is a clear-cut task. We want to move the screen to the same place that the PET uses the screen. That's very straightforward from a video chip standpoint. (Note: If you type the following POKEs in one at a time, you may have to type blind for some of them.) The PET screen belongs at 32768, so we must select that slice with:

```
POKE 56576,5
```

so that we'll pick up RAM starting at 32768. The ROM character generator is still in place.

Since we want the screen (video matrix) to be positioned right at the start of the block, we must set it to a value of zero. The character base can stay at its value of four (for graphics mode), so we must set up address 53272 with zero times 16 plus four:

```
POKE 53272,4
```

That completes the video, but we have a few other things to do to make BASIC work in a sound manner. We must tell BASIC where the new screen is located:

```
POKE 648,128
```

And finally, we should set the start and end of BASIC to correspond with a 32K PET:

```
POKE 1024,0:POKE 44,4:POKE 56,128:NEW
```

Clear the screen, and the job's done. Zero page usage is still different, so not all PEEKs and POKEs will automatically work on this reconfigured system; but BASIC and screen now match the PET.

Task 4: High Resolution Plotting

There are only eight places in memory that we can place a high resolution screen: 0, 8192, 16384, 24576, 32768, 40960, 49152, and 57344. We tend to choose the two 16K blocks that don't have the character generator, 16384 to 32767 and 49152 to 65535. That way, we'll have more clear RAM to use; there will be more space left for our video matrix and any sprites we need.

If we want to write characters on the hi-res screen, we'll have to generate them ourselves or steal them from the character generator. Here's an odd thing – the video chip sees the character ROM at two different addresses, but the processor chip (and that includes your program) sees the same 4K ROM only at a third location, 53248 to 57343. Most of the time, the processor can't see the ROM anyway, since the addresses are overlaid with the I/O chips.

So if our program wants to see the character set, it must flip away the I/O chip with POKE 1,51 – stop, don't do it yet! There are two problems. First, once the I/O chips are moved out – sound, video, interface, everything – you won't be able to type on the keyboard; so you'll never be able to type the POKE to put everything back. Second, the interrupt program uses these I/O chips for quite a few things, and it will go berserk the moment you take them out of action. So we must use a program or a multiple direct command to do the job, and we must temporarily lock out the interrupt activity. Type the following statements as a single line:

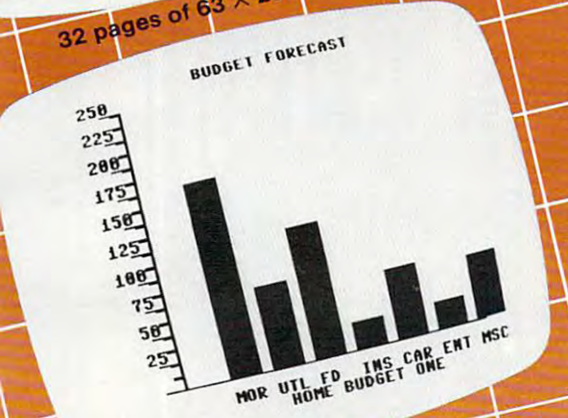
```
POKE 56333,127:        (lock out the interrupt)
  POKE 1,51:           (flip out I/O)
    X=PEEK(53256):     (read part of character)
  POKE 1,55:           (restore I/O)
POKE 56333,129         (restore interrupt)
```

X will contain the top row of pixels for the letter "A." If you like, you can draw a character's shape with the following program:

```
100 INPUT"CHARACTER NUMBER";A
110 IF A<0 OR A>255 THEN STOP
120 B=53248+8*A
130 C=56333
```

```
SYSTEM : B C D E F G L O P
 F5=HELP       F6=PRINT  CLR=CLEAR
 A            B          C          D
              HOME BUDGET 1
              Weekly     Monthly    Yearly
ME
ary 1         350.00     1400.00    16800.00
ary 2         210.00      840.00    10080.00
tal           560.00     2240.00    26880.00
PEMSES
ortgage       175.00      700.00     8400.00
tilities       75.00      300.00     3600.00
ood           120.00      480.00     5760.00
Insurance      25.00      100.00     1200.00
Car Exp.       65.00      260.00     3120.00
Entertain      25.00      100.00     1200.00
Misc.          60.00      240.00     2880.00
Total         545.00     2180.00    26160.00
Left Over      15.00       60.00      720.00
```

32 pages of 63 × 254 cells



GRAPHIC DISPLAY on screen and printer

View as many as FOUR pages at one time

```
                                       $ AC   16Y
D22
              HOME BUDGET 2
              Weekly     Monthly    Yearly
P 2
 1INCOME      320.00     1280.00    15360.00
 2            200.00      800.00     9600.00
 3Salary 1
 4Salary 1    350.00     1400.00    16800.00
 5Salary      210.00      840.00    10080.00
P 1                                 26880.00
 3Salary 1               26160.00
 4Salary 2  P 2  2180.00 -1200.00
 5          19
 6Total     20  -100.00 -1200.00     8400.00
 7          21                       3600.00
 8EXPEMS  P  1   2180.00 26160.00    5760.00
 9          18                       1200.00
10Mortga    19     60.00   720.00    3120.00
11Utilit    20                       1200.00
12Food      21             240.00    2880.00
13Insura    22
14Car Ex           60.00
15Entert
16Misc.
17
```

the foxiest

PLANNING and FORECASTING TOOL AVAILABLE

Calc Result™

For the COMMODORE 64™ with disk drive

We started with the best that standard spreadsheet programs could offer.

Then we added features designed to create a planning tool more useful than ever before.

The Result?

CALC RESULT! The most powerful, understandable and economical spreadsheet program on the market today.

Thirty-two pages, graphics and the ability to view up to four pages (spreadsheets) at once make CALC RESULT the spreadsheet program that outfoxes them all!

Calc Result Features:

- A three dimensional spreadsheet with 32 pages of 63 × 254 cells, offering unrivaled flexibility
- Graphic display on screen and printer
- The ability to view as many as four pages at once through a window and split screen. This allows you to compare spreadsheets!
- Help function on-line to make Calc Result's features easy to use
- Color coordinated cells that speed calculations
- IF-THEN-ELSE with AND, OR and NOT-ELSE functions in each cell give you unlimited possibilities for decision making
- Timesaving full function editing
- Flexible column width printouts for formatting reports
- Utilization of memory only in cells that are active
- Replicate, copy and move commands that save time
- Consolidation of spreadsheets to get the "bottom line"
- Protection of cells containing formulas
- Ability to load VisiCalc™ files

Distributed by:

COMPUTER MARKETING SERVICES INC.

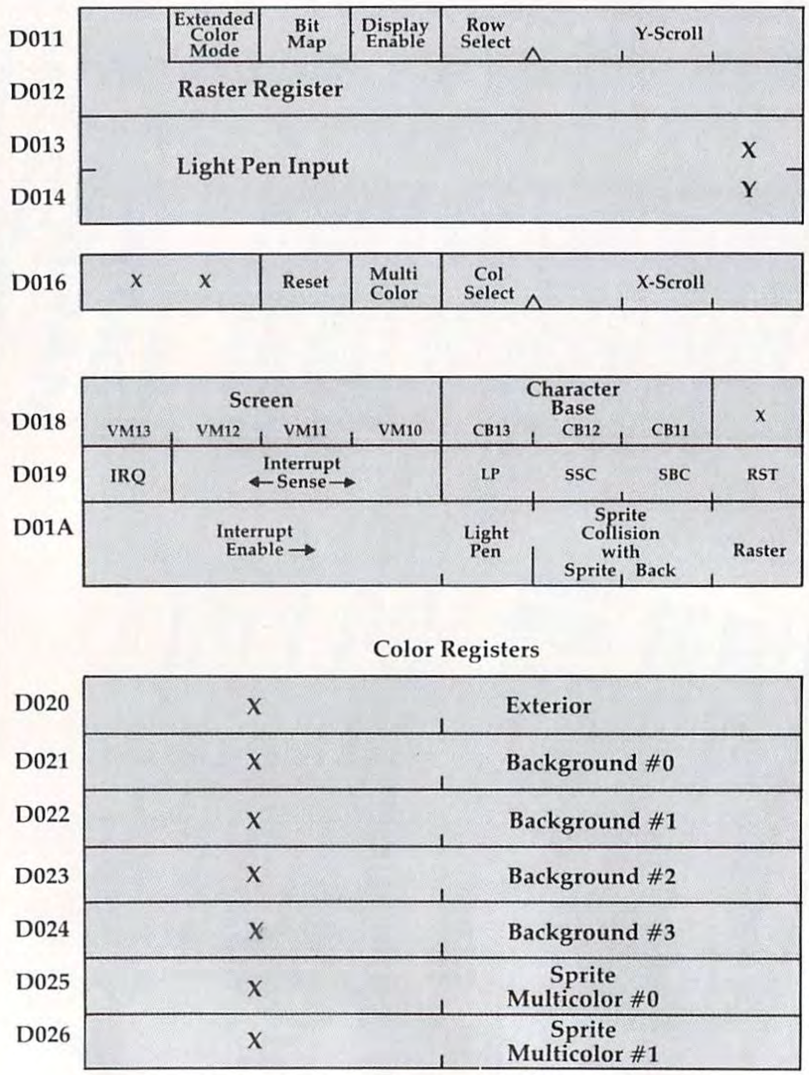
300 W. Marlton Pike • Cherry Hill, N.J. 08002 • 609-795-9480

"Our products outfox them all!"

Commodore 64 is a trademark of Commodore Business Machines
VisiCalc is a trademark of VisiCorp.
Calc Result is a trademark of Handic Software, AB.

Table 1:

6566 Video Chip
C64 Control and Miscellaneous Registers



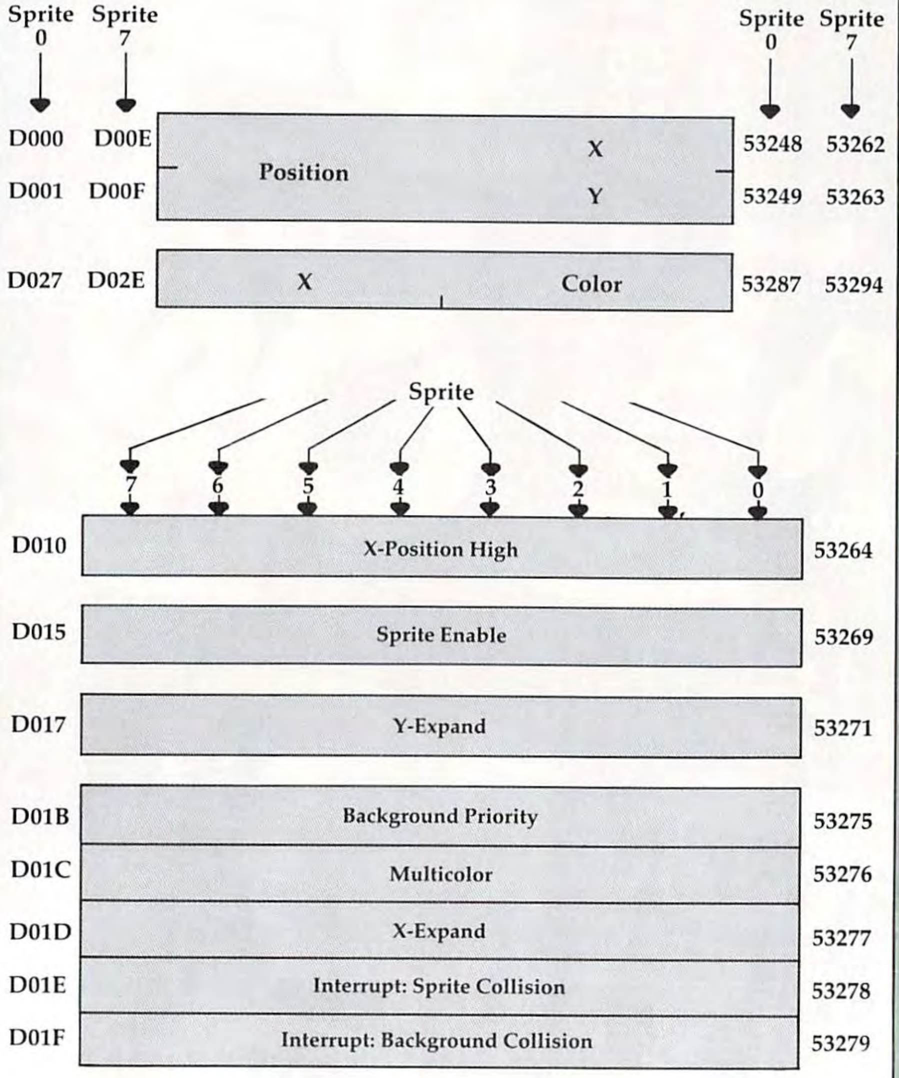
D011		Extended Color Mode	Bit Map	Display Enable	Row Select	Y-Scroll			53265
D012	Raster Register								53266
D013	Light Pen Input X								53267
D014	Light Pen Input Y								53268
D016	X	X	Reset	Multi Color	Col Select	X-Scroll			53270
D018	Screen VM13	VM12	VM11	VM10	Character Base CB13	CB12	CB11	X	53272
D019	IRQ	Interrupt ←Sense→			LP	SSC	SBC	RST	53273
D01A	Interrupt Enable →				Light Pen	Sprite Collision with Sprite	Sprite Collision with Back	Raster	53274

Color Registers

D020	X	Exterior	53280
D021	X	Background #0	53281
D022	X	Background #1	53282
D023	X	Background #2	53283
D024	X	Background #3	53284
D025	X	Sprite Multicolor #0	53285
D026	X	Sprite Multicolor #1	53286

Table 2:

6566 Video Chip
C64 Sprite Registers



Sprite 0	Sprite 7			Sprite 0	Sprite 7
D000	D00E	Position	X	53248	53262
D001	D00F	Position	Y	53249	53263
D027	D02E	X	Color	53287	53294

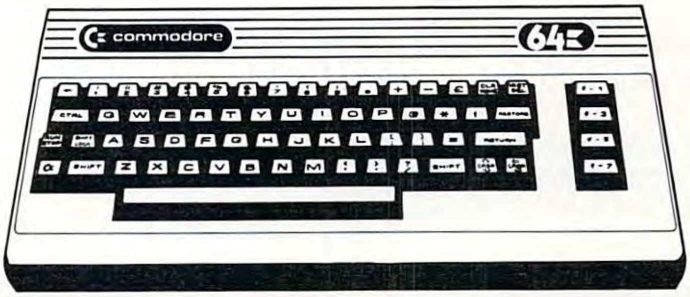
	Sprite 7	6	5	4	3	2	1	0	
D010	X-Position High								53264
D015	Sprite Enable								53269
D017	Y-Expand								53271
D01B	Background Priority								53275
D01C	Multicolor								53276
D01D	X-Expand								53277
D01E	Interrupt: Sprite Collision								53278
D01F	Interrupt: Background Collision								53279

BUSIWRITER

BUSIWRITER A Honey of a Word Processor

Why word processors?

Word processors allow the user to quickly and easily create letters, memos, notes, reports, term papers, manuals, poetry and any other written information using the memory of the computer as a pencil and paper. The computer display or terminal acts as a window through which the user views the information as it is entered. The outstanding advantage of using BUSIWRITER is that it acts not only as a pencil and paper but as a perfect eraser and automatic typewriter.



For Commodore CBM-64
Commodore 1515, 1525, Epson, C. Itoh, Qume, Diablo, NEC Spinwriter, Starwriter, Prowriter, Okidata, Microline, Gemini-10
And many more printers

BUSIWRITER The Queen Bee of Word Processors

BUSIWRITER allows the user to quickly and easily make any number of alterations to the text. BUSIWRITER will instantly reformat your text and show you exactly and continuously how the final output will appear. BUSIWRITER has more functions than any other known microcomputer word processor. With BUSIWRITER assisting in the entry of text, providing a **20 page memory** and performing an enormous number of editing/composing functions, the preparation of written data is far faster and outstandingly more accurate than if it were prepared by hand.

BUSIWRITER With the Sting Removed from the Prices

BUSIWRITER 64.............................only **$99.00** for the CBM 64

BUSIWRITER AVAILABLE NOW FROM YOUR LOCAL DEALER
(800) 227-9998
FOR THE NAME OF YOUR NEAREST DEALER

California, Canada, Alaska and Hawaii please call (415) 965-1735

Skyles Electric Works
231G South Whisman Road
Mountain View, CA 94041

Europe please contact Supersoft, Winchester House, Harrow Wealdstone, England HA3 7SJ, Tel. 01 861 1166

```
140 FOR J=0 TO 7
150 POKE C,127:POKE 1,51:X=PEEK(B+J)/
    128
160 POKE 1,55:POKE C,129
170 FOR K=1 TO 8
180 X%=X:X=(X-X%)*2
190 PRINT CHR$(32+X%*3);
200 NEXT K:PRINT
210 NEXT J
220 GOTO 100
```

To terminate this program, enter a number over 255. You'll note that most of the characters are drawn with "double width" lines. A video technician would tell you that this reduces the video frequencies and is likely to cause less picture smear.

Arranging the video areas is almost an art. It takes a little practice, but you'll get the knack of it fairly quickly.

In the next and final section, we'll give a simple example of a program using sprites. In this way, we'll try to draw together some of the skills discussed in this series.

Copyright © 1982 Jim Butterfield

©

SYNTAX SOFTWARE INC

COMMODORE 64

CASSETTE SOFTWARE

CYCLONS

Continuing with their plan to conquer the universe, the CYTRON EMPIRE has chosen your sector as the first target in our galaxy. As COMMANDER of the protective forces, you must manoeuvre your craft, avoiding collision and enemy missiles, to attack and destroy enemy war ships.

CYCLONS is programmed 100% in machine language using full HI-RES graphics and utilizes many of the graphics/sound capabilities of the Commodore 64. Choose the skill level and game options that provide you with the best 'feel.' The game is controlled with a joystick. AVAILABLE SOON IN DISK

SCRIBBLER

Van Gogh never had it this good. SCRIBBLER turns your computer into a versatile, easy to operate art studio and your television into a magnificent HI-RES canvass.

Independent control of all 16 colours for background, border and the multi-colour drawing mode, 8X magnification for fine adjustments, paint and circle functions are only some of the features.

The capabilities of SCRIBBLER are as far reaching as your mind. Test designs for graphic displays, create drawings and charts for projects, or simply test your creative abilities. SCRIBBLER requires a joystick in conjunction with the keyboard. AVAILABLE SOON IN DISK!

Check for availability with your local dealer, or use the order form provided. Dealer enquiries are invited. Catalogues available on request.

FORWARD TO: SYNTAX SOFTWARE INC., 33 ELMHURST AVE., SUITE 502, WILLOWDALE, ONTARIO, CANADA M2N 6G8 PHONE (416) 221-8008

☐ Certified Cheque ☐ Money Order ☐ Visa ☐ Master-Card ☐ American Express

_____ **CYCLONS @ $27.95 (U.S.)/$34.95 (CDN.) =** _____
_____ **SCRIBBLERS @ $35.95 (U.S.)/$44.95 (CDN.) =** _____
Shipping and Handling @ $1.00 per Cassette = _____
Ontario Residents Please Add 7% Sales Tax = _____
Card No. _____ Expiry Date _____ **TOTAL =** _____
Signature _____

PLEASE INCLUDE FULL ADDRESS WITH ORDER!

Commodore 64 is a registered trademark of Commodore Business Machines Inc

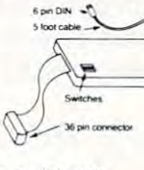
MICRO WORLD ELECTRONIX

PROGRESSIVE PERIPHERALS & SOFTWARE

U.S. Distributors for:

MW-302
VIC-20/64 Parallel Printer Interface

Works with all centronics type parallel printers and plotters including:
Epson
C. Itoh
Okidata
Nec
Gemini 10
TP-1 Smith Corona



- Hardware driven — works off of the serial port.
- Quality construction (Steel DIN connectors and Shielded cables).
- Switch selectable options:
  - —Device 4, 5, 6, or 7
  - —ASCII or PET ASCII
  - —7 bit or 8 bit output
  - —Upper and lower or upper case only

RECOMMENDED BY PROFESSIONAL SOFTWARE for WordPro 3 Plus for the 64.

MW-302 .... **$119.95**

THE AUTO CLOCK™

Turn your VIC-20/64 into a real time intelligent controller.

- Switch your VIC-20/64 or other AC devices on and off under software control.
- 256 year clock/calendar.
- 2K CMOS battery backed up RAM.
- Menu driven software.
- Plugs into the buss expansion slot.
- Cartridge style case.
- 19 user accessible subroutines.
- 20 page illustrated manual with detailed programming examples.

AUTO CLOCK **$129.95**

VIC-20 / PET
DIGITAL TO ANALOG and
ANALOG TO DIGITAL CONVERTER

- 0 to 5 volt range
- 8 inputs, 2 outputs
- Includes driver software and documentation.

MW-304 .... **$129.95**

STARLIGHTER™

A sophistocated computer operated portable stage lighting controller with the features of $20,000 theatre installations. Under $1,000. Works with the VIC-20.

Call for specifications and quotes of the Starlighter system.

GOTHMOG'S LAIR

- Pro Adventure Series for the Commodore 64.
- Sound and Color Graphics.
- Comprehensive manual with fold out maps.
- The ultimate challenge to the serious computer adventurist.

World 1 GOTHMOG'S LAIR **$39.95**

90 day parts and labor guarantee.

MICRO WORLD ELECTRONIX will beat any advertised price (under similar instock conditions) on COMMODORE/EPSON/KAYPRO/C. ITOH and other lines. Call for quotes. Dealer inquiries invited. We service what we sell.

⁕WordPro 3 Plus is a trademark of Professional Software.
⁕Auto Clock and Starlighter are trademarks of PP&S.

MICRO WORLD ELECTRONIX, INC.
3333 South Wadsworth Blvd., #C105, Lakewood, Colorado 80227, (303) 934-1973 or (303) 987-2671

VISA MasterCard

www.commodore.ca

VIC File Case

John Stilwell

Nothing difficult. Just a straightforward, easy-to-use (how-did-I-manage-without it?) program for your VIC to keep track of files. For VIC's of any memory size.

I have a lot of fun playing games on my VIC-20, but I use it for work, too. I recently found that I needed a program to keep track of files – something versatile, so the format had to be simple. Since I couldn't find anything already written, I wrote my own.

The "File Case" is a set of 31 pages with ten entries per page. Because of the limited screen space, each entry can be no more than two lines long to prevent any scrolling.

Because of the "crunching" techniques I used when writing this program, some lines are longer than the maximum 80 columns. When typing in the longer lines, use abbreviations for the commands. For example, PRINT is entered as ?.

Type N to start a new file. You will be asked to confirm and then to give the new file name. *Note:* This will erase any data already in the computer.

Type P and the page number you want; then push RETURN. The page shows ten entry numbers with a "-" after them. To make an entry, type E and type in the number (one of the ten displayed) on the page where you want it to go. After pressing RETURN again, type in your entry. The entry cannot include commas or colons. When you hit RETURN, it will appear on the page. When entering or inserting a line, if you want the line to appear in the catalog, it has to be reversed. To do this, type ", then CONTROL RVS ON, and then type in your entry (all of this on the same line). When you hit RETURN, the entry will appear in inverse video on the page (white on black).

Type I to insert a line between two existing entries. An existing line may be deleted by typing K. This kills the specified line and moves up all succeeding lines. Type S to save your data on tape, and L to load the data back into the computer. Type ? to get the definitions of the controls.

To cancel a control (except for Load, Save, or New), simply type any control letter instead of an entry number.

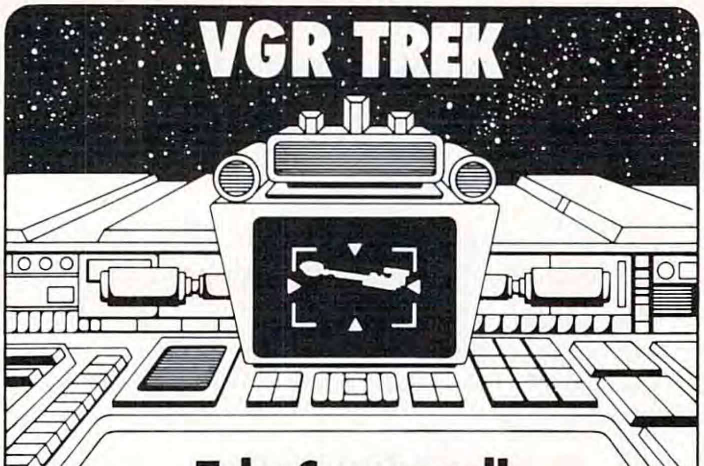
Pressing RETURN will move you to the next page. Type C to get the catalog. If any of your entries are reversed, they will appear next to the page number that they are on. The catalog can show only ten listings at a time. If you have more than ten reversed entries, push RETURN to get the next ten reversed entries.

If you are not using a memory cartridge, I suggest that the variable N in line 1 be changed from 309 to 109. This gives you only 11 pages to work with. If you want more or fewer pages to work with, then change this number by multiples of 10 only. The program will work with any memory configuration.

```
10 N=309:X=(N+1)/10:DIMS$(N):P=1:POKE3687
     9,187
20 FORI=0TON:S$(I)="-":NEXT
30 PRINT"{CLEAR}"
40 GOSUB590:IFA=0THENPRINT"{03 UP}":GOTO4
     0
50 ONAGOTO60,140,220,260,330,390,450,510,
     550
60 K=0
70 Q=0:PRINT"{CLEAR}{BLK}{REV}CATALOG :";
     T$:PRINT"PAGE{PUR}"
80 FORJ=KTON:IFASC(S$(J))=18THEN:PRINTINT
     (J/10+1);S$(J):Q=Q+1:IFQ>9THENGOT
     O100
90 NEXTJ
100 IFJ>=NTHENGOTO40
110 PRINT"{DOWN}{REV}HIT RETURN TO CONTINU
     E{OFF}"
120 GETA$:IFA$=""THEN 120
130 K=J+1:GOTO70
140 INPUT"{BLK}WHAT PAGE{PUR}";P$:P=VAL(P$
     ):A$=P$:GOSUB610:IFA=0THEN160
150 GOTO40
160 IFP<1ORP>XTHENPRINT"{02 UP}":GOTO140
170 PRINT"{CLEAR}{REV}{BLK}PAGE"P;T$:PRINT
     "{PUR}":FORI=0TO9:L=(P-1)*10+I:PR
     INT"{LEFT}"L;S$(L):NEXT
180 GOSUB 590:IF A=0 THEN 200
190 GOTO 50
200 P=P+1:IF P>XTHENP=1
210 GOTO 170
220 INPUT"{BLK}ENTER#{PUR}";R$:R=VAL(R$):A
     $=R$:GOSUB610:IFA=0THEN240
230 GOTO40
240 IFR<0ORR>NTHEN PRINT"{02 UP}":GOTO220
250 INPUTS$(R):GOTO170
260 INPUT"{BLK}INSERT#{PUR}";R$:R=VAL(R$):
     A$=R$:GOSUB610:IFA=0THEN280
270 GOTO40
280 IFR<0ORR>NTHEN PRINT"{02 UP}":GOTO260
290 PRINT"{BLK}ENTRY{PUR}":INPUTD$:PRINT"{
     BLK}INSERTING{PUR}":IFR=NTHEN170
```

```
300 FORI=RTON-1STEP2:SA$=S$(I+1):S$(I+1)=S
    $(I):S$(I)=D$:D$=SA$:IFASC(D$)=45
    THENGOTO320
310 NEXT
320 GOTO170
330 INPUT"{BLK}KILL WHICH LINE#{PUR}";R$:R
    =VAL(R$):A$=R$:GOSUB610:IFA=0THEN
    350
340 GOTO40
350 IFR<0ORR>NTHENPRINT"{02 UP}":GOTO330
360 IFR=NTHEN380
370 FORI=RTON-1:S$(I)=S$(I+1):NEXT
380 S$(N)="-":GOTO170
390 PRINT"{CLEAR}{BLK}{REV}SAVE TO TAPE":P
    RINT"{DOWN}ARE YOU SURE (Y/N)
400 GETA$:IFA$=""THEN400
410 IFA$="N"THEN170
420 OPEN1,1,1,T$:PRINT#1,T$:FORI=0TON:PRIN
    T#1,S$(I):PRINT"{HOME}"TAB(15);I:
    NEXT:CLOSE1
430 PRINT"{10 DOWN}"T$" SAVED{DOWN}{PUR}"
440 GOTO40
450 PRINT"{CLEAR}{BLK}{REV}LOAD FROM TAPE"
    :PRINT"{DOWN}ARE YOUR SURE (Y/N)
460 GETA$:IFA$=""THEN460
470 IFA$="N"THEN170
480 OPEN1,1,0:INPUT#1,T$:FORI=0TON:INPUT#1
    ,S$(I):PRINT"{HOME}"TAB(15);I:NEX
    T:CLOSE1
490 PRINT"{06 DOWN}{PUR}"
500 GOTO40
510 PRINT"{DOWN}{BLK}{REV}ARE YOU SURE (Y/
    N){PUR}"
520 GETA$:IFA$=""THEN520
530 IFA$<>"Y"THEN170
540 PRINT"THE NEW FILE NAME":INPUTT$:GOTO2
    0
550 PRINT"{CLEAR}{REV}{BLK} CONTROL DEFINI
    TIONS  ":PRINT"{REV}C{OFF}ATALOG{
    DOWN}":PRINT"{REV}P{OFF}AGE NUMBE
    R{DOWN}"
560 PRINT"{REV}E{OFF}NTER LINE{DOWN}":PRIN
    T"{REV}I{OFF}NSERT LINE{DOWN}":PR
    INT"{REV}K{OFF}ILL LINE{DOWN}"
570 PRINT"{REV}S{OFF}AVE TO TAPE{DOWN}":PR
    INT"{REV}L{OFF}OAD FROM TAPE{DOWN}"
    :PRINT"{REV}N{OFF}EW FILE{DOWN}"
    :PRINT"{REV}?{OFF} DEFINITIONS"
580 GOTO40
590 PRINT"{DOWN}{BLK}{REV}C,P,E,I,K,S,L,N,
    ?{PUR}"
600 GETA$:IFA$=""THEN600
610 IFA$="C"THENA=1:RETURN
620 IFA$="P"THENA=2:RETURN
630 IFA$="E"THENA=3:RETURN
640 IFA$="I"THENA=4:RETURN
650 IFA$="K"THENA=5:RETURN
660 IFA$="S"THENA=6:RETURN
670 IFA$="L"THENA=7:RETURN
680 IFA$="N"THENA=8:RETURN
690 IFA$="?"THENA=9:RETURN
700 A=0:RETURN
```

©



VIC-20*

SOFTWARE SPECIALS

CBM-64*

NEW! CARTRIDGE GAMES FROM TRONIX

SCORPION $34.95

Full 4-way scrolling, fast action predator game where it's you against killer frogs, slimy worms, stalker flies, dragons and hatcher pods. With 32 levels of play.

GOLD FEVER .. $29.95

Explore a deadly mine searching for valuable gold deposits. Avoid roaming mine carts, rolling boulders and a crazy claim jumper! With 9 levels of play.

DEADLY SKIES $29.95

Frenetic, fast paced, action-packed game where you are the Rebel fighter attacking the hostile military base. Avoid S.A.M.'s, smart bombs and deadly radioactive clouds! Over 10 levels of play.

From Interesting Software
Cassette $15.95
ALL MACHINE CODE!

Bring the fun of the shooting gallery into your home. With music and colorful graphics.

CBM-64 & VIC-20 MINI-MONITOR

All machine code monitor which will disassemble code, do text dump, move memory, hex to decimal and decimal to hex conversion as well as a mini-assembler!
VIC-20 version requires 8K expansion.

Cassette	**$24.95**
Disk	**$29.95**

CREATIVE SOFTWARE GAMES ON CARTRIDGE

CHOPLIFTER	$39.95
SERPENTINE	$39.95
APPLE PANIC	$39.95
ASTROBLITZ	$39.95
TRASHMAN	$39.95

Stellar Triumph

Great new all machine code game for your CBM-64. One or two player game with all the arcade sound and graphics! Fantastic space war game with many options.

From H.A.L. Labs ... tape or disk $24.95

Dust Covers

Water resistant
Attractive brown canvas
$7.95

KIDS & THE VIC

Great new book to add to your library.
only $14.95

INTERESTING SOFTWARE
21101 S. Harvard Blvd., Torrance, CA 90501
(213) 328-9422

Visa MC Check Money Order Add $2.00 Postage & Handling
CA residents add appropriate sales tax Dealer Inquiries Invited

*VIC-20 & CBM-64 is a trademark of Commodore Business Machines

---

FOR THE VIC-20®

THE COMPUTER REVOLUTION IS COMING!
BE READY WITH A MASTERY OF THE COMPUTER KEYBOARD!

IN THE AGE OF THE COMPUTER, EVERYONE FROM THE SCHOOL CHILD TO THE CHAIRMAN OF THE BOARD SHOULD BE AT HOME AT THE COMPUTER KEYBOARD. THESE PROGRAMS PROVIDE EVERYTHING YOU NEED TO MASTER THE KEYBOARD AND GAIN THE COMPETITIVE EDGE THIS BRINGS IN THE COMPUTER AGE.

Rated THE BEST educational program for the VIC-20 by Creative Computing Magazine

*TYPING TUTOR PLUS WORD INVADERS — $21.95

(2 programs on one cassette tape for the unexpanded VIC-20)

Typing Tutor plus Word Invaders makes learning the keyboard easy and fun! Typing Tutor teaches the keyboard in easy steps. Word Invaders makes typing practice an entertaining game. Highly praised by customers: "Typing Tutor is great", "Fantastic", "Excellent", "High Quality", "A source of great learning and joy for our children."

Customer comment says it all . . .

". . . and it was everything you advertised it would be. In three weeks, my 13 year old son, who had never typed before, was typing 35 w.p.m. I had improved my typing speed 15 w.p.m. and my husband was able to keep up with his college typing class by practicing at home."

FOR THE COMMODORE 64®

SPRITE DESIGNER by Dr. Lee T. Hill — $16.95
Save hours of work when designing sprites. Helps you create multiple sprites, copy and alter them to create views from different perspectives automatically for 3-D or animated effects. Options include: copy any of the previous sprites, reflection, rotation, translation, shearing, reverse image, merge & intersect. Saves sprite data for merge into your program.

SHIPPING AND HANDLING $1.00 PER ORDER. CALIFORNIA RESIDENTS ADD 6% SALES TAX.
VISA AND MASTERCARD ORDERS MUST INCLUDE FULL NAME AS SHOWN ON CARD, CARD NUMBER, AND EXPIRATION DATE.

FREE CATALOG SENT WITH ORDER AND ON REQUEST

P.O. BOX 9403
SAN RAFAEL, CA 94912

ACADEMY SOFTWARE

VISA master charge

(415) 499-0850

Programmers. Write to our New Program Manager concerning any exceptional VIC-20 or C64 game or other program you have developed.

The Atari Musician

Barry Belian

You'll be making music on your Atari in no time with the help of these two programs. You can compute pitch values to play major and minor chords, generate scales, and even tune the computer so that you and Atari can play duets.

COMPUTE! published an eye-opening article in the February 1982 issue entitled "Transposition." The author, Janet Whitehead, explained the simple mathematical relationship between each of the pitch values for the various musical notes available in Atari BASIC. After she explained how this could be put to use in musical transposition, she challenged the reader to find further applications. Here is my crack at it.

Four-Note Chords

The most commonly used chords are the four-note major and minor chords. The four notes of any chord can be defined by the first note of the chord and the interval pattern for that particular type of chord. The first (lowest pitch) note of the C-major chord, for example, is a C. The second note of any major chord is always located four half-steps, or two whole steps, above the first. This gap between the notes is known as an interval.

A half-step interval can be found on the piano by locating any two adjacent keys, such as C and C sharp. It can also be found in the pitch table of the *Atari BASIC Manual* by locating any two consecutive entries.

Since we know that the first interval of a major chord is four half-steps, we determine the second note in a C-major chord by counting up four half-steps from C, arriving at E. The interval between the first and third notes of a major chord is always seven half-steps. If we again count upward from C, we find that the third note of a C-major chord is a G. The fourth note is always a 12 half-step interval, or *octave*, above the first, which gives us a C for our final note. Thus, the four notes of a C-major chord are C-E-G-C. In a similar manner, the four notes of an F-major chord are found to be F-A-C-F.

Computing Pitch Values

At this point, let's summarize the previous article. Basically, the author pointed out that the pitch values for any two adjacent notes in the pitch table are related in the same way that the frequencies for those two notes are. Namely, they differ by a constant factor of M=2^(1/12) for each half-step interval. Two half-steps would involve a factor of M squared, three half-steps a factor of M cubed, and so forth.

Therefore, to compute the pitch value of the second note of a major chord, multiply the first value by M raised to the fourth power. To compute the third pitch, multiply the first by M to the seventh power, and to compute the fourth, multiply the first pitch by M to the twelfth power, which is just two. This procedure will result in pitch values for any major chord, *regardless of the starting value.* The only limitation is that we are restricted to eight bits in which to specify a pitch, which gives us a range from zero to 255 to work with.

If we continue with our example of the C-major chord, we start with a pitch value of 121 for middle C and proceed to compute the rest of the chord as follows:

C=121
E=121/(2^(4/12))=96
G=121/(2^(7/12))=81
C=121/2=60

Program 1 is a demonstration which puts all of this information together. This program allows you to select a starting pitch and play either a major or minor chord built upon the selected low note. The desired chord will then be played for a few seconds.

Scales, Chords, And Duets

If you prefer, you can generate scales using a similar technique. Program 2 allows you to play a major, minor, or chromatic scale of one octave, given a starting pitch. All major scales consist of eight notes and have the following interval pattern: whole-step, whole-step, half-step, whole-step, whole-step, whole-step, and half-step. Minor scales also have eight notes, but they differ from major scales in that the third and sixth notes are each dropped down a half-step. A chromatic scale includes every half-step in an octave, which results in 13 notes.

When a song is transposed it simply means that you are playing the same tune, but starting it on a different note. To do this, multiply (or divide) the variable used to hold the pitch values of the song by a constant of your choice.

Do you have a program which plays a few random notes? Perhaps it would sound better to

EASTCOAST SOFTWARE

***ecs...** inflation-fighting prices.*

ATARI SOFTWARE

747 Landing Simulator 24KC	$17.75
747 Landing Simulator 32KD	17.75
Advanced Music System D	23.25
Adventure on a Boat 32KD	17.90
Airstrike C/D	28.90
Ali Baba & Forty Thieves 32KD	24.90
Alien Garden 16KR	28.90
Andromeda Conquest C	12.75
Andromeda Conquest 40KD	16.25
Apple Panic 16KC/48KD	20.95
Armor Assault 32KD	28.90
Assembler Editor 8KR	46.40
Asteroids 8KR	28.45
Atari Basic 8KR	46.40
Atari Speed Reading C	58.15
Atari Writer R	62.00
Attack At EP-CYG-4 C	20.95
Attack At EP-CYG-4 D	24.90
Avalanche 16KC	17.75
Avalanche 16KD	17.75
Bandits 48KD	24.75
Baseball 16KC	20.95
Baseball 24KD	24.75
Basketball 8KR	27.00
Bookkeeper Kit 48KD	193.70
Bookkeeper 48KD	116.25
Canyon Climber 16KC/D	20.95
Catacombs of Baruth D	17.75
Caverns of Mars 16KD	31.00
Centipede 8KR	34.75
Checkers 32KD	35.50
Chess 48KD	49.50
Chicken R	33.00
Chicken 16KC/D	27.50
Choplifter 48KD	24.75
Claim Jumper R	33.00
Claim Jumper 16KC	24.75
Clowns & Balloons 16KC/D	20.95
Commbat 24KD	17.90
Communicator Kit R	235.00
Computer Stocks & Bonds 32KC	15.90
Computer Stocks & Bonds 40KD	17.90
Conversational Spanish 16KC	46.40
Conversational Italian 16KC	46.40
Conversational German 16KC	46.40
Conversational French 16KC	46.40
Cosmic Balance 48KD	28.90
Crossfire 8KR	33.00
Crossfire 16KC/32KD	20.95
Crush, Crumble & Chomp 32KC/D	20.95
Crypt of the Undead 40KD	20.95
Curse of RA 32KC	15.90
Curse of RA 32KD	15.90
Cypher Bowl 16KC	35.50
Cytron Masters D	28.90
Danger in Drindisti 32KC	15.90
Danger in Drindisti 32KD	15.90
Data Management System D	17.75
Data Perfect 32KD	76.65
Datestones of Ryn 32KC	15.90
Datestones of Ryn 32KD	15.90
David's Midnight Magic 48KD	24.75
Deadline 32KD	35.50
Defender R	34.75
Deluxe Invaders 16KR	28.90
Deluxe Invaders 16KD	24.75
Dig Dug R	34.75
Disk Workshop D	24.75
Diskey 32KD	35.50
Dodge Racer 16KC/32KD	24.75
Dog Daze 8KC	17.75
Dog Daze 24KD	17.75
Downhill 16KC	17.75
Downhill 32KD	17.75
Dragon's Eye 40KD	20.95
Eastern Front 16KC/32KD	23.95
Empire of the Overmind 40KC	20.95
Empire of the Overmind 40KD	24.75
Entertainer Kit 8KR	73.15
Escape From Vulcan's Isle 32KD	20.95
ET Home Phone R	38.75
Face Maker D	24.75
Family Cash Flow 32KD	17.75
Family Finance D	38.75
File Manager 800+ 40KD	70.00
Flip Out D	20.95
Fort Apocalypse 32KC/D	24.75
Frogger 16KC/32KD	24.75
Galactic Empire 32KC	15.90
Galactic Gladiators D	28.90
Galactic Trader 32KC	15.90
Galahad and the Holy Grail 32KD	23.25
Galaxian R	34.75
Genetic Drift 16KC/32KD	20.95
GFS Sorceress 48KC	20.95
GFS Sorceress 40KD	24.75
Golf Challenge R	33.00
Golf Challenge C/D	17.90
Gomoku 8KC	15.90
Gomoku D	20.97
Gorf 16KR	33.00
Gorf 16KD	28.90
Guradian of Gorn 16KC	20.95
Guardian of Gorn 24KD	24.75
Hellfire Warrior 32KD	28.90
Home Filing Manager 32KD	38.75
Home Financial Management C	23.00
Home Manager Kit D	62.00
Invasion Orion C	17.90
Invasion Orion 32KD	17.90
Invitation to Programming 1 8KC	19.25
Invitation to Programming 2 8KC	23.15
Invitation to Programming 3 8KC	23.15
It-Is-Balloon 16KC/D	24.75
Jeepers Creepers D	20.95
Juggler D	20.95
Jumbo Jet Pilot R	38.30
Kayos 8KC/D	24.75
Keys of Acheron 32KC/D	15.90
Kid Grid 16KC/D	20.95
King Arthur's Heir C	15.90
King Arthur's Heir 32KD	20.95
Labyrinth 16KC/32KD	20.95
Legionnaire 16KC	24.75
Letter Perfect 24KR	145.00
Letter Perfect 24KD	110.00
Letterman 16KC	17.75
Letterman 32KD	17.75
Lost Colony D	20.95
Lunar Lander 24KC	10.75
Lunar Lander 32KD	16.00
Macro Assembler & Text Ed. 32KD	70.00
Mad-Netter 16KC/D	24.75
Mail Merge/Utility 16KD	20.95
Master Type 32KD	28.90
Microsoft Basic 32KD	70.00
Miner 2049er 16KR	35.50
Missile Command 8KR	28.45
Monster Maze 16KR	28.90
Morloc's Tower 16KC	15.90
Music Composer R	32.50
My First Alphabet 24KD	27.15
Nautilus 32KC/D	24.75
Number Blast 16KC	12.40
Number Blast 24KD	12.40
Odin 48KD	35.50
Outlaw/Howitzer 24KC	17.75
Outlaw/Howitzer 24KD	17.75
Pac Man 8KR	34.75
Pacific Coast Highway 16KC/D	20.95
Picnic Paranoia R	33.00
Picnic Paranoia 16KC/D	24.75
Pig Pen D	20.95
Pilot (Home Package) 8KR	61.85
Pinball D	20.95
Platterman 16KR	28.90
Pogoman 16KC/D	28.90
Poker Solitaire 8KC	10.75
Poker Solitaire D	15.90
Preppie 16KC/32KD	20.95
Probe 1 40KD	27.50
Programmer Kit 8KR	57.85
Protector II R	33.00
Protector II 32KC/D	24.75
Raster Blaster 32KD	20.95
Rear Guard 16KC	15.90
Rear Guard 24KD	17.90
Reptilian 16KC/D	24.75
Rescue at Rigel 32KC	20.95
Rescue atRigel 32KD	20.95
Reversi 8KC	15.90
Reversi D	20.97
Ricochet 32KC	15.90
Ricochet 32KD	15.90
S.A.M. 8KD	46.00
Saga #1—#12 24KD	28.90
Salmon Run 16KC	17.75
Salmon Run 24KD	17.75
Scram 16KC	19.25
Sea Fox 48KD	20.95
Sentinel I 16KC	20.95
Sentinel I 24KD	24.75
Serpentine D	24.75
Seven Card Stud 24KC	12.40
Seven Card Stud 32KD	12.40
Shamus R	33.00
Shamus 16KC/D	24.75
Shooting Arcade 16KC/D	20.95
Sky Rescue 32KC	15.90
Sky Rescue 32KD	17.90
Slime R	33.00
Slime 16KC/D	24.75
Snapper D	24.90
Snooper Troops #1 D	33.00
Snooper Troops #2 D	33.00
Space Invaders 8KR	28.45
Speedway Blast D	20.95
Star Raiders 8KR	34.75
Star Warrior C	28.90
Star Warrior 32KD	28.90
Starcross 32KD	28.90
Story Machine D	24.75
Submarine Commander R	38.30
Sunday Golf 16KC	10.75
Survival of the Fittest R	28.90
Tanktics 24KC	17.00
Tanktics 32KD	20.50
Telelink 8KR	23.15
Temple of Apshai 32KC/D	28.90
Text Wizard 32KD	70.00
The Birth of the Phoenix D	15.60
The Nightmare 32KD	20.95
Time Wise D	23.15
Touch Typing 16KC	19.25
Treasure Quest 16KC	10.75
Twerps D	27.50
Upper Reaches of Apshai 32KC/D	15.90
VC 40KD	17.90
Video Math Flash Cards 8KC	12.40
Video Math Flash Cards 16KD	12.40
Visicalc (Special Price) 32KD	172.00
War 32KD	17.90
Warlock's Revenge 40 KD	24.75
Wizard of Wor 16KR	33.00
Wizard of Wor 16KD	28.90
Word Processor 48KD	116.25
Zaxxon C/D	28.90
Zork I 32KD	28.90
Zork II 32KD	28.90
Zork III 32 KD	28.90

Atari 800 (48K)..... $525.00
Atari 400 (16K)..... $225.00

Price Reflects Cash Discount Only

Atari® is a registered trademark of ATARI COMPUTER INC.

EASTCOAST SOFTWARE

110 West Caracas Avenue
Hershey, PA 17033

Shipping 1% ($2.50 min.)
C.O.D. Add An Additional $2.50
Foreign FPO-APO Orders We Ship
Air Mail...Add 7% (U.S. Currency Only)
No Minimum Order
Visa-Mastercard-C.O.D.-Check
Prices Subject To Change

MAIL YOUR ORDER OR CALL **(717) 533-8125**

Key
(D) Disk
(C) Cassette
(R) Rom Cartridge

Many more titles available.
We also carry a full line of Apple Software.

play random chords instead. Once you have selected your random low note, use the previously mentioned techniques to generate the other notes.

Have you tried to play piano along with your Atari? If so, you may have found that they were not quite in tune with each other. It could be expensive to tune your piano, so tune your computer instead. Find a pitch value that sounds in tune with middle C on your piano (or other instrument). Then divide by M repeatedly to generate pitch values for higher notes, and multiply by M to compute the lower notes. Remember, your pitch values must stay in the range from zero to 255. Now use the table you have generated to replace the one given in the *Atari BASIC Manual*. You can start playing duets with your Atari.

Program 1: Major And Minor Chords

```
10 DIM D(3)
20 D(1)=1.25992103
30 D(2)=1.1892071
40 D(3)=1.49830706
50 PRINT " ENTER PITCH OF LOW NOTE O
   F CHORD";:INPUT X1
60 IF X1>255 THEN 50
70 PRINT " ENTER 1 FOR MAJOR OR 2 FO
   R MINOR";:INPUT Y
80 X2=X1/D(Y)
90 X3=X1/D(3)
100 X4=X1/2
110 SOUND 0,X1,10,10:SOUND 1,X2,10,1
    0:SOUND 2,X3,10,10:SOUND 3,X4,10
    ,10
120 FOR X=1 TO 1000:NEXT X
130 FOR X=0 TO 3:SOUND X,0,0,0:NEXT
    X
140 STOP
```

Program 2: Scale Generation

```
10 DIM D(2)
20 D(1)=1.12246203
30 D(2)=1.05946308
40 PRINT " ENTER PITCH OF LOW NOTE O
   F SCALE";:INPUT X
50 IF X>255 THEN 40
60 PRINT " ENTER 1 FOR MAJOR, 2 FOR
   MINOR,":PRINT " OR 3 FOR CHROMATI
   C";:INPUT Y
70 IF Y=3 THEN 200
80 GOSUB 500
90 X=X/D(1):GOSUB 500
100 X=X/D(Y):GOSUB 500
110 IF Y=2 THEN X=X/D(2)
120 X=X/D(2):GOSUB 500
130 X=X/D(1):GOSUB 500
140 X=X/D(Y):GOSUB 500
150 IF Y=2 THEN X=X/D(2)
160 X=X/D(1):GOSUB 500
170 X=X/D(2):GOSUB 500
180 STOP
200 GOSUB 500
210 FOR I=1 TO 12
220 X=X/D(2):GOSUB 500
230 NEXT I
240 STOP
500 SOUND 0,X,10,10
510 FOR Z=1 TO 200:NEXT Z
520 SOUND 0,0,0,0
530 RETURN
```

©

Eric Martin's

Where prices are born, not raised!

Atari 1200XL 64K CALL

810 Disc Drive	CALL
1010 Program Recorder (NEW)	$79.00
1025 Printer (NEW)	$410.00
CX85 Numeric Keyboard	$109.00
CX419 Bookkeeper Kit	CALL
CX488 Communicator Kit	CALL
ATARI Software	
CXL4025 Defender	$39.00
RX8026 Dig Dug	$39.00
RX8039 Eastern Front (ROM)	$44.00
CLX 4027 Qix	$39.00
RX8037 Star Trux	$39.00
DX5049 Visicalc	$159.00
CA01655 Technical Reference Notes	$29.95
Third Party Software	
Miner 2049	CALL
Zaxxon	$27.95
Eastern Front 1941 (cassette)	$29.95
Wizard of War	$30.00
Gorf	$30.00
Frogger	$30.00
Chop Lifter	$29.00
Apple Panic	$23.75
Baha Buggies	$23.75
Submarine Commander (ROM)	$35.95
Jumbo Jet Pilot (ROM)	$35.95
Soccer (ROM)	$36.95
Gamestar Football	CALL

SCOTCH maxell

Diskettes & Tape	
SCOTCH 5¼" Single sided	$26.95
SCOTCH 5¼" Double sided	$29.95
SCOTCH Tape C-10 (lot of 10)	$24.90
SCOTCH Tape C-30 (lot of 10)	$26.90
SCOTCH T-120 VHS	$9.95
MAXELL 5¼" Single sided	$31.00
MAXELL 5¼" Double sided	$39.00
MAXELL VHS Tape (SUPER PRICE)	CALL

**We take TRADE-INS.
Call for your price.**

ATARI SERVICE
FACTORY AUTHORIZED NETWORK

Orders shipped in 24 hours

For fast delivery, send certified or cashier checks, money orders, or direct bank wire transfers. Personal checks allow 2 to 3 weeks to clear. Prices reflect cash discount and are subject to change. Add 2% for credit card purchases. Shipping—Software $2 Minimum. Hardware—call. Foreign inquiries invited —add 15% for shipping. Ohio residents add 6.5% sales tax.

Eric Martin's

5485 Warrensville Center Road
Maple Heights, Ohio 44137

**Call Toll Free
1-800-482-7254
In Ohio 216/663-2032
Mon.-Sat. 10-6 EST**

FOR THE WONDERFUL WORLD OF ATARI 400 & 800 SYSTEMS

RCE ANNOUNCES . . .

COMMANDER 2400

AN INVITATION TO AN EXCITING NEW DIMENSION OF COMPUTER CONTROL AND PROGRAMMING EASE.

2400 WITH KEY PAD – 2400 STANDARD

EXPERIENCE . . . . .

. . . The responsive feel of superbly crafted engineering under your fingertips.

. . . The convenience and comfort of your own detachable professional keyboard system.

. . . The beauty, elegance and natural warmth of wood.

. . . The luxuriousness, softness and durability of fine furniture textured vinyl.

. . . A combination of features designed to return the thrill of personal command to computing.

FEATURES

1. Exclusive and unique calculator circuit! Allows keypad to be switched into use as a standard rapid entry calculator.
2. Detachable option allows easy disconnection to store away while the youngsters play their games!
3. User installable in minutes, no soldering required!
4. Allows simultaneous use of BOTH keyboards!
5. Keyswitches and components are top quality design and manufacture.

THE COMMANDER 2400 IS AVAILABLE FROM $119.00 TO $219.00 DEPENDING ON YOUR CHOICE OF OPTIONS AND COMES WITH A 10 DAY MONEY BACK GUARANTEE. OUR WARRANTY IS FOR 6 MONTHS, BOTH PARTS & LABOR! SEND FOR OUR FREE BROCHURE AND FULL ATARI CATALOG!

TO ORDER, CALL TOLL FREE
(800) 547-2492

RCE
536 N.E. "E" STREET
GRANTS PASS, OREGON 97526

ATARI®

A Warner Communications Company

"Computers For People"

FREE CATALOG!
With any order, or send $1.00(refundable with your first order)

Over 1000 items for your Atari. . .

- ● Mosaic ● Percom
- ● Broderbund ● APX
- ● Roklan ● Datasoft
- ● Synapse ● A.I.
- ● On-Line ● Atari
- ● Hayes ● Epson
- ● Visicalc ● More!

Make Royal Your ATARI® *Source!*
We handle Only Atari Compatible hardware and software. . . So we know what works best! *Send for our complete catalog, Only $1.00(Refundable with your order).*

INTRODUCING. . .

Super Mailer

From Royal Software

48K DISK
$49.95

The most user-friendly mail maintenance program available! Here are a few of the outstanding features. . .

- ● New OS that offers fewer 'crashed-disks'-True random access-Store 500 to 2000 names/addresses per disk.
- ● Works on single or double density.
- ● Automatic delete of duplicates.
- ● Print a disk directory.
- ● Official state abbreviations are built-in.
- ● Make back-up copies. ● Merge files
- ● Search files ● Sort files
- ● Create sub-files ● Print lables/file copy

Let "Super Mailer" speed your mail!

Protective Dust Covers
For ATARI 400/410 800/810, Please specify.

$8.95 Each
Please specify which you want

Flip-N-File™
Available for both disks and cartridges

Smoke-gray Acrylic, The very best way to protect your valuable software!

Specify Disk or Cart **$29.95**

- Fast Arcade Action
- 100% Machine Language
- 16K Disk or Cassette

From Royal Software

METEOR STORM

$29.95
Disk Tape

Excellent Graphics & Sound!

Your Atari® Source!

Royal Software

2160 W. 11th St. • Eugene, OR 97402
Phone (503)683-5361
Mastercard — Visa — American Express

PROGRAMMING THE TI

C. Regena

GRAPHICS

"Graphics" or drawing pictures on the TI can be a lot of fun, and using graphics in your programs can really enhance them. The TI has 16 colors, and all 16 colors may be used at the same time on the screen, even with high-resolution graphics. Later in this column, I will discuss user-defined graphics characters.

Video-Graphs

First, let's briefly review the TI Video-Graphs command module, since using the command module is an easy way to see graphics on the TI without actually programming. You may see different random color patterns, or you may draw pictures on the screen using the arrow keys and a few function keys. You may save or load a picture on cassette tape.

Because Video-Graphs was one of the first command modules produced by TI, the manual you get with your module may be written for the TI-99/4 console. There are some changes that are necessary for the module to work with the TI-99/4A console. (By the way, if you have the TI-99/4 console, be sure to use the overlay that comes with the module or ask Texas Instruments to send you an overlay. The overlay has all the colors and commands so you don't need to keep referring to the manual.)

Make these changes for the TI-99/4A console. Instead of pressing ENTER, press the period key to return to the activity selection list. You will also need to press the period instead of zero to return to the main index lists. The comma key represents the color GRAY. To save a picture or to get to the TAPE options, press the semicolon key. To change colors, use the virgule/slash key.

The "Patterns" option presents three different random graphics demonstrations. STOP a picture by pressing N. You can't change colors while a picture is stopped. To restart the picture, press 6. While a pattern is going, you may change colors. Let's say you are looking at pulsing lights and want to change all the white squares to magenta. Press / then M then 0.

The "Pictures" option presents four different ways you can draw on the computer. Mosaic and Sketchpad are like using a pen directed by the arrow keys. Color Life is designed to be like the venerable computer game "Life," which replicates cells according to strict rules. Building Blocks has several shapes at the bottom of the screen. You may move the cursor to the shape you want for your picture, then press Y for the pen and move the shape up to your picture. Again, you may change colors by pressing / followed by the present color and then the color desired.

Programming Your Own Graphics

Think of the screen on your monitor or television set as a rectangle divided up into 24 rows and 32 columns. To graphically place a character on the screen, you specify the row number, the column number, and the character number – the ASCII code number of the character you desire. You may also specify a number of repetitions. CALL HCHAR(8,5,65,7) will start in row 8 and column 5 and draw character number 65, which is the letter A, seven times horizontally. CALL VCHAR(12, 14,66,9) will draw the letter B nine times vertically, starting in row 12 and column 14.

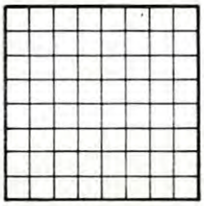
If you don't want to draw a picture using A's and B's or the other letters and symbols available, you can define your own high-resolution characters. Each square in the 24 x 32 rectangle can be divided up into an 8 x 8 square, and each dot in that 8 x 8 square can be turned on or off – colored in or not. By specifying with code numbers which dots you want on and which you want off, you can define your own graphics character and then place it on the screen.

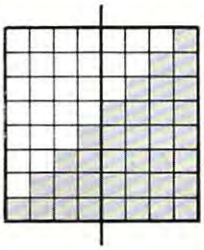
Here is an example. I want to draw a small triangle. The dots in the 8 x 8 square are colored in. The next step is to divide the square in half so that there are columns of four squares on each side. Now, working left to right and downward, figure out the hex code for each pattern of four squares. In the first row, 0000 is 0 and 0001 is 1. In the second row 0000 is 0 and 0011 is 3. Continue down the rows. The code is 0103070F1F3F7FFF. In your program, you can define the character with a CALL CHAR statement, then place the character on the screen:

```
200 CALL CHAR(128,"0103070F1F3F7FFF")
210 CALL HCHAR(12,15,128)
```

Line 200 defines character number 128 to be the colored-in triangle, and line 210 places that character on the screen. You may either redefine one of the existing characters (numbers 32 through 127) or use numbers from 128 to 159. If I had redefined the letter A (character 65), every time I print A on the screen you would see a triangle instead of an A.

```
200 CALL CHAR(65,"0103070F1F3F7FFF")
210 PRINT "A CAT"
220 GOTO 220
```





Program 1, "Defining Characters," allows you to design a graphics character. You will see a large square which has been divided up into an 8 x 8 square. Use the arrow keys to move the cursor. Press F if you want the space filled in; press the SPACE BAR if you don't. Press ENTER when you are finished with your character. The computer will go through to compare the patterns of on and off dots and will print the code values, then an actual-size character will be placed on the screen so you can see what your character looks like. The definition is then repeated in a string form so you may copy it and use it in your own programs.

After the character is defined, you have the option of modifying it, defining a new character, or ending the program. If you choose to modify it, the character will reappear, and you may alter it in any way you wish.

Character 97, "a", is defined as an open square □, and Character 98, "b", is defined as a filled square ■ (lines 200-210). When the 8 x 8 square is drawn on the screen, it is done by printing "aaaaaaaa" eight times (lines 420-440).

The hex codes are read in as data (lines 120-170). H$(I,1) is the pattern of blank or filled squares, and there are 16 patterns. H$(I,2) is the corresponding hex code number or letter. The flashing cursor is red so you can tell where you are on the pattern you are designing (lines 180-190). CALL GCHAR(X,Y,C) determines what character number C is at row X and column Y.

Program 2, "Bull," is a graphics demonstration program that illustrates user-defined, high-resolution graphics. Lines 130 to 340 define graphics characters. Lines 350-460 draw the bull's head on the screen by printing redefined characters. Lines 470-530 place more graphics characters on the screen. (George H. Sunada of Logan, Utah, was the artist of the original Utah State University "Aggie bull.")

A later column will discuss how to use the CALL COLOR statement and how to plan color sets.

Program 1: Defining Characters

```
100 REM  DEFINING CHARACTERS
120 DIM H$(15,2)
130 FOR I=0 TO 15
140 READ H$(I,1),H$(I,2)
150 NEXT I
160 DATA aaaa,0,aaab,1,aaba,2,aabb,3
    ,abaa,4,abab,5,abba,6,abbb,7,baa
    a,8,baab,9
170 DATA baba,A,babb,B,bbaa,C,bbab,D
    ,bbba,E,bbbb,F
180 CALL COLOR(13,9,1)
190 CALL CHAR(128,"FFFFFFFFFFFFFFFF"
    )
200 CALL CHAR(97,"FF818181818181FF")
210 CALL CHAR(98,"FFFFFFFFFFFFFFFF")
220 CALL CLEAR
230 PRINT "DEFINE A GRAPHICS CHARACT
    ER"
240 PRINT :"PRESS F TO FILL THE SQUA
    RE"
250 PRINT "PRESS SPACE TO CLEAR SQUA
    RE"
260 PRINT "PRESS ARROW KEYS TO MOVE"
270 PRINT :"PRESS ENTER WHEN FINISHE
    D":::
280 IF (K=50)+(K=0)THEN 420
290 FOR I=1 TO 15 STEP 2
300 FOR L=0 TO 15
310 IF SEG$(D$,I,1)=H$(L,2)THEN 330
320 NEXT L
330 C$=H$(L,1)
340 PRINT "{3 SPACES}";C$;
350 FOR L=0 TO 15
360 IF SEG$(D$,I+1,1)=H$(L,2)THEN 38
    0
370 NEXT L
380 C$=H$(L,1)
390 PRINT C$
400 NEXT I
410 GOTO 450
420 FOR I=1 TO 8
430 PRINT "{3 SPACES}aaaaaaaa"
440 NEXT I
450 X=16
460 Y=6
470 CALL SOUND(150,1397,2)
480 CALL GCHAR(X,Y,C)
490 CALL KEY(0,K,S)
500 CALL HCHAR(X,Y,128)
510 CALL HCHAR(X,Y,C)
520 IF S<0 THEN 490
```

```
530 IF K=13 THEN 760
540 IF K=70 THEN 740
550 IF K=32 THEN 720
560 IF K<>68 THEN 600
570 IF Y=13 THEN 470
580 Y=Y+1
590 GOTO 480
600 IF K<>88 THEN 640
610 IF X=23 THEN 470
620 X=X+1
630 GOTO 480
640 IF K<>83 THEN 680
650 IF Y=6 THEN 470
660 Y=Y-1
670 GOTO 480
680 IF K<>69 THEN 490
690 IF X=16 THEN 470
700 X=X-1
710 GOTO 480
720 CALL HCHAR(X,Y,97)
730 GOTO 470
740 CALL HCHAR(X,Y,98)
750 GOTO 470
760 CALL SOUND(150,440,2)
770 D$=""
780 FOR I=1 TO 8
790 C$=""
800 FOR J=6 TO 9
810 CALL GCHAR(I+15,J,C)
820 C$=C$&CHR$(C)
830 NEXT J
840 GOSUB 1050
850 CALL HCHAR(I+15,16,ASC(D1$))
860 D$=D$&D1$
870 C$=""
880 FOR J=10 TO 13
890 CALL GCHAR(I+15,J,C)
900 C$=C$&CHR$(C)
910 NEXT J
920 GOSUB 1050
930 CALL HCHAR(I+15,17,ASC(D1$))
940 D$=D$&D1$
950 NEXT I
960 CALL CHAR(136,D$)
970 CALL HCHAR(20,20,136)
980 PRINT :"DEFINITION = ";D$
990 PRINT ::"PRESS 1 TO MODIFY"
1000 PRINT "{6 SPACES}2 TO START OVE
     R"
1010 PRINT "{6 SPACES}3 TO END PROGR
     AM":
1020 CALL KEY(0,K,S)
1030 IF (K=49)+(K=50)THEN 220
1040 IF K=51 THEN 1110 ELSE 1020
1050 FOR L=0 TO 15
1060 IF C$=H$(L,1)THEN 1090
1070 NEXT L
1080 L=L-1
1090 D1$=H$(L,2)
1100 RETURN
1110 PRINT ::
1120 END
```

Program 2: Graphics Demonstration

```
120 CALL CLEAR
130 FOR C=33 TO 140
140 READ C$
150 CALL CHAR(C,C$)
160 NEXT C
170 DATA FFFFFFFFFFFFFFFF,,0001070F1
    F3F7F7F,40C0800000000808,00000000
    003C4582,00000304081020E,7FC
180 DATA C0303F080402,0000876810100
    8,0000806C12473804,000406070303
    07,000000008 0C0E0F,E0FFFFFFFFFF
    FFF
190 DATA 0102FFFEFFFFFAFC,05489020C0
    8,000003030110E,00808000CF3,07
    0F3F2F271D06 02,F0FCFFFFFFFF1F0D
200 DATA 0000FFFFFFFFFFFF,0F1FFFFFF
    FFFFFFF,FCFCFCFCFCFCFCFC,7F7F7F3
    F1F1F2F2,FFF FFFFFFCF0C,FCF9FA0D
210 DATA 7080384488102021,030001020
    40402,438C304040818282,0E166EBF
    7E,FFFFFFFF0 F0301,F8F0F0E0C08
220 DATA 00000001060 40E0F,2020418307
    1F7FFF,0080000808CFFFFFF,0000806A
    7FFFFFFF,2224455EFFFEFFFE
230 DATA 01FD037985030 10D,84B4242424
    1C0101,0C0830408090 20C,00807 07C3
    E3E1F1F,0000101C3E3FFFFF
240 DATA 38300E81406,000000080C020100
    C,1F1F3F3F7F7F797,FFFFFFFFFFFCFA
    FD,FEFFFCFCF858810B,749C2008A8F8
    FCFC
250 DATA 8040404020204 01008,1F0F0F0F
    070707E7,070301,FFFFFF7F,F4E9CB8
    30F070707,17FFFFF9FDFCFEFE
260 DATA 0F000818FCFCFCFC,F8C8070060
    906,38D890187C94E407,FFFFFFFEF09
    0909,FFFFFF7F3F1F272,FFFFFFFFFFF
    CF8
270 DATA 0303030301010101,7F7F7DF8E0
    FFFFFF,0707030101010303,FFFFFFCF
    CFCEFCF1,9090A0A06040C09,202020
    20202020 2
280 DATA FEFCF8F0E0C0C081,1010202040
    439418,204040808,7F7F3F3F3F1F1F0
    F,FCF8F0E0E0E6FFFF,00001F205F84C
    7E
290 DATA 0404848480C0F3FF,000000000C0
    20101,1202020204040808,0F0F07070
    70737C7,FFFFFFB38080F0FF,E0E0C08
    000003FFF
300 DATA 7F7F7F3E1C0080F,808000181C1
    E3F7E,1010202040808038,FFFF3F3F3
    F3F1F1F,FEFEFEFCF0F2F1F,0F0F,FF7
    F,FFF8
310 DATA F0E,0780402018050381,00E040
    808,4222120A06020101,86463A01,80
    00000003050505,000003FC,408
320 DATA 0808081010100202,08080404040
    40404,0000008040201 01,000007080A
    0A04,0333428008102 04,0E70800102 0
    C106
330 DATA 8000402010101 02,8001020080 8
    080C,A0100F,00010638C,8080407807
    ,4040808080808 08,8080808E513E2
340 DATA 0000071820204 04,00C02010000
    00001
350 PRINT TAB(6);"#$ %&'()*  +,"
360 PRINT TAB(6);"!-./  0123456"
370 PRINT TAB(6);"789:  ;< =>!?"
380 PRINT TAB(5);"@ABCDE  FGHIJK"
390 PRINT TAB(5);"L!!MNOP{3 SPACES}Q
    !!5,"
400 PRINT TAB(6);"RSTU!VWX#YZ[S"
410 PRINT TAB(8);"\!J6 ^_`a"
420 PRINT TAB(9);"!!6 \bcd"
430 PRINT TAB(9);"e!fghij"
440 PRINT TAB(9);"k!lmnop"
```

```
450 PRINT TAB(10);"q!!!r"
460 PRINT TAB(10);"s tuv":::::
470 FOR I=1 TO 25
480 READ X,Y,C
490 CALL HCHAR(X,Y,C)
500 NEXT I
510 DATA 18,17,119,18,18,120,19,17,1
    21,20,18,122,19,18,123,20,19,124
    ,20,20,125,1
9,20,126
520 DATA 18,20,127,17,20,128,17,19,1
    29,18,11,130,18,10,131,19,11,132
    ,20,11,125,2
0,10,134
530 DATA 19,10,133,20,9,135,20,8,136
    ,19,8,137,18,8,138,17,8,139,17,9
    ,39,17,10,14
0,1,1,32
540 GOTO 540
550 END
```

©

Clear Plastic DUST COVER $7 95 * plus $2 shipping and handling

Fits standard keyboard and speech synthesizer.

Single Cassette Cables for TI Computers

Cassette Cable C-2000	$13.95
RS 232 Flat Ribbon C-2010 5ft.	$24.95
RS 232 Flat Y (Printers) C-2020 5ft.	$49.95
RS 232 Modem C-2030 5ft.	$24.95
RS 232 Flat Y (Printer-Modem) C-2040 5ft.	$49.95
TI-PIO Flat Centronics C-2050 5ft.	$34.95
PIO Flat Centronics C-2060 5ft.	$34.95

Guaranteed 90 days against workmanship defects. Repairable at low cost. Inquire about customized or hard-to-find cables. Add $2 shipping and handling.
*Florida residents add 5% sales tax.

Dealer inquiries invited.

GET COMPUTERIZED INC.
3550 S. Washington Ave., Dept. A
Titusville, FL 32780 ● (305) 268-4007

ATTENTION
TEXAS INSTRUMENTS
TI-99/4A
OWNERS

We have hundreds of 3rd party independent software programs on cassette and disk ready to run on your TI-99/4A. Games, business, and educational programming at discount prices as low as $8.95 ea. Plus all TI hardware and software at incredibly low, low prices, including the new TI-99/2 and CC-40 computers. We also have dust covers, heavy duty joysticks with TI adapters, and many more accessories. Call or write now for a FREE listing. We ship your order U.P.S. the same or next business day to insure fast service. Visa and MasterCard accepted (NO service charges) or C.O.D. is okay.

THE MUSIC WORKSHOP
59 E. Tioga St.
Tunkhannock, PA 18657
CALL 1-717-836-4522

TI-99/4A™

NEW FROM COMPUTE!

PROGRAMMER'S REFERENCE GUIDE FOR THE TI-99/4A™

by C. Regena,
COMPUTE! Columnist

Contains over 40 programs! An indispensable guide to understanding your TI-99/4A. Everything you need to know about: learning BASIC, editing, variables, graphics, music, speech, mathematical functions, using files and arrays, sorting, conserving memory, and much more. Useful for everyone from beginners to experienced programmers.

RESERVE YOUR FIRST EDITION TODAY!

YES! Send me a copy of the *Programmer's Reference Guide for the TI-99/4A.*
_____ $12.95 (plus $2 shipping/handling) check or money order enclosed.
_____ Charge my ☐ VISA ☐ MasterCard ☐ American Express
Acct. # _____________ Exp. _____________
Prepaid orders only. All orders must include $2 S/H.
Name _____________
Address _____________
City/State/Zip _____________
COMPUTE! Books • P.O. Box 5406 • Greensboro, NC 27403
Please allow 4-6 weeks for delivery.

COMPUTE! Subscriber Services

Please help us serve you better. If you need to contact us for any of the reasons listed below, write to us at:

COMPUTE! Magazine
P.O. Box 5406
Greensboro, NC 27403

or call the Toll Free number listed below.

Change Of Address. Please allow us 6-8 weeks to effect the change; send your current mailing label along with your new address.

Renewal. Should you wish to renew your **COMPUTE!** subscription before we remind you to, send your current mailing label with payment or charge number or call the Toll Free number listed below.

New Subscription. A one year (12 month) US subscription to **COMPUTE!** is $20 (2 years, $36; 3 years, $54. For subscription rates outside the US, see staff page). Send us your name and address or call the Toll Free number listed below.

Delivery Problems. If you receive duplicate issues of **COMPUTE!**, if you experience late delivery or if you have problems with your subscription, please call the Toll Free number listed below.

COMPUTE!
800-334-0868
In NC 919-275-9809

www.commodore.ca

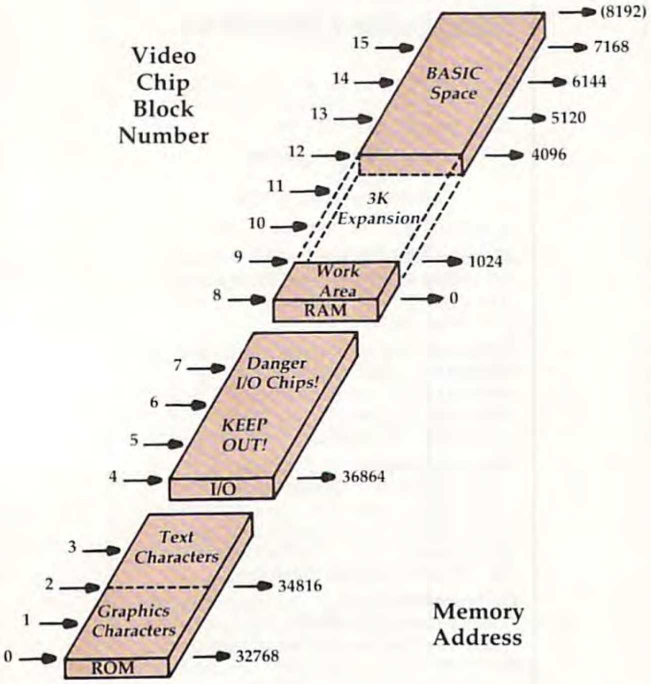
Part I

Visiting The VIC-20 Video

Jim Butterfield, Associate Editor

In which the traveler discovers a new way of viewing the computer's memory: through a video chip. This is the first of a multi-part series about the structure and uses of the VIC's video chip.

If we want to put the VIC-20 video chip to work, we must learn to see things from its standpoint. It sees the computer memory in a way that differs significantly from the way the processor chip sees it. Let's look at what the video chip sees:



How the video chip sees memory.

The video chip sees only the memory shown above. Even if you have expanded your computer to include lots of extra RAM above address 8191, the chip can't see it. The chip sees only the character ROM, in blocks 0, 1, 2, and 3; and the lowest 8K of RAM (in blocks 8 to 15). Blocks 4, 5, 6, and 7 would look at the Input/Output area, but take my advice: don't do it – no good will come from these addresses.

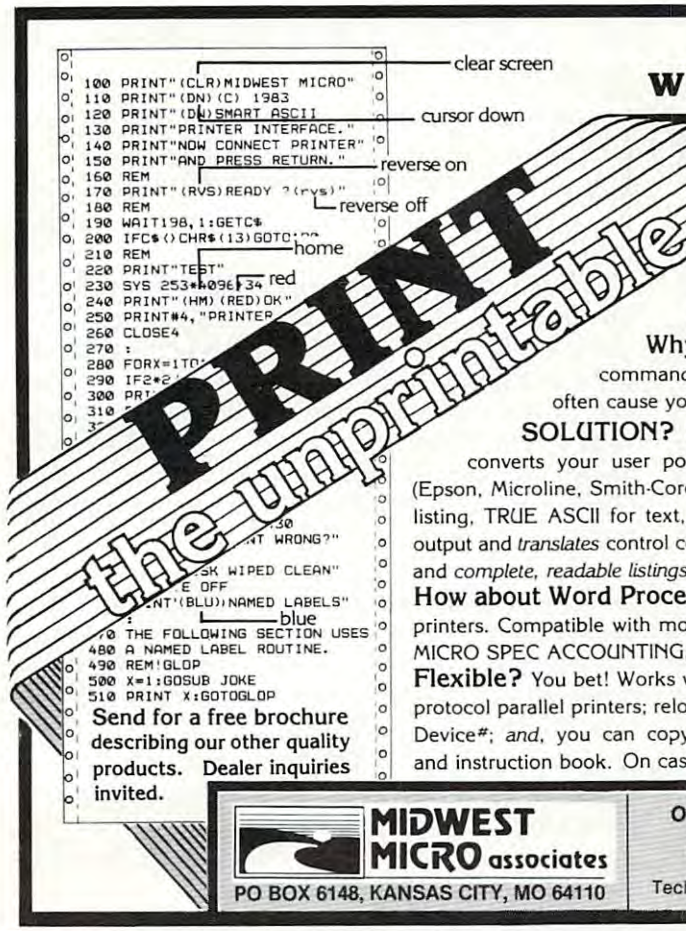
What The Chip Wants

The video chip wants to dig out two things from memory and deliver them to the screen. It wants to look at "screen memory" – usually the characters you have typed. On a minimum 5K VIC, that's block 15.5, which corresponds to decimal address 7680 or hexadecimal 1E00. Did I mention that for screen memory, we can look at "half blocks"? It makes sense, since only five hundred odd characters are needed to fill the screen.

By the way, the official name for screen memory is the "video matrix." Whatever you call it, if you POKE 7680,1 on an unexpanded VIC, you'll see the letter A appear at the start of the screen. Unless, of course, you're printing white on white, in which case you need very good vision to see it.

The second thing that the chip wants from memory is the "character set" – instructions on how to draw each character on the screen. On a typical VIC, this will be either block 0 for the graphics character set or block 2 for the text mode (upper- and lowercase). You can change it, but you'll usually want to stay with even numbers: a full character set including the reversed characters takes up 2048 bytes of memory.

The official name for the character set is "Character Cells," although the term "Character Base" is coming into use. Whatever you call it, you can't POKE 32768,55 and expect anything to happen – the standard characters are in ROM and cannot be changed. They're carved in stone, or silicon, to be more exact. If you want to switch to



```
100 PRINT"(CLR)MIDWEST MICRO"
110 PRINT"(DN)(C) 1983
120 PRINT"(DN)SMART ASCII
130 PRINT"PRINTER INTERFACE."
140 PRINT"NOW CONNECT PRINTER"
150 PRINT"AND PRESS RETURN."
160 REM
170 PRINT"(RVS)READY ?(rvs)"
180 REM
190 WAIT198,1:GETC$
200 IFC$()CHR$(13)GOTO
210 REM
220 PRINT"TEST"
230 SYS 253*4096+34
240 PRINT"(HM)(RED)OK"
250 PRINT#4,"PRINTER
260 CLOSE4
270 :
280 FORX=1TO
290 IF2*2
300 PRI
310
```

```
                30
          NT WRONG?"
        SK WIPED CLEAN"
         E OFF
      NT'(BLU))NAMED LABELS"
     :
  70 THE FOLLOWING SECTION USES
480 A NAMED LABEL ROUTINE.
490 REM!GLOP
500 X=1:GOSUB JOKE
510 PRINT X:GOTOGLOP
```

Send for a free brochure describing our other quality products. Dealer inquiries invited.

with Smart ASCII

A software parallel printer interface for the VIC and '64.

$59.95

What's Unprintable? Cursor movements and other special control commands! Your parallel printer can't LIST these from the VIC or '64.

Why? Because the Commodore graphics representing these commands are not found on most parallel printers, *and* these commands often cause your printer to jump into **Bold**, or go "off-line", etc.

SOLUTION? Smart ASCII! (Say ask-ee.) This new software interface converts your user port into an intelligent parallel port for most popular printers (Epson, Microline, Smith-Corona, etc.). Smart ASCII provides 3 print modes: CBM ASCII for listing, TRUE ASCII for text, and TRANSLATE. TRANSLATE is smart! It intercepts printer output and *translates* control commands into helpful text abbreviations. *No more printer hang-ups* and *complete, readable listings!*

How about Word Processing? Enjoy faster, letter-quality printing with low-cost parallel printers. Compatible with most applications programs: WORD PRO®, QUICK BROWN FOX®, MICRO SPEC ACCOUNTING, MAIL-LIST, WRITER'S ASSISTANT, etc.

Flexible? You bet! Works with *any size* VIC or the '64; has 3 print modes; for "Centronics" protocol parallel printers; relocatable software for special programming needs; programmable Device#; *and*, you can copy to disk for quick loading. Complete with connecting cable and instruction book. On cassette.

MIDWEST MICRO associates
PO BOX 6148, KANSAS CITY, MO 64110

ORDER DESK: (Orders only!)
(816) 254-9600
Technical support (816) 921-6502

MAIL ORDER: Add $1.25 shipping and handling ($3.50 for C.O.D.); VISA/Mastercard add 3% (card# and exp. date). MO residents add 4.6% sales tax. Foreign orders payable U.S.$, U.S. Bank ONLY; add $5 shp/hndlg.

WANNA KNOW A SECRET?

WORD PROCESSING Full capability word processing. Word-oriented—not a line editor. Menu-driven. For VIC: TOTL TEXT 2.0 $25.00
More powerful versions include footnotes, headings, footing, keyboard input, special printer control and more. For VIC + 16K or 24K: TOTL TEXT 2.5 $35.00
For C-64: TOTL TEXT 2.6 $40.00

MAILING LIST and LABELS Easy editing, automatically sorted, optimal non-printing data line(s), browse and select functions. Menu-driven.
For VIC or 64: TOTL LABEL 2.0 $20.00

KEYWORD CROSS REFERENCE Students and authors: keep track of reference notes and bibliographies. Quick reference by keyword. Requires printer.
For VIC: RESEARCH ASSISTANT 2.0 $30.00
For C-64: RESEARCH ASSISTANT 2.0 $35.00

TIME MANAGEMENT Keep track of activities by date (and time). Screen inquiry by date, person, project. 56 different bar chart formats available.
For VIC: TOTL TIME MANAGER 2.1 $30.00
For C-64: TOTL TIME MANAGER 2.6 $35.00

BUSINESS ACCOUNTING Accounts receivable and payable. Inventory and expense tracking, print invoices, statements, reports. Disk only.
For VIC and C-64: Inquire for price.

ANNOUNCING THE ONE MEGABYTE Fuzzy DISKETTE

A Revolutionary New Concept in User Support —A soft-sectored novelty pillow no serious computer user should be without. $25.00 including full documentation!

Mail Orders: Send check or money order (Calif. residents add 6% sales tax) to:

TOTL software inc.
1555 Third Ave., Walnut Creek, CA 94596
MasterCard VISA **Call (415) 943-7877**

TOTL Software for
VIC 20* and COMMODORE 64*
the best deal in town!

All programs work with disk and/or tape; adaptable for 40 or 80 column formats and most printers. VIC programs require minimum 8K expansion

(Be sure to specify machine when ordering)

*VIC 20 and COMMODORE 64 are trademarks of Commodore Business Machines.

custom characters, you'll need to stage them in RAM and tell the chip which block to take them from.

There's a third thing that the chip uses, but it doesn't come from regular memory in the usual way. That's the screen colors (the "Color Matrix"). This color information for each character comes through the back door, so to speak, and we won't worry about the details too much here. When we need to, we'll set the color and assume everything will work.

Architecture

Looking at the diagram, we can begin to see why the VIC does its odd screen switch when you add memory. In the 5K VIC, the screen sits at the top of memory – and that's the highest address that the video chip can see (block 15.5). If we add 3K RAM expansion, the screen can stay where it is above the BASIC RAM area. But if we add 8K or more, the video chip can't see that high, and the screen memory must flip down to the bottom where it won't get in the way of your BASIC program. Which bottom, you may ask? It turns out to be block 12, which is memory address 4096 or hexadecimal 1000, even if the 3K expansion is in place.

You can move this around yourself, of course, and we'll be doing that in just a few moments.

The trick is mostly location 36869, which contains instructions on which blocks to use for screen and characters. We do it this way: select which blocks you want for each. Now, multiply the screen block (not including the .5 if you're using it) by 16 and add the character block. POKE the result into 36869, and the job's done. We'll need to do a couple of other things for sanity's sake, but that's the main job.

The "half page" for the screen memory goes into location 36866; you invoke it by adding 128 to the "column count" if you want to go the extra distance. That means that under normal circumstances (22 columns), you want to POKE 36866,22 for an exact block number, and POKE 36866,150 to nudge to the extra half page.

An Adventure

Let's do something useless, but fun. We'll move the screen memory down to address zero (that's block 8). We can't play with this area – too many important things are happening there – but we can watch interesting things in progress, like the timer and the cursor doing their peculiar things.

First, the calculation. We want the character set to stay the way it is (block 0 for graphics), and we want to move the screen memory to block 8. Eight times 16 plus zero gives 128. No half block, so 36866 should be 22.

A preliminary step: let's make sure that we don't print white-on-white by clearing the screen and typing:

```
FOR J=37888 TO 38911:POKE J,0:NEXT J
```

Ready? Here goes: enter POKE 36869,128:POKE 36866,22. Press RETURN. No, we haven't crashed, but we'll have to type blind from now on.

First, examine the fascinating busy things that are under way. The timer is working away in three bytes. At first glance, only one byte seems to be changing. The cursor flash is being logged and timed somewhat below. And if you start typing, you'll see a whole new series of working values coming into play. Indeed, if you can type blind, you might try PRINT 1234+5678 and watch the flurry of activity.

If you type a lot, the screen will start to scroll, and the display will start to vanish as the colors are rolled off the top.

Restore everything to normal by holding down RUN/STOP and tapping the RESTORE key.

This has been a first exploration, but you may feel that you understand better what the video chip is up to. Indeed, you may feel that you have gained some measure of control.

There's much more to be learned. This is a start.

©

COMPUTE!'s
First Book Of VIC

Authors: **COMPUTE!** Magazine contributors
Price: $12.95
On Sale: Now

Finally, it's VIC's turn!

Users of other popular personal computers have been enjoying their **COMPUTE! Books**: *COMPUTE!'s First Book Of PET/CBM* ...the *First Book Of Atari* ...the *Second Book Of Atari* ... *Programming The PET/CBM* ... and others.

Now, there's a book devoted exclusively to the Commodore VIC-20 computer: *COMPUTE!'s First Book Of VIC*.

The editors of **COMPUTE!** Magazine – the leading resource for the VIC-20 – gathered together the best VIC-20 articles published since the summer of 1981 and added some new material. The result is more than 200 pages of valuable information – information that goes beyond the instruction manuals. In the **COMPUTE!** tradition, it is carefully edited to be easily understood and useful for beginners and experts alike.

COMPUTE!'s First Book Of VIC is spiral-bound to lie flat, and includes ready-to-type program listings and articles such as "The Joystick Connection: Meteor Maze," "STARFIGHT3," "Train Your PET To Run VIC Programs," "Renumber BASIC Lines The Easy Way," "High Resolution Plotting," "Custom Characters For The VIC," "VIC Memory – The Uncharted Adventure," and "A Simple Monitor For The VIC."

At only $12.95, less than most computer manuals, *COMPUTE!'s First Book Of VIC* is among the best resources a VIC user can own.

Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

Add $2 shipping and handling. Outside the U.S. add $5 for air mail, $2 for surface mail. All orders prepaid, U.S. funds only.

Part II:

COLOR COMPUTER GENERAL-PURPOSE DATA BASE

Jeffrey S Yohay

This concludes a two-part tutorial and model program for creating data bases on the TI/99-4A and TRS-80 Color Computer. The model program is called "Video Movie Data Base Program" (VMDP), because it was designed to catalog and manage a collection of movies on videotape. Here the author discusses screen displays and program structure, and presents the data base program itself. The Color Computer program requires 16K RAM memory and Extended BASIC.

Before utilizing this data base manager, there are a few more details to explore. We'll pick up where we left off in March with a discussion of how to add new records.

Adding A Record

When you add a new record, the "add record" routine of the VMDP will prompt you for all of the information necessary to fill the 17 fields. Since the field lengths are all fixed (see Table 1), the "add record" routine will also display a left arrow at the point where the length of the input will match the length of the field.

If you write over this arrow while answering an input prompt, your answer will be too big to fit into the field being filled. You should then backspace and start over, using abbreviations where possible. If you don't, your input will be larger than the field size and will be truncated. If your input is smaller than the field size, the field will be filled with blanks to keep the field (and the record) size constant.

Note that your answer to a field input question will be displayed (in its final length) after you press ENTER; so if your answer was truncated, you'll see it on the screen immediately. You'll have to delete and reenter the record if the truncated data isn't correct.

As I mentioned before, several of the fields contain a code that can be expanded by the VMDP into usable information. The "type of movie" field is a two-byte code that describes the movie; the code can be any of the following:

CO – Comedy (or any light drama)
DR – Drama (a good death scene qualifies)
HI – History (war movies, costume dramas, etc.)
HO – Horror (Bela and Boris, or "Halloween XXIII")
MU – Musical (that's entertainment!)
MY – Mystery (from my favorite director, I presume)

The "commercials" field is a one-byte code that describes how you dealt with commercials when you recorded the movie:

N – None (a pre-recorded tape, or a movie broadcast on non-commercial television)
E – Edited (you removed them)
F – Few (you tried for an "E" but fell asleep!)
M – Many (you deleted a few, then decided it wasn't worth the effort)
A – All (you weren't home, or you just got lazy)

And finally, the "recording speed" field will vary depending on the video format of your VCR. VHS owners will put an S, L or E in this field, for SP, LP or EP recording speed. Beta owners will use 1, 2 or 3 in this field, for Beta I, Beta II, or Beta III recording speed. Beta owners might also want to change line 490 of the "add record" routine from "SPEED (S,L,E)" to "SPEED (1,2,3)" and line 250 of the "display full-data" routine from "P VIEW TIME: " to "B VIEW TIME: ".

The rest of the fields are self-explanatory. You may have to do some thinking to fit a particularly long name into the "title," "director," or "actor/actress" fields, but that shouldn't happen often (unless you have a lot of movies like *Abbott and Costello Meet Dr. Jekyll and Mr. Hyde*).

And filling the "approximate viewing time" and "approximate time remaining" fields will require some extra effort on your part. You'll need to make a chart of your VCR's counter number vs. recording time, or buy one of the commercially available ones (if there is one for your machine). Note that if the movie is the last one on a particular videotape, you can answer "EOT" (end-of-tape) to the "time remaining" question instead of calculating the few minutes remaining.

It's designed to display as much information in as little space as possible.

Text Screen Displays

The text screen of the Color Computer consists of 512 bytes of RAM at memory locations 1024-1535. This allows for 16 lines of 32 characters, or 512 characters total.

It takes a lot of planning to use this text screen properly, since the small number of characters doesn't allow you to display very much information at once. So I designed the text screens of the VMDP to display as much information in as little space as I could. I also made ample use of the reverse video feature of the text screen (green letters on a black background instead of the usual black letters on a green background) to highlight various portions of the screen. Since lowercase letters are displayed in reverse video, you'll see a lot of PRINT output in lowercase in the program listing.

You might also notice a lot of POKEs into the text screen memory area. Since there is no way to PRINT spaces or special characters (colon, comma, period, etc.) in reverse video, I wondered how I could do the highlighting I had in mind. Luckily, I discovered from the *TRS-80 Color Computer Technical Reference Manual* that POKEing the ASCII value of these characters directly into the video memory locations in RAM will cause them to appear on the screen in reverse video. Just add 1024 to the desired "PRINT @" screen location to get the correct memory address for the POKE.

I have included some "screen prints" of the VMDP's main text screen displays: Figure 1 is the main menu, Figure 2 is a sample full-data output for a particular movie, and Figure 3 is a sample titles-only movie display. These figures will give you a good idea of how the VMDP displays will look on your screen.

Memory Requirements

The program itself is 5211 bytes long, leaving ample room for movie data: up to 60 movie records in a 16K computer, and up to 180 in a 32K computer. But this storage is available only if you don't reserve any RAM for graphics (which the VMDP doesn't need anyway). This means not reserving even one graphics page (1536 bytes). Since the Color Computer does not have a "PCLEAR 0" command to clear all the graphics memory for programs and data, you'll have to do it yourself.

Before loading the program, type in the line:

```
POKE 25,6: NEW <ENTER>
```

This does the same thing as the missing "PCLEAR 0" command. Then load and run the VMDP. If you forget to clear the graphics memory, the VMDP will remind you by generating an OM (Out of Memory) error in line 40 when it tries to CLEAR the string space for the movie record array.

Note that I use a POKE to test for a 32K machine (line 40), then CLEAR the appropriate amount of string space for the available RAM. I can do this because memory location 16384 (16K+1) will be 255 in a 16K computer (since it doesn't really exist), but will contain whatever you POKE into it in a 32K machine.

Program Structure

Table 2 shows the structure of the VMDP, and Table 3 is a list of the program variables.

Line 40 reserves RAM for movie record storage as described before. Lines 50-80 display the main menu of program options and get the desired option from a two-character command. To check for a correct response and then run the desired subroutine, I used a technique to truncate every answer to one size and then compare it to a string of all the correct answers (CC$) that I previously defined.

Lines 120-200 are *global* subroutines, i.e., subroutines called from various places in the program. Lines 240-360 are the display routines, including "full-data" and "titles-only" displays of movie data as well as the "search and display" of a particular movie.

Lines 400-430 repeat the "full-data" and "titles-only" displays for a printer. Here is where you might want to use your own imagination to customize the program. Though I have a very capable printer (the NEC 8023), I hesitated to use any of its special features in these routines in order to keep the VMDP as general as possible. So feel free to add the control codes for your printer to enhance the printed output in any way you want.

Lines 470-560 perform the "add record" and "delete record" functions. The "add record" function will prompt you for all the data necessary to build a movie record. The "delete record" function will just find and delete an existing movie record. Note that there is no way to edit an existing record to change only one or more fields. I felt this would require too much memory to implement, and I wanted to keep the VMDP as small as possible to leave ample room for movie data in a 16K machine.

Lines 600-690 are the sort routines. Using a Shell-Metzger sorting algorithm, I provided three sort routines (with many of the required program lines shared by all three) to sort the movie records:

1. Alphabetically by title.
2. Alphabetically by type and, within types, by title.
3. Numerically by videotape number and, within videotapes, numerically by VCR counter number.

You can sort the movie records whenever you want before displaying or printing the movie data.

And finally, lines 730-770 perform all cassette I/O operations to load and save movie data files.

Table 1: VMDP Record Format

Position In Record	Length In Bytes	Information
1-28	28	Title of movie
29-32	4	Year of release
33-48	16	Director
49-64	16	Actor/Actress
65-80	16	Actor/Actress
81-96	16	Actor/Actress
97-98	2	Type of movie (code)
99-100	2	Videotape number
101-104	4	Start of movie (VCR counter number)
105-108	4	End of movie (VCR counter number)
109	1	Reserved for future use (now "/")
110	1	Recording speed (code)
111-113	3	Approximate viewing time of movie
114-116	3	Approximate time remaining on tape
117	1	Reserved for future use (now "/")
118-123	6	Date recorded
124-125	2	Channel
126	1	Color?
127	1	Commercials (code)

Program 1: Color Computer Version

```
40 POKE16384,0:IFPEEK(16384)<>0THENCL
   EAR8132:DIMR$(60)ELSECLEAR24396:DI
   MR$(180)
50 CC$="DA DT DS PA PT AD DE SM ST SN
    LO SA ":CLS:PRINT@9,"VIDEOTAPE MO
```

Table 2: VMDP Structure

Line No.	Function
40	Tests for memory size and CLEAR space for data
50-80	Display main menu and get command
120-130	Expand type of movie code (subroutine)
140-180	Assign data fields to variables (subroutine)
190-200	Search for a movie record (subroutine)
240-280	Display full data for all movies
290-330	Display titles only for all movies
340	Searches and displays full data for any movie
350-360	Display subroutines
400-420	Print full data for all movies
430	Prints titles only for all movies
470-550	Add record for new movie
560	Deletes record of an existing movie
600-690	Sort movies by title, type, or videotape
730-740	Load data file
750	Saves data file
760-770	Load/Save subroutine

Table 3: VMDP Variables

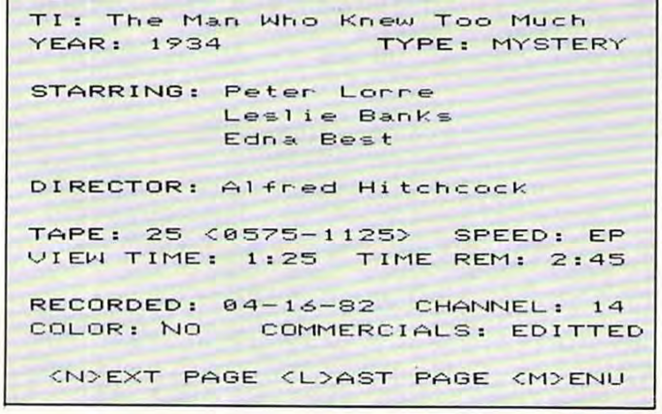
A$	Answer to question
A1$,A2$,A3$	Actor/Actress #1, #2, #3
C,C$,CC$	Main Menu command variables
CH$	Channel
CL$	Color?
CM$	Commercials code
CN$	VCR counter numbers
DI$	Director
DT$	Date recorded
F$	Data file name
I,I1,I2	Loop counters
I1,I2,I3,I4	Shell-Metzger sort counters
IL,IO,IP	Line and page counters for display and print
IR	Number of records counter
K$	Input from keyboard
L	Add Record field length
MP	Maximum number of pages in titles-only display
N	Shell-Metzger sort variable
Q, Q$	Add Record field input question variables
R$,R$()	Individual movie record and movie record array
RP	Add Record input field location in movie record
S	Add Record field input question screen location
S$	Print output spacing variable
SP$	Recording speed code
T$	Title to search for to display or delete
TN$	Videotape number
TY$	Type of movie code
VR$,VT$	Remaining time on tape and viewing time of movie
X$,X1$,X2$	Subroutine call variables
W	Loop Variable to pause program

```
    VIE":POKE1042,32:PRINT@41,"DATABAS
    E SYSTEM":POKE1073,32:PRINT@73,"CO
    MMAND":PRINT"DISPLAY  <DA> ALL
    {3 SPACES}<DT> TITLES":POKE1127,32
    :PRINT@137,"<DS> SEARCH AND DISPLA
    Y"
60  PRINT"PRINTER  <PA> ALL{3 SPACES}<
    PT> TITLES":POKE1223,32:PRINT:PRIN
    T"CHG DATA <AD> ADD{3 SPACES}<DE>
    DELETE":POKE1283,32:PRINT@297,"<SM
    > SORT BY MOVIE":PRINT@329,"<ST> S
    ORT BY TYPE":PRINT@361,"<SN> SORT
    BY TAPE #"
70  PRINT:PRINT"DATAFILE <LO> LOAD  <S
    A> SAVE":PRINT@489,"<QU> QUIT PROG
    RAM";:PRINT@80,"";:INPUTC$
80  C$=C$+"  ":C$=LEFT$(C$,3):IFC$="QU
     "THENCLS:ENDELSEC=INSTR(CC$,C$)-1
    :IFC/3<>INT(C/3)THEN50ELSEONC/3+1G
    OSUB240,290,340,400,430,470,560,60
    0,600,600,730,750:GOTO50
90  '
100 ' GLOBAL SUBROUTINES
110 '
120 R$=R$(IO):TY$=MID$(R$,97,2):IFTY$
    ="CO"THENTY$="COMEDY"ELSEIFTY$="D
    R"THENTY$="DRAMA"ELSEIFTY$="HI"TH
    ENTY$="HISTORY"ELSEIFTY$="HO"THEN
    TY$="HORROR"ELSEIFTY$="MU"THENTY$
    ="MUSICAL"ELSEIFTY$="MY"THENTY$="
    MYSTERY"
130 RETURN
140 A1$=MID$(R$,49,16):A2$=MID$(R$,65
    ,16):A3$=MID$(R$,81,16):DI$=MID$(
    R$,33,16):TN$=MID$(R$,99,2):CN$=M
    ID$(R$,101,4)+"-"+MID$(R$,105,4)
150 SP$=MID$(R$,110,1):VT$=MID$(R$,11
    1,1)+":"+MID$(R$,112,2):VR$=MID$(
    R$,114,1):IFVR$="E"THENVR$="EOT"E
    LSEVR$=VR$+":"+MID$(R$,115,2)
160 DT$=MID$(R$,118,2)+"-"+MID$(R$,12
    0,2)+"-"+MID$(R$,122,2):CH$=MID$(
    R$,124,2):CL$=MID$(R$,126,1):IFCL
    $="N"THENCL$="NO "ELSECL$="YES"
170 CM$=MID$(R$,127,1):IFCM$="N"THENC
    M$="NONE"ELSEIFCM$="E"THENCM$="ED
    ITTED"ELSEIFCM$="F"THENCM$="FEW"E
    LSEIFCM$="M"THENCM$="MANY"ELSEIFC
    M$="A"THENCM$="ALL"
180 RETURN
190 CLS:PRINT@41,X1$;" RECORDS":POKE1
    071,32:PRINT@96,"TITLE TO ";X2$:P
    RINT@158,CHR$(127)
200 PRINT@128,"";:INPUTT$:T$=LEFT$((T
    $+STRING$(28,32)),28):PRINT@130,T
    $:FORIO=1TOIR:IFT$=LEFT$(R$(IO),2
    8)THENRETURNELSENEXT:PRINT@192,"N
    O SUCH RECORD":POKE1218,32:POKE12
    23,32:FORW=1TO750:NEXT:RETURN
210 '
220 ' DISPLAY ROUTINES
230 '
240 IO=1
250 GOSUB120:CLS:GOSUB140:GOSUB350:PR
    INT"STARRING:  ";A1$:PRINTTAB(10)A
    2$:PRINTTAB(10)A3$:PRINT:PRINT"DI
    RECTOR:  ";DI$:PRINT:PRINT"TAPE:  "
    ;TN$;" <";CN$;">  SPEED:  ";SP$;"P
     VIEW TIME:  ";VT$;"  TIME REM:  ";
    VR$
260 PRINT:PRINT"RECORDED:  ";DT$;"  CH
    ANNEL:  ";CH$:PRINT"COLOR:  ";CL$;"
      COMMERCIALS:  ";CM$:GOSUB360
270 K$=INKEY$:IFK$=""THEN270ELSEIFK$=
    "M"THENRETURNELSEK=ASC(K$):IFK<>7
    6ANDK<>78OR(K=78ANDIO=IR)OR(K=76A
    NDIO=1)THEN270ELSEIFK=78THENIO=IO
    +1ELSEIFK=76THENIO=IO-1
280 GOTO250
290 IP=0:MP=INT(IR/5):IFIR/5=INT(IR/5
    )THENMP=MP-1
300 CLS:FORIL=1TO5:IO=IP*5+IL:IFIO<=I
    R THENGOSUB120:GOSUB350:NEXT
310 GOSUB360
320 K$=INKEY$:IFK$=""THEN320ELSEIFK$=
    "M"THENRETURNELSEK=ASC(K$):IFK<>7
    6ANDK<>78OR(K=78ANDIP=MP)OR(K=76A
    NDIP=0)THEN320ELSEIFK=78THENIP=IP
    +1ELSEIFK=76THENIP=IP-1
330 GOTO300
340 X1$="SEARCH":X2$="SEARCH FOR":GOS
    UB190:IFIO>IR THENRETURNELSE250
350 PRINT"TI:  ";LEFT$(R$,28);:PRINT"Y
    EAR:  ";MID$(R$,29,4)TAB(18)"TYPE:
```

Figure 1: VMDP Main Menu

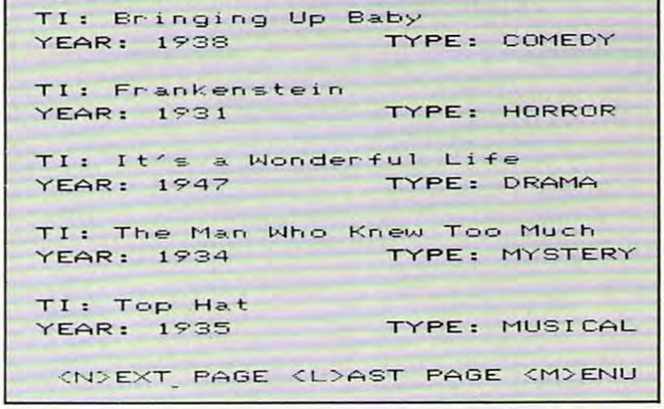
```
            VIDEOTAPE MOVIE
            DATABASE SYSTEM
            COMMAND?
DISPLAY     <DA> ALL     <DT> TITLES
            <DS> SEARCH AND DISPLAY

PRINTER     <PA> ALL     <PT> TITLES

CHG DATA    <AD> ADD     <DE> DELETE
            <SM> SORT BY MOVIE
            <ST> SORT BY TYPE
            <SN> SORT BY TAPE #

DATAFILE    <LO> LOAD    <SA> SAVE

            <QU> QUIT PROGRAM
```

Figure 2: Sample Full-Data Display



```
TI: The Man Who Knew Too Much
YEAR: 1934         TYPE: MYSTERY

STARRING: Peter Lorre
          Leslie Banks
          Edna Best

DIRECTOR: Alfred Hitchcock

TAPE: 25 <0575-1125>  SPEED: EP
VIEW TIME: 1:25  TIME REM: 2:45

RECORDED: 04-16-82  CHANNEL: 14
COLOR: NO   COMMERCIALS: EDITTED

 <N>EXT PAGE <L>AST PAGE <M>ENU
```

Figure 3: Sample Titles-Only Display



```
TI: Bringing Up Baby
YEAR: 1938         TYPE: COMEDY

TI: Frankenstein
YEAR: 1931         TYPE: HORROR

TI: It's a Wonderful Life
YEAR: 1947         TYPE: DRAMA

TI: The Man Who Knew Too Much
YEAR: 1934         TYPE: MYSTERY

TI: Top Hat
YEAR: 1935         TYPE: MUSICAL

 <N>EXT PAGE <L>AST PAGE <M>ENU
```

```
 ";TY$:PRINT:RETURN
360 PRINT@481,"<N>EXT PAGE <L>AST PAG
    E <M>ENU";:RETURN
370 '
380 ' PRINTER ROUTINES
390 '
400 S$=STRING$(4,32):FORIO=1TOIR:GOSU
    B120:GOSUB140:PRINT#-2,STRING$(3,
    13);"TITLE: ";LEFT$(R$,28);S$;"YE
    AR: ";MID$(R$,29,4);S$;"TYPE: ";T
    Y$:PRINT#-2,CHR$(13);"STARRING: "
    ;A1$;S$;A2$;S$;A3$:PRINT#-2,"DIRE
    CTOR: ";DI$
410 PRINT#-2,CHR$(13);"TAPE: ";TN$;S$
    ;"COUNTER: ";CN$:PRINT#-2,"SPEED:
     ";SP$;"P";S$;"VIEW TIME: ";VT$;S
    $;"TIME REM: ";VR$:PRINT#-2,"RECO
    RDED: ";DT$;S$;"CHANNEL: ";CH$;S$
    ;"COLOR: ";CL$;S$;"COMMERCIALS: "
    ;CM$:IFIO/5=INT(IO/5)THENPRINT#-2
    ,STRING$(10,13)
420 NEXT:RETURN
430 PRINT#-2,STRING$(2,13);TAB(10)"TI
    TLE";TAB(34)"YEAR";TAB(45)"TYPE";
    CHR$(13):FORIO=1TOIR:GOSUB120:PRI
    NT#-2,LEFT$(R$,28);TAB(34)MID$(R$
    ,29,4);TAB(44)TY$:NEXT:RETURN
440 '
450 ' ADD/DELETE ROUTINES
460 '
470 X$=" AND LOWER CASE)":GOSUB530:R$
    =STRING$(127,32):RP=1:Q$="TITLE"+
    STRING$(27,32):L=28:GOSUB540:S=S+
    32:Q$="YEAR":L=4:GOSUB540:Q$="DIR
    ECTOR":L=16:GOSUB540:FORI=1TO3:Q$
    ="ACTOR #"+RIGHT$(STR$(I),1):GOSU
    B540:NEXT:FORW=1TO250:NEXT
480 X$="CASE ONLY)":GOSUB530:Q$="TYPE
     (CO,DR,HI,HO,MU,MY)":L=2:GOSUB54
    0:Q$="TAPE #":L=2:GOSUB540:Q$="CO
    UNTER START":L=4:GOSUB540:Q$="COU
    NTER END  ":GOSUB540:MID$(R$,RP,1
    )="/":RP=110
490 Q$="SPEED (S,L,E)":L=1:GOSUB540:Q
    $="VIEW TIME (H:MM)":L=4:GOSUB540
    :Q$="TIME REM  (H:MM)":L=4:GOSUB5
    40:MID$(R$,111,7)=MID$(R$,111,1)+
    MID$(R$,113,3)+MID$(R$,117,2)+"/"
    :RP=118
500 Q$="DATE RECORDED (MM-DD-YY)
    {8 SPACES}":L=8:GOSUB540:S=S+32:M
    ID$(R$,120,4)=MID$(R$,121,2)+MID$
    (R$,124,2):RP=124:Q$="CHANNEL":L=
    2:GOSUB540:Q$="COLOR (Y OR N)":L=
    1:GOSUB540:Q$="COMMERCIALS (N OR
    E,F,M,A)":L=1:GOSUB540
510 IFIR=0THENI1=1:GOTO520ELSEFORI1=1
    TOIR:IFLEFT$(R$(I1),28)<LEFT$(R$,
    28)THENNEXTELSEFORI2=IR TOI1 STEP
    -1:R$(I2+1)=R$(I2):NEXT
520 R$(I1)=R$:IR=IR+1:RETURN
530 CLS:PRINT@11,"ADD RECORD":POKE107
    0,32:PRINT:PRINT"(ANSWER IN UPPER
    ";X$:S=64:RETURN
540 S=S+32:Q=LEN(Q$):PRINT@S,Q$;"?":P
    RINT@S+Q+L+3,CHR$(127):PRINT@S+Q+
    2,"";:LINEINPUTA$:MID$(R$,RP,L)=A
    $:RP=RP+L
550 PRINT@S+Q+L+2,STRING$(32,32):RETU
    RN
560 X1$="DELETE":X2$="DELETE":GOSUB19
    0:IFIO>IR THENRETURNELSEPRINT@192
    ,"DELETING RECORD...":FORI=IO TOI
    R-1:R$(I)=R$(I+1):NEXT:IR=IR-1:RE
    TURN
570 '
580 ' SORT ROUTINES
590 '
600 IFC$="SM "THENC=1ELSEIFC$="ST "TH
    ENC=2ELSEIFC$="SN "THENC=3
610 CLS:PRINT@70,"...SORTING RECORDS.
    ..":N=IR
620 N=INT(N/2):IFN=0THENRETURNELSEI3=
    IR-N:I2=1
630 I1=I2:ONC GOTO640,660,680
640 I4=I1+N:IFLEFT$(R$(I1),28)>LEFT$(
    R$(I4),28)THENT$=R$(I1):R$(I1)=R$
    (I4):R$(I4)=T$:I1=I1-N:IFI1>=1THE
    N640
650 I2=I2+1:IFI2>I3 THEN620ELSE630
660 I4=I1+N:IFMID$(R$(I1),97,2)+LEFT$
    (R$(I1),28)>MID$(R$(I4),97,2)+LEF
    T$(R$(I4),28)THENT$=R$(I1):R$(I1)
    =R$(I4):R$(I4)=T$:I1=I1-N:IFI1>=1
    THEN660
670 GOTO650
680 I4=I1+N:IFMID$(R$(I1),99,6)>MID$(
    R$(I4),99,6)THENT$=R$(I1):R$(I1)=
    R$(I4):R$(I4)=T$:I1=I1-N:IFI1>=1T
    HEN680
690 GOTO650
700 '
710 ' LOAD/SAVE ROUTINES
720 '
730 X1$="LOAD":X2$="ON THE CASSETTE R
    ECORDER.":GOSUB760:PRINT:PRINT"LO
    ADING ";F$;"...":IR=1:OPEN"I",-1,
    F$
740 IFEOF(-1)THENIR=IR-1:CLOSE#-1:RET
    URNELSEINPUT#-1,R$(IR):IR=IR+1:GO
    TO740
750 X1$="SAVE":X2$="ANDRECORD ON THE
    CASSETTE RECORDER.":GOSUB760:PRIN
    T:PRINT"SAVING ";F$;"...":OPEN"O"
    ,-1,F$:FORI=1TOIR:PRINT#-1,R$(I):
    NEXT:CLOSE#-1:RETURN
760 CLS:PRINT@41,X1$;" DATA FILE":POK
    E1069,32:POKE1074,32:PRINT:INPUT"
    DATA FILE NAME";F$:PRINT:PRINT"PO
    SITION TAPE AND PRESS PLAY ";X2$:
    PRINT@256,"PRESS <ENTER> WHEN REA
    DY."
770 IFINKEY$<>CHR$(13)THEN770ELSERETU
    RN
```

Program 2: TI Version

```
10 REM VMDP TI VERSION
40 DIM R1$(60),Y$(5)
41 YY$="CODRHIHOMUMY"
42 FOR I=0 TO 5
43 READ Y$(I)
44 NEXT I
45 DATA COMEDY,DRAMA,HISTORY,HORROR,M
   USICAL,MYSTERY
50 CC$="DA DT DS PA PT AD DE SM ST SN
    LO SA "
52 CALL CLEAR
54 PRINT TAB(6);"VIDEOTAPE MOVIE":TAB
   (6);"DATABASE SYSTEM": : :"DISPLAY
     <DA> ALL":TAB(10);"<DT> TITLES"
56 PRINT TAB(10);"<DS> SEARCH,DISPLAY
   ": :"PRINTER  <PA> ALL":TAB(10);"<
   PT> TITLES"
60 PRINT :"CHG DATA <AD> ADD
   {3 SPACES}":TAB(10);"<DE> DELETE":
   TAB(10);"<SM> SORT BY MOVIE"
62 PRINT TAB(10);"<ST> SORT BY TYPE":
   TAB(10);"<SN> SORT BY TAPE #": :"D
```

Notes On TI-99/4A Version

C. Regena

An effort was made to keep the translation as close to the author's version as possible. The VMDP record format is the same and the variables used in the program are the same as in the TRS-80 CC version. The line numbers with the explanation are the same in most cases; sometimes lines were added in the TI version because TI BASIC does not allow multi-statement lines.

The TI printed screen is 28 columns wide and 24 lines long. The TI does not have PRINT AT capabilities, so while you are adding a record the screen will scroll, rather than using separate screens.

The cassette file processing procedure is similar to the TRS-80. Line 734 OPENs file device #1, "CS1" or cassette 1. INPUT is used to read in previously saved data. INTERNAL format is used rather than DISPLAY format for more efficiency in this application. Each record is a FIXED length of 127. The TI cassette tape device will use record lengths of 64, 128, or 192 positions in FIXED record type, so we need to specify FIXED 128.

Line 752 OPENs file device #2 to save data in the same format required to read in data.

This program does not check your INPUT as you are adding a record to make sure your answers are logical. Follow the instructions listed in the TRS-80 version for each item entered.

Cassette file processing does not have an EOF function to signal the last data record (disk file processing does). To signal the last record, this program will read the record, then check to see if the first three characters are "ZZZ". Therefore, just before you choose the option to save your data, enter a title of ZZZ (or ZZZZ, etc.). You may press ENTER on each of the remaining INPUT prompts.

Since you may have nearly any type of printer connected to your TI, you will be asked to enter your printer configuration when you choose the printing options. Be sure to use the quotation marks. For example, if you have a TI 825 printer, your printer configuration will be:

"RS232.BA=600"

For a teletype, the configuration may be:

"RS232.TW.BA=110"

This program illustrates the power of string manipulation. The data is saved as one long string of characters (127 long), then certain segments are examined for the sort routines or the displays. SEG$ is a function that will return a specific SEGment of a string variable. For example, R$ is the data record. SEG$(R$,1,28) is the segment of R$ starting with the first character and taking 28 characters – the title. SEG$(R$,97,2) is the segment of R$ starting with the 97th character and taking two characters (the TYpe of movie). String variables need to be combined with &, not +.

```
   ATAFILE <LO> LOAD":TAB(10);"<SA> S
   AVE"
64 PRINT :TAB(10);"<QU> QUIT PROGRAM"
   : :
70 INPUT C$
80 C$=SEG$(C$,1,2)
82 IF C$="QU" THEN 800
84 P=POS(CC$,C$,1)
85 IF P=0 THEN 52
86 P=INT(P/3)+1
88 ON P GOSUB 240,290,340,400,430,450
   ,560,600,600,600,730,750
89 GOTO 52
120 R$=R1$(IO)
122 TY$=SEG$(R$,97,2)
124 P=POS(YY$,TY$,1)
125 P=INT(P/2)
126 TY$=Y$(P)
130 RETURN
140 A1$=SEG$(R$,49,16)
141 A2$=SEG$(R$,65,16)
142 A3$=SEG$(R$,81,16)
143 DI$=SEG$(R$,33,16)
144 TN$=SEG$(R$,99,2)
145 CN$=SEG$(R$,101,4)&"-"&SEG$(R$,10
    5,4)
150 SP$=SEG$(R$,110,1)
151 VT$=SEG$(R$,111,1)&":"&SEG$(R$,11
    2,2)
152 VR$=SEG$(R$,114,1)
154 IF VR$="E" THEN 158
155 VR$=VR$&":"&SEG$(R$,115,2)
156 GOTO 160
158 VR$="EOT"
160 DT$=SEG$(R$,118,2)&"-"&SEG$(R$,12
    0,2)&"-"&SEG$(R$,122,2)
162 CH$=SEG$(R$,124,2)
164 CL$=SEG$(R$,126,1)
165 IF CL$="N" THEN 168
166 CL$="YES"
167 GOTO 170
168 CL$="NO"
170 CM$=SEG$(R$,127,1)
171 IF CM$<>"N" THEN 174
172 CM$="NONE"
173 GOTO 185
174 IF CM$<>"E" THEN 177
175 CM$="EDITTED"
176 GOTO 185
177 IF CM$<>"F" THEN 180
```

```
178 CM$="FEW"
179 GOTO 185
180 IF CM$<>"M" THEN 183
181 CM$="MANY"
182 GOTO 185
183 CM$="ALL"
185 RETURN
190 CALL CLEAR
192 PRINT X1$;" RECORDS": :"TITLE TO
    ";X2$: :
200 INPUT T$
201 T$=SEG$(T$&"{28 SPACES}",1,28)
203 FOR IO=1 TO IR
204 IF T$=SEG$(R1$(IO),1,28)THEN 212
205 NEXT IO
207 PRINT : :"** NO SUCH RECORD **"
208 PRINT :"PRESS <ENTER>";
209 CALL KEY(0,K,S)
210 IF K<>13 THEN 209
212 RETURN
240 IO=1
250 GOSUB 120
252 CALL CLEAR
254 GOSUB 140
255 GOSUB 350
256 PRINT "STARRING: ";A1$:TAB(11);A2
    $:TAB(11);A3$: :"DIRECTOR: ";DI$
258 PRINT :"TAPE: ";TN$;" <";CN$;">":
    "SPEED: ";SP$;"P":"VIEW TIME: ";V
    T$:"TIME REM:  ";VR$
260 PRINT :"RECORDED: ";DT$:"CHANNEL:
     ";CH$:"COLOR: ";CL$:"COMMERCIALS
    : ";CM$
265 GOSUB 360
270 CALL KEY(0,K1,S1)
271 IF K1=77 THEN 365
272 K=K1
273 IF (K<>76)*(K<>78)+(K=78)*(IO=IR)
    +(K=76)*(IO=1)THEN 270
274 IF K<>78 THEN 277
275 IO=IO+1
276 GOTO 250
277 IF K<>76 THEN 250
278 IO=IO-1
280 GOTO 250
290 IP=0
291 MP=INT(IR/5)
292 IF IR/5<>INT(IR/5)THEN 300
294 MP=MP-1
300 CALL CLEAR
301 FOR IL=1 TO 5
302 IO=IP*5+IL
303 IF IO>IR THEN 310
304 GOSUB 120
305 GOSUB 350
306 NEXT IL
310 GOSUB 360
320 CALL KEY(0,K1,S1)
321 IF K1=77 THEN 365
322 K=K1
323 IF (K<>76)*(K<>78)+(K=78)*(IP=MP)
    +(K=76)*(IP=0)THEN 320
325 IF K<>78 THEN 328
326 IP=IP+1
327 GOTO 300
328 IF K<>76 THEN 300
329 IP=IP-1
330 GOTO 300
340 X1$="SEARCH"
341 X2$="SEARCH FOR"
342 GOSUB 190
344 IF IO>IR THEN 365 ELSE 250
350 PRINT "TI: ";SEG$(R$,1,28):"YEAR:
     ";SEG$(R$,29,4);TAB(14);"TYPE: "
    ;TY$: :
355 RETURN
360 PRINT :"<N>EXT PAGE":"<L>AST PAGE
    ":"<M>ENU";
365 RETURN
390 CALL CLEAR
392 PRINT "  ** PRINTER ROUTINE **  "
    : : :
394 PRINT "ENTER YOUR PRINTER":"CONFI
    GURATION:": :
395 INPUT P1$
397 OPEN #3:P1$
399 RETURN
400 GOSUB 390
402 S$="{4 SPACES}"
403 FOR IO=1 TO IR
404 GOSUB 120
405 GOSUB 140
406 PRINT #3: : : :"TITLE: ";SEG$(R$,
    1,28);S$;"YEAR: ";SEG$(R$,29,4);S
    $;"TYPE: " ;TY$
407 PRINT #3: :"STARRING: ";A1$;S$;A2
    $;S$;A3$:"DIRECTOR: ";DI$
410 PRINT #3: :"TAPE: ";TN$;S$;"COUNT
    ER: ";CN$:"SPEED: ";SP$;"P";S$;"V
    IEW TIME:";VT$;S$;"TIME REM: ";VR$
412 PRINT #3:"RECORDED: ";DT$;S$;"CHA
    NNEL: ";CH$;S$;"COLOR: ";CL$;S$;"
    COMMERCIALS: ";CM$
414 IF IO/5<>INT(IO/5)THEN 420
416 PRINT #3: : : : : : : : : : :
420 NEXT IO
421 CLOSE #3
422 RETURN
430 GOSUB 390
431 PRINT #3: : :TAB(10);"TITLE";TAB(
    34);"YEAR";TAB(45);"TYPE": :
432 FOR IO=1 TO IR
433 GOSUB 120
434 PRINT #3:SEG$(R$,1,28);TAB(34);SE
    G$(R$,29,4);TAB(44);TY$
435 NEXT IO
436 CLOSE #3
437 RETURN
450 X$=""
451 GOSUB 530
452 RP=1
453 Q$="TITLE"&"{23 SPACES}"
454 L=28
455 GOSUB 540
456 Q$="YEAR"
457 L=4
458 GOSUB 540
459 Q$="DIRECTOR"
460 L=16
461 GOSUB 540
462 FOR I=1 TO 3
463 Q$="ACTOR #"&STR$(I)
464 GOSUB 540
465 NEXT I
466 PRINT
467 Q$="TYPE(CO,DR,HI,HO,MU,MY)"
468 L=2
469 GOSUB 540
470 Q$="TAPE #"
471 L=2
472 GOSUB 540
473 Q$="COUNTER START"
474 L=4
475 GOSUB 540
476 Q$="COUNTER END   "
477 GOSUB 540
478 R$=R$&"/"
479 RP=110
```

```
480 Q$="SPEED (S,L,E)"
481 L=1
482 GOSUB 540
483 Q$="VIEW TIME (H:MM)"
484 L=4
485 GOSUB 540
486 Q$="TIME REM (H:MM)"
487 L=4
488 GOSUB 540
490 R$=SEG$(R$,1,110)&SEG$(R$,111,1)&
    SEG$(R$,113,3)&SEG$(R$,117,2)&"/"
492 RP=118
494 Q$="DATE RECORDED (MM-DD-YY)
    {4 SPACES}{8 SPACES{,}"
496 L=8
498 GOSUB 540
500 R$=SEG$(R$,1,119)&SEG$(R$,121,2)&
    SEG$(R$,124,2)
502 RP=124
503 Q$="CHANNEL"
504 L=2
505 GOSUB 540
506 Q$="COLOR (Y OR N)"
507 L=1
508 GOSUB 540
509 Q$="COMMERCIALS (N OR E,F,M,A)"
510 L=1
511 GOSUB 540
512 IF IR<>0 THEN 515
513 I1=1
514 GOTO 525
515 FOR I1=1 TO IR
516 IF SEG$(R1$(I1),1,28)>=SEG$(R$,1,
    28)THEN 520
517 NEXT I1
518 GOTO 525
520 FOR I2=IR TO I1 STEP -1
521 R1$(I2+1)=R1$(I2)
522 NEXT I2
525 R1$(I1)=R$
526 IR=IR+1
529 RETURN
530 CALL CLEAR
532 PRINT "{4 SPACES}** ADD RECORD **
    ": : :
533 R$=""
534 RETURN
540 PRINT Q$;
541 INPUT A$
542 IF LEN(A$)<=L THEN 546
543 A$=SEG$(A$,1,L)
544 GOTO 550
546 FOR II=LEN(A$)+1 TO L
548 A$=A$&" "
549 NEXT II
550 R$=R$&A$
551 RP=RP+L
552 PRINT
554 RETURN
560 X1$="DELETE"
561 X2$="DELETE"
562 GOSUB 190
563 IF IO>IR THEN 572
565 PRINT :"DELETING RECORD ..."
567 FOR I=IO TO IR-1
568 R1$(I)=R1$(I+1)
569 NEXT I
570 IR=IR-1
572 RETURN
600 IF C$<>"SM" THEN 603
601 C=1
602 GOTO 610
603 IF C$<>"ST" THEN 606
604 C=2
605 GOTO 610
606 IF C$<>"SN" THEN 610
607 C=3
610 CALL CLEAR
611 PRINT "... SORTING RECORDS ...":
    : :
613 N=IR
620 N=INT(N/2)
622 IF N=0 THEN 699
624 I3=IR-N
626 I2=1
630 I1=I2
632 ON C GOTO 640,658,680
640 I4=I1+N
641 IF SEG$(R1$(I1),1,28)<=SEG$(R1$(I
    4),1,28)THEN 650
642 T$=R1$(I1)
643 R1$(I1)=R1$(I4)
644 R1$(I4)=T$
645 I1=I1-N
646 IF I1>=1 THEN 640
650 I2=I2+1
655 IF I2>I3 THEN 620 ELSE 630
658 I4=I1+N
659 S1$=SEG$(R1$(I1),97,2)&SEG$(R1$(I
    1),1,28)
660 S2$=SEG$(R1$(I4),97,2)&SEG$(R1$(I
    4),1,28)
661 IF S1$<=S2$ THEN 650
663 T$=R1$(I1)
664 R1$(I1)=R1$(I4)
665 R1$(I4)=T$
666 I1=I1-N
667 IF I1>=1 THEN 658 ELSE 650
680 I4=I1+N
681 IF SEG$(R1$(I1),99,6)<=SEG$(R1$(I
    4),99,6)THEN 650
682 T$=R1$(I1)
683 R1$(I1)=R1$(I4)
684 R1$(I4)=T$
685 I1=I1-N
687 IF I1>=1 THEN 680 ELSE 650
699 RETURN
730 X1$="LOAD"
732 GOSUB 760
734 OPEN #1:"CS1",INPUT ,INTERNAL,FIX
    ED 128
736 IR=0
738 IR=IR+1
740 INPUT #1:R1$(IR)
742 IF SEG$(R1$(IR),1,3)<>"ZZZ" THEN
    738
746 IR=IR-1
747 CLOSE #1
748 RETURN
750 X1$="SAVE"
751 GOSUB 760
752 OPEN #2:"CS1",OUTPUT,INTERNAL,FIX
    ED 128
754 FOR I=1 TO IR
755 PRINT #2:R1$(I)
756 NEXT I
757 CLOSE #2
758 RETURN
760 CALL CLEAR
762 PRINT "{4 SPACES}** ";X1$;" DATA
    FILE **": : : :
764 RETURN
790 B$=""
792 FOR B=1 TO B1
794 B$=B$&" "
796 NEXT B
798 RETURN
800 CALL CLEAR
810 END
```

©

TCON:

The Apple Writer Processes Programs

Michael Ginsberg

Would you like to have the power to: change all or some variables in an Apple program; look at two different parts of a program at the same time; find all occurrences of a word or phrase; move one or more lines of a program around at will; have named GOSUB targets; and have other powerful programming tools at your fingertips? You've already got it. Here's how to get more out of the Apple Writer than you may have thought possible.

The Apple Writer, the word processor which comes with every Apple II, can be used in two ways to aid your programming. First, you can use the features of Apple Writer to modify existing programs. Second, you can write your new programs directly using the Apple Writer. If you write programs using the Apple Writer, the only difference is that you use the control-K to keep the characters in uppercase.

A knowledge of text files and BASIC files is necessary to understand how this process works. A short program is included here for files that are currently BASIC programs. This short program uses the EXEC feature of the Apple to create a routine that converts the BASIC program to text so that the Apple Writer can read it.

The TCON program appends three lines to the beginning of your program. The line numbers are 0, 1, and 2. If you already have lines in your program that use those numbers, you must increase these line numbers to 3 or above. First, type in and run EXEC TCON; it will create the TCON program which will convert BASIC to text. Load in the BASIC program and type in EXEC TCON; the disk will start spinning, and your program will be converted. When the program has been converted, you can boot your Apple Writer and use all of the features to help you debug your program. After it is booted, you should hit control-K so it will be in alpha lock.

Some of the features of TCON are: search, replace, scrolling, deleting and retrieving, split screen, and word and phrase counter. Some experimenting with Apple Writer is necessary to learn how it works. After you have finished debugging your program, all you need to do is save the file.

The next step involves converting your file to a BASIC program. This sounds hard but is actually quite simple. After DOS is booted, you need to type NEW; then type EXEC followed by the file name. That's it. Two minutes later, after you've seen many]'s, your file will be magically converted to a working BASIC program. Now you should save the BASIC program and, if you are through making changes, you can delete the text file. Apple Writer can be extraordinarily versatile as a programming aid.

```
10 Q$ =  CHR$ (34):D$ =  CHR$ (4)
20  PRINT D$;"OPEN TCON"
30  PRINT D$;"WRITE TCON"
100  PRINT "0  D$ = CHR$(4) : PRINT D$;"Q$;"
     OPEN FILE";Q$; CHR$ (13)
110  PRINT "1  PRINT D$;"Q$;"WRITE FILE";Q$;
     ": LIST 3-"; CHR$ (13)
120  PRINT "2  PRINT D$;"Q$;"CLOSE FILE";Q$;
     ": END"; CHR$ (13)
130  PRINT "RUN"
140  PRINT "0"; CHR$ (13): PRINT "1"; CHR$ (
     13): PRINT "2"; CHR$ (13)
```

©

Apple Fast Sort

John Sarver

It can take a long time to put a list into alphabetical order. In a recent experiment, using a basic bubble sort routine, it took the author's Apple eight hours and 57 minutes to sort 1000 randomly created strings of random length between one and 20 characters. This subroutine puts both one- and two-dimensional Apple arrays in order at a tolerable speed: that same list of 1000 strings now takes one minute and 45 seconds.

Strings values, when assigned, are stored at the very top of Apple's free RAM, and as more strings are assigned, they are stored below the strings already in memory. A table, created when you use the DIM statement, keeps track of where each string is in RAM.

Some important information is stored at the beginning of this table. The first byte represents the first character in the variable name. The second byte represents the second character in the variable name plus $80 (adding $80 designates it as a string array rather than an integer or decimal point number array). The next pair of bytes gives the length of this pointer table.

The fifth byte is the number of dimensions that you have used with the DIM statement. If you used a two-dimensional array, the next two bytes tell how many variables are in the second part of the dimension (if three-dimensional, the next four bytes, and so on).

The final two bytes of information are the number of strings in the first dimension. The table begins here. Each variable is located by a three-byte pointer. The first byte is the length of the record, and the next two point to where the first character of the variable is stored. These pointers are always in order from the zero dimension to the nth dimension.

At the end of this grouping of pointers are the pointers for the first group of the second dimensioned part of the array. Following this is the second group of pointers for the second dimensioned part of the array, and so on. If you used a one-dimensional array, there is only one group of pointers.

As you can see, there is no need to sort the strings themselves. Just sort the pointers. Therefore, there is no time wasted in garbage collection and, in most cases, the length of the strings does not affect the time of execution.

Simple To Use

Using this sort is quite simple. Apple stores the last variable used in $81 and $82, so you may need to insert a statement in your BASIC program such as A$(0) = A$(0) (see line 90 of Program 2), or you may POKE these values in if you are putting this utility on another machine. The sort can be easily changed to use the zero dimension of an array if you wish. To do this, simply change the following lines in the BASIC loader (Program 1).

```
120  IF CK <  > 56854 THEN PRINT "CHECK DAT
     A STATEMENTS FOR ERROR": STOP
200  DATA  169,0,133,253,133,239,169,1
400  DATA  165,6,105,2,133,6,169,0
```

If you are using a two-dimensional array, you will need to store the records that are to be put in order by using the zero subscript of the second dimension (that is, A$(1,0), A$(2,0), etc.). The accompanying arrays (A$(1,1), A$(2,1), A$(1,2), A$(2,2), etc.) will be kept with their respective zero-subscripted record.

The sort will automatically ascertain if you are using a one- or two-dimensional array and will adjust itself accordingly. You may use any number of subscripts desired in one-dimensional arrays and in the first part of the two-dimensional arrays. But don't try to use anything larger than a two-dimensional array, or attempt to use more than 255 variables in the second part of your two-dimensional array. Some of the corresponding subarrays would not be properly aligned.

Program 1 loads the machine language sorting routine into RAM. You should save this on disk by typing:

```
BSAVE SORT, A$944A,L$1B6
```

Program 2 provides an example of the steps necessary to use the routine.

Program 1: ML Fast Sort Loader

```
100  REM  THIS PROGRAM INSTALLS BUT DOES
      NOT RUN THE ML FAST SORT
110  FOR I = 37962 TO 38399: READ A:CK =
      CK + A: POKE I,A: NEXT
120  IF CK <  > 56857 THEN  PRINT "CHECK
      DATA STATEMENTS FOR ERROR": STOP
130  TEXT : HOME : PRINT "TYPE 'BSAVE SORT,
      A $944A,L$1B6'"
140  PRINT "TO SAVE SORT ROUTINE ON DISK"
```

```
150  NEW
200  DATA  169,0,133,253,169,1,133,239
210  DATA  133,31,166,107,134,6,166,108
220  DATA  134,7,165,129,160,0,209,6
230  DATA  208,3,32,126,148,200,208,246
240  DATA  232,134,7,228,112,208,239,209
250  DATA  6,208,3,32,126,148,200,196
260  DATA  111,208,244,96,165,130,200,208
270  DATA  2,230,7,209,6,240,10,192
280  DATA  0,208,2,198,7,136,165,129
290  DATA  96,192,0,208,2,198,7,136
300  DATA  24,152,101,7,133,7,169,0
310  DATA  101,7,133,7,104,104,56,160
320  DATA  4,177,6,233,1,240,8,200
330  DATA  200,177,6,133,31,169,2,24
340  DATA  101,6,105,5,133,6,169,0
350  DATA  101,7,133,7,160,0,177,6
360  DATA  133,249,133,251,133,26,200,177
370  DATA  6,133,250,133,25,162,2,24
380  DATA  165,250,101,25,133,25,165,251
390  DATA  101,26,133,26,202,208,240,24
400  DATA  165,6,105,5,133,6,169,0
410  DATA  101,7,133,7,56,165,250,229
420  DATA  239,133,250,133,252,176,10,165
430  DATA  239,240,6,198,249,165,249,133
440  DATA  251,165,6,133,237,165,7,133
450  DATA  238,169,0,198,250,197,250,208
460  DATA  42,197,249,240,5,198,249,24
470  DATA  144,33,197,253,240,18,133,253
480  DATA  198,252,165,251,133,249,165,252
490  DATA  133,250,208,213,165,251,208,1
500  DATA  96,56,233,1,133,249,133,251
510  DATA  24,144,198,24,165,237,133,235
520  DATA  105,3,133,237,165,238,133,236
530  DATA  105,0,133,238,160,0,132,254
540  DATA  177,235,208,6,177,237,240,177
550  DATA  208,54,209,237,240,8,144,6
560  DATA  177,237,240,165,133,254,133,255
570  DATA  162,0,200,177,235,149,0,177
580  DATA  237,149,2,232,192,2,208,242
590  DATA  160,0,177,0,209,2,240,4
600  DATA  144,135,176,12,200,196,255,208
610  DATA  241,165,254,208,3,76,19,149
620  DATA  169,1,133,253,160,0,177,235
630  DATA  72,177,237,145,235,104,145,237
640  DATA  200,192,3,208,241,166,31,202
650  DATA  240,45,24,165,235,101,25,133
660  DATA  27,165,236,101,26,133,28,165
670  DATA  237,101,25,133,29,165,238,101
680  DATA  26,133,30,160,0,177,27,72
690  DATA  177,29,145,27,104,145,29,200
700  DATA  192,3,208,241,202,208,3,76
710  DATA  19,149,24,165,27,101,25,133
720  DATA  27,165,28,101,26,133,28,165
730  DATA  29,101,25,133,29,165,30,101
740  DATA  26,133,30,24,144,205,141,183
```

Program 2: Steps Necessary To Use Fast Sort

```
10  HIMEM: 37962
20 D$ =  CHR$ (4)
30  PRINT D$"BLOAD SORT"
40  INPUT "HOW MANY RECORDS";N
45  DIM A$(N)
50  FOR A = 1 TO N
60  PRINT "WHAT IS RECORD #"A;
70  INPUT " ";A$(A)
80  NEXT
90 A$(0) = A$(0)
100  CALL 37962
110  FOR A = 1 TO N
120  PRINT A$(A)
130  NEXT
140  END
```

©

64 Odds And Ends

David Martin

Here are a few interesting tidbits about the 64.

• Warm Start By SYS 64738

This handy little number will help save your power switch. However, if the system crashes or locks up, you will have to power down.

• List Terminator

This feature will keep others from viewing your program after it's run. To disable the list, add to your program POKE 775,200. To restore the list feature, use POKE 755,167.

• STOP Key

POKE 808,239 turns the STOP key off.
POKE 808,237 turns the STOP key on.

•RUN/STOP And RESTORE Key Terminator

POKE 808,225 disables these keys; however, it changes the appearance of the program listing (this does not affect the program run). POKE 808,237 restores both keys to normal.

• Keyboard Killer

POKE 649,0 turns the keyboard off.
POKE 649,10 turns the keyboard on.

• Save And List Destroyer

The saving and listing of your program can be prevented by killing the STOP and RESTORE keys. To do this, add POKE 808,225:POKE 818,32 to your program. To go back to normal, type POKE 808,237:POKE 818,237. Note: POKE 808,225 has a side effect – it messes up the system clock.

• Magic Merge

"Magic Merge" will work on the 64, if you use the VIC-20 method.

"Magic Merge" is a technique described by Jim Butterfield (**COMPUTE!**, June 1982) that lets you combine lines from one program with another. Here is a condensed set of instructions:

To prepare the lines you want to merge:

1. Insert a blank tape, rewind, and then type:

```
OPEN 1,1,1,"PROGNAME":CMD1:LIST
```

("PROGNAME" is a name for your program)

2. When the tape stops and 'READY' comes back, enter: PRINT#1:CLOSE 1

3. After the tape stops, you can remove it.

To merge with a program in memory:

1. Put the "merge tape" in the tape unit.

2. Enter: POKE 19,1:OPEN 1

3. After 'READY' comes back, clear the screen (SHIFT-HOME).

4. Press exactly three cursor-downs.

5. Enter:

```
PRINTCHR$(19) :POKE198,1:POKE631,13:POKE153,1
```

6. The tape will finally stop with an error message. Ignore the error, and enter CLOSE 1.

7. The lines are now merged, magically. ©

Atari Times

B. B. Garrett

Knowing how much time the Atari needs to perform specific operations can help you speed up running times for BASIC programs. Here are the durations of various operations, along with suggestions for fixing the most time-consuming ones.

Most people who purchase a home computer do so for a long list of practical reasons beyond the fact that computers are great fun. My own list included the preparation of color slides, a modest amount of word processing, and some fairly heavy number crunching in connection with my research in theoretical solid state chemistry.

Because of its excellent color graphics, very good keyboard feel, and relatively fast 1.8 MHz clock rate, the Atari 800 was my choice.

After using the computer for all those other things for a few months, it came time to make the machine earn its keep by doing a big repetitive calculation. I won't drag you through the details of that computation, but the size of the problem is illustrated by the fact that four deep nested loops with indices ranging up to 40 were required. This meant about a million passes through the inner loop where several calculations and a couple of comparisons were necessary.

My original BASIC program *would still be running* today, if it had been turned loose on the full problem. I needed to optimize the program or develop a machine language subroutine to get the calculation done in a reasonable time. In any case, a knowledge of the execution times for specific operations was required to make intelligent programming decisions. Let's examine some of the facts and myths about speeding up program running times in Atari BASIC.

Taking A Hard Look

In the problem I have been discussing, an overall time reduction of 66 percent was accomplished without resorting to machine language. These savings were achieved by utilizing every speedup hint I had ever encountered. Many of these changes were tedious and ineffective, but others obviously worked. Examining the actual time savings proved that a systematic approach to faster BASIC programs was called for.

The most important idea is to spend your time where the program is spending its time. There is little value in clipping a few milliseconds off a section of the program which is traversed only once or twice. It also helps if programs are laid out from the start with fast execution in mind. The best way to write faster, more efficient programs is to know your tools. To understand the way BASIC works, one needs to know:

- How it proceeds from statement to statement and line to line,
- How it branches and sets up loops,
- How it stores and looks up variables, matrices, and strings, and, most important for speed,
- How long it takes to perform various operations.

Lane Winner and Bill Wilkinson have described many aspects of Atari BASIC recently in very informative articles. These articles give a clear description of the first three items above. Briefly, BASIC lines are stored sequentially in memory beginning with line numbers and the number of bytes offset to the next line. The offset to the next statement precedes each tokenized BASIC statement. Tokens are one-byte identifiers of commands, variables, etc., which serve as offset addresses in appropriate tables. Command and syntax tables guide the interpretation of the statement. A matrix or string would be tracked from the variable name table through the variable value table to the string array table. Branch destination lines are found by sequentially comparing line numbers from the beginning of the program each time the branch is made. Return line numbers and statement offsets are saved on a last-in, first-out runtime stack.

The main focus of this article is on the time required to perform a specific operation in Atari BASIC. This information should allow a programmer to make better choices to increase speed.

Before looking at BASIC operation times, let's review the kinds of advice about speeding up programs which have been published in various places. Such advice falls into three categories:

A. Choose the most efficient program logic for the task at hand.

APPLE COUNTRY LTD.®

YOU'RE GONNA LOVE THESE ROCK BOTTOM PRICES!

PROGRAM NAME	RETAIL PRICE	SALE PRICE
ADVANCED MUSIC SYSTEM	29.95	21.95
ADVENTURE ON A BOAT	24.95	17.95
AE	34.95	24.49
ALI BABA & THE 40 THIEVES	32.95	24.95
ALIEN AMBUSH	29.95	21.95
ALIEN GARDEN-ROM	39.95	27.95
ALIEN SWARM	34.95	24.49
ANDROMEDA (NEW IMPROVED)	29.95	21.95
ARMOR ASSAULT	39.95	27.95
ASTEROIDS-ROM	34.95	26.49
ATARI ASSEMBLER EDITOR	59.95	42.95
THE ATARI ASSEMBLER-BOOK	12.95	9.95
ATARI BASIC	59.95	42.95
ATARI BASIC REF MANUAL	10.95	7.95
ATARI BASIC-BOOK	10.95	8.95
ATARI BASKETBALL-ROM	34.95	24.49
ATARI BOOKKEEPER	149.95	106.95
ATARI BOOKKEEPER KIT	249.95	179.95
ATARI GAMES & REC.-BOOK	14.95	11.95
ATARI HOME FILING MANAGER	49.95	35.95
ATARI HOME MANAGER KIT	79.95	57.95
ATARI MACRO ASSEM/TEXT ED	89.95	64.49
ATARI MICROSOFT BASIC	89.95	64.49
ATARI MUSIC COMPOSER-ROM	39.95	29.95
ATARI PILOT HOME PKG-ROM	79.95	56.95
ATARI PILOT FOR BEGIN-BOOK	14.95	11.95
ATARI PROGRAMMER KIT	69.95	49.95
ATARI SOUND & GRAPHICS-BOOK	9.95	8.95
ATARI SPEED READING	74.95	54.95
ATARI TECH USER NOTES	29.95	21.95
ATARI TELELINK-ROM	29.95	21.95
ATARI TOUCH TYPING	24.95	17.95
ATARI WORLD	59.95	41.95
ATARI WRITER	79.95	56.95
ATTACK AT EP-CYG-4	32.95	22.95
BANDITS	34.95	24.95
BASEBALL (IN HOME)	34.95	24.95
BASIC COMPILER (DATASOFT)	99.95	68.95
BATTLE FOR NORMANDY	39.95	27.95
BATTLE OF SHILOH	39.95	27.95
BATTLE TREK	29.95	21.85
BISHOP'S SQUARE	29.95	21.95
THE BLADE OF BLACKPOOL	39.95	27.95
BOOK OF ATARI SOFTWARE'83	19.95	14.95
BUG OFF!	29.95	21.95
CASTLE WOLFENSTEIN	29.95	21.95
CANYON CLIMBER	29.95	21.95
CATACOMBS OF BARUTH	29.95	21.95
CAVE-IN-ROM	39.95	27.95
CAVERNS OF MARS	39.95	28.95
CENTIPEDE-ROM	44.95	31.95
CHECKERS	49.95	34.49
CHESS	69.95	49.95
CHICKEN	34.95	24.49
CHOPLIFTER	34.95	24.95
CLAIM JUMPER	34.95	24.49
CLOWNS & BALLOONS	29.95	21.95
COLOR PRINT	39.99	27.95
COMMUNICATOR KIT	279.95	209.95
COMPU-READ	29.95	21.95
COMPU-MATH/FRACTION	39.95	27.95
COMPU-MATH/DECIMALS	39.95	27.95
CONVERSATIONAL FRENCH	59.95	42.95
CONVERSATIONAL GERMAN	59.95	42.95
CONVERSATIONAL ITALIAN	59.95	42.95
CONVERSATIONAL SPANISH	59.95	42.95
THE COSMIC BALANCE	39.95	27.95
CROSSFIRE	29.95	21.95
CROSSFIRE-ROM	44.95	29.95
CRUSH CRUMBLE & CHOMP	29.95	21.95
CYTRON MASTERS	39.95	27.95
DATA MANAGEMENT SYSTEM	22.95	16.95
DATA PERFECT	99.95	74.95
DATALINK	39.95	27.95
DATASM 65 2.0	89.97	61.95
DAVID'S MIDNIGHT MAGIC	34.95	24.49
DEADLINE	49.95	34.49
DEADLY DUCK-ROM	34.95	26.49
DEFENDER	44.95	31.95
DELUXE INVADER-ROM	39.95	27.95
DIG DUG	44.95	31.95
DISK DETECTIVE	29.95	21.95
DISK MANAGER	29.95	21.95
DISK WORKSHOP	34.95	24.49
DISKETTE INVENTORY SYSTEM	24.95	17.49
DISKEY	49.95	34.49
DISKSCAN	40.00	28.00
DODGE RACER	34.95	24.49
DRELBS	34.95	24.49
EASTERN FRONT (1941)	29.95	21.95
EDIT 6502-ROM	199.95	144.95
EMBARGO-ROM	44.95	31.95
ET HOME PHONE	49.95	35.95
FACEMAKER	34.95	24.49
FAMILY FINANCE	49.95	37.95
FANTASTIC VOYAGE-ROM	34.95	26.49
FAST EDDY-ROM	34.95	26.49
FILEFAX	129.00	89.95
FILE MANAGER +	99.95	68.95
FILE-IT 2 SYSTEM	49.95	34.49
FINANCIAL WIZARD	59.95	39.95
FLAME LORDS	34.95	24.95
FLASH GORDON-ROM	34.95	26.95
FLIP OUT	29.95	21.95
FIREBIRD-ROM	39.95	27.95
FORMULA 1 RACING	29.95	21.95
FORT APOCALYPSE	34.95	24.49
FROGGER	34.95	24.49
GALACTIC CHASE	29.95	21.95
GALACTIC GLADIATOR	39.95	27.95
GALAHAD & THE HOLY GRAIL	29.95	21.95
GALAXIAN	44.95	31.95
GENETIC DRIFT	29.97	21.97
GHOST ENCOUNTERS	29.95	21.95
GLOBE MASTER	29.99	21.95
GOLD MINE-ROM	39.95	27.95
GOLF CHALLENGE	24.95	17.49
GORF	39.95	27.95
GORF-ROM	44.95	28.49
GRAPHIC GENERATOR	24.95	17.49
GRAPHIC MASTER	39.95	27.95
GRAPHICS COMPOSER	39.95	27.95
GRAPH WORKSHOP	39.95	27.95
HOME ACCOUNTANT	74.95	54.95
INTRUDER	34.95	24.49
INVASION ORION	24.95	17.95
INVITATION TO PROGRAM 3	29.95	21.95
IT IS BALLOON	34.95	24.49
JAWBREAKER	29.95	21.95
JERRY WHITE'S MUSIC LESSON	29.95	21.95
JOURNEY TO THE PLANETS	29.95	21.95
JUGGLER	29.95	21.95
JUGGLES HOUSE	29.95	21.95
JUGGLES RAINBOW	29.95	21.95
K-DOS	89.95	64.49
KID GRID	29.95	21.95
KIDS AND THE ATARI-BOOK	19.95	13.95
KINDERCOMP	29.95	21.95
K-RAZY SHOOTOUT-ROM	49.95	34.49
K-RAZY KRITTERS-ROM	49.95	34.49
K-STAR PATROL-ROM	49.95	34.49
K-RAZY ANTIKS-ROM	49.95	34.49
KAYOS	34.95	24.49
KING ARTHUR'S HEIR	29.95	21.95
LABYRINTH	29.95	21.95
LETTER PERFECT (40/80)	149.95	109.95
LETTER PERFECT-ROM (40)	199.95	144.95
LETTER PERFECT UTILITY	29.95	21.95
LISP INTERPETER	124.95	89.95
LOST COLONY	29.95	21.95
LUNAR LANDER	20.95	14.49
MAD-NETTER	34.95	24.49
MASH-ROM	39.95	27.95
MASTER TYPE	39.95	27.95
MAURAUDER	34.95	24.49
MAX/65 (WITH OS/A+)	80.00	54.95
MICROPAINTER	34.95	24.49
MINER 2049'ER-ROM	49.95	34.49
MISSILE COMMAND-ROM	34.95	26.49
MONSTER MAZE-ROM	39.95	27.95
MOON BASE IO	29.95	21.95
MOON SHUTTLE	39.95	27.95
MOUSKATTACK	34.95	24.49
MUSIC BOX	29.95	21.95
MY FIRST ALPHABET	34.95	24.95
NAUTILUS	34.95	24.49
NEXAR-ROM	34.95	24.95
NUMBER CRUNCH-ROM	39.95	27.95
ODIN	49.95	34.49
OS-A+ & BASIC A+	80.00	54.95
PAC MAN-ROM	44.95	31.95
PACIFIC COAST HIGHWAY	29.95	21.95
PAGE 6	34.95	24.49
PATHFINDER	34.95	24.49
PICKNICK PARANOIA	34.95	24.49
PIG PEN	29.95	21.95
PINBALL	29.95	21.95
PLATTER MANIA-ROM	39.95	27.95
P.M.ANIMATOR	34.95	24.49
POKER-S.A.M.	24.49	17.95
POOL 1.5	34.95	24.49
POOL 400-ROM	39.95	27.95
PREPARING FOR THE SAT	139.95	99.95
PREPPIE	29.95	21.95
PRESCHOOL IQ BUILDER	23.95	17.95
PRESCHOOL IQ BUILDER 2	23.95	17.95
PRISM	24.95	17.95
PROBE I	34.95	24.49
PROGRAMMER'S WORKSHOP	34.95	24.49
PROTECTOR II	34.95	24.49
QIX	44.95	31.95
REPTILIAN	34.95	24.49
RASTER BLASTER	29.95	21.95
RHYMES & RIDDLES	29.95	21.95
RICOCHET	19.95	14.95
SAGA #1-#12 (COST EACH)	39.95	27.95
SAMMY THE SEA SERPENT	23.95	16.95
SCRAM	24.95	17.95
SEA DRAGON	34.95	24.49
SEA FOX	29.95	21.95
SENTINEL 1	34.95	24.95
SERPENTINE	34.95	24.95
747 LANDING SIMULATOR	22.95	16.95
SHADOW WORLD	34.95	24.49
SHAMUS	34.95	24.49
THE SHATTERED ALLIANCE	39.95	27.95
SHOOTING ARCADE	29.95	21.95
SLIME	34.95	24.49
SNAKE BYTE	29.95	21.95
SNAPPER	32.95	22.95
SNEAKERS	29.95	21.95
SNOOPER TROOPS #1	44.95	31.95
SNOOPER TROOPS #2	44.95	31.95
SOFTWARE AUTO-MOUTH (SAM)	59.95	41.49
SPACE EGGS	29.95	21.95
SPACE INVADERS-ROM	34.95	26.49
SPACE SHUTTLE	29.95	21.95
SPEED READ PLUS	59.95	41.49
SPEEDWAY BLAST	29.95	21.95
SPELL WIZARD	79.95	54.95
STAR BLAZER	31.95	21.95
STARCROSS	39.95	27.95
STAR RAIDERS-ROM	44.95	31.95
STAR WARRIOR	39.95	27.95
STORY MACHINE	34.95	24.49
STRATOS	34.95	24.49
SURVIVAL ADVENTURE	24.95	16.50
SURVIVER	34.95	24.49
SWIFTY TACH MASTER	29.95	21.95
SYN ASSMBLER	49.95	34.49
TAX ADVANTAGE	59.95	42.95
TELEATARI	39.95	27.95
TELECOM	69.95	49.95
TELETALK	49.95	36.95
TEMPLE OF APSHAI	39.95	27.95
TEXT WIZARD I	99.95	68.95
THE ADVENTURES OF OSWALD	23.95	17.95
THE GUARDIAN OF GORN	34.95	24.95
THE NEXT STEP	39.95	27.95
3-D SUPERGRAPHICS	39.95	27.95
THRESHOLD	39.95	27.95
TIGERS IN THE SNOW	39.95	27.95
TIME WISE	29.95	21.95
TRACK ATTACK	29.95	21.95
TRIVIA TREK	29.95	21.95
TYPE ATTACK	39.95	27.95
TUMBLE BUGS	29.95	21.95
TURMOIL-ROM	34.95	26.95
TUTTI FRUTTI	24.95	17.95
TWERPS	34.95	24.49
ULYSESS & GOLDEN FLEECE	39.95	27.95
UPPER REACHES OF APSHAI	99.95	13.95
VC	15.00	17.49
VISICALC	250.00	179.95
WALL WAR	29.95	21.95
WARLOCK'S REVENGE	34.95	24.49
WAY OUT	39.95	27.95
WIZARD & PRINCESS	32.95	22.95
WIZARD OF WOR	39.95	27.95
WORDRACE	24.95	17.49
WORM WAR I-ROM	34.95	26.49
YOUR ATARI COMPUTER-BOOK	16.95	12.95
ZAXXON	39.95	27.95
ZORK I	39.95	27.95
ZORK II	39.95	27.95
ZORK III	39.95	27.95

HARDWARE

AMDEK COLOR I 13" MON.	339.95
ATARI HOME COMPUTERS	$CALL
ATARI NUMERIC KEYPAD	94.95
410 RECORDER	72.95
810 DISK DRIVE	424.95
850 INTERFACE MODULE	169.95
C. ITOH PROWRITER I	394.95
C. ITOH PROWRITER II	649.95
C. ITOH STARWRITER	1325.00
ELEPHANT SS/SD DISK	10/18.95
IN HOME 400 KEYBOARD	94.95
INTEC 32K RAM	69.95
INTEC 48K RAM	119.95
MOSAIC 64K RAM SELECT	149.95
AXLON 128K RAMDISK	464.95
HAYES SMARTMODEM 300 BD	194.95
HAYES SMARTMODEM 1200 BD	499.95
K-BYTE STICK STAND	5.95
LE STICK	29.95
NEC 8023 PRINTER	459.95
NEC 12" HIRES GREEN SCRN	149.95
NEC 12" ECONO GREEN SCRN	109.95
NOVATION J-CAT MODEM	109.95
NOVATION SMART-CAT 103	179.95
NOVATION SMART-CAT 312	429.95
PERCOM SS/SD/1DR (88K)	419.95
PERCOM SS/DD/1DR (176K)	539.95
PERCOM SS/DD/2DRS (352K)	859.95
PERCOM DS/DD/1DR (352K)	649.95
PERCOM DS/DD/2DRS (704K)	939.95
SIGNALMAN MK II MODEM	79.95
USI 12" AMBER MONITOR	159.95
VERBATIM SS/DD DISK	10/25.00
VERSAWRITER GRAPH TABLET	239.95
WICO JOYSTICK	21.95
WICO REDBALL JOYSTICK	24.95
WICO DELUXE JOYSTICK	29.95
WICO TRACKBALL	49.95
WICO 12 FT EXTENSION CORD	6.95

Call us... we can help! (619) 765-0239

P.O. Box 1099, 2225 Main Street, Julian, Calif. 92036

ATARI

TERMS: WE ACCEPT VISA/MASTERCARD (please include name, address, phone number, card number & expiration date), cashier's check, or personal check (allow 10 working days to clear). Unless otherwise requested, we ship U.P.S. surface (street address required). Please include $5 or 5% (whichever is greater) for shipping & handling. U.P.S. blue label slightly higher, please call. Please add $10 or 5% (whichever is greater) for shipping and handling of monitors due to their excessive weight. Foreign orders please include $10 or 10% (whichever is greater) for shipping and handling. Please **INCLUDE PHONE NUMBER WITH ALL ORDERS.** All items are new and carry manufacturer's warranty. Apple Country, Ltd. cannot guarantee the merchantability of any product. Prices are subject to availability and change without notice. Call before returning goods for repair or replacement, RMA number required. California residents add 6% sales tax. Please send S.A.S.E. for free catalog. WE CARRY A FULL LINE OF SOFTWARE FOR APPLE, ATARI, IBM, TI, TRS-80, AND VIC.

Apple Country, Ltd. is a DISCOUNT MAIL ORDER HOUSE for the micro computer industry and is a California corporation not affiliated with Apple Computer Inc. Apple is a trademark of Apple Computer Inc.

B. Don't distract the machine while it is trying to get your calculation done.

C. Avoid unnecessary or time-consuming operations, particularly in loops.

Type A advice includes selecting the most efficient algorithm, rewriting heavily revised programs to eliminate the tangles, and substituting machine language for BASIC loops, via USR subroutines. Advice in categories B and C is usually more specific, recommending particular machine operations or program sequences.

Turning The Screen Off

Fixes of type B might involve shutting down the screen or using a lower resolution graphics display while calculations are in progress. Screen support in Graphics mode 0 occupies 31 percent of the Atari's time, which may be saved with POKE 559,0 before entering the calculational loop and later POKEing 559,34 to get the display back. An additional three percent saving accrues when the display processor is turned off by inserting a one in register 66 in place of the usual zero. The display processor should be disabled after the screen, but not before the next vertical blank period; wait 17 milliseconds (*ms*) to be sure. Before the machine gets down to serious computation, all INPUT, READ, and disk access operations should be completed. Removal of such extraneous activities from its workload leaves the 6502 free to crunch your numbers as fast as BASIC will allow.

Most timesaving programming hints are of type C. BASIC branches to a line number or returns to a FOR statement by searching line numbers from the start of the program; thus, frequently used destination lines and loops should have low line numbers. Similarly, variables, matrix elements, and strings must be looked up in the variable name table and should be near the beginning of the table if they are used often.

GOSUBs and loops remember where to return by saving that line number on a stack. Removing GOSUBs from loops and placing the most repeated loop deepest in nested loops should minimize such stack operations. Calculations may be needlessly repeated by placing them within a loop. For example, multiplication every time through a loop can often be replaced by multiplying the sum once after the loop is completed. Most of these hints are based on a valid premise, but some offer negligible time savings.

Some contradictory admonitions are also in circulation. Preferences for both variables and constants in BASIC statements have appeared. The relative merits of IF __ THEN __ and ON __ GOTO__,__,__ conditional branches are debated in letters to the editor. Some confusion may develop when the characteristics of one computer are assumed to be the same as those of another. For the Atari, constants are actually marginally faster than the equivalent variable. Constants are ten to forty times slower to read in a BASIC line for both PET and Apple, which is the reason why BASIC games written for these machines all seem to start with the sequence, N1=1:N0=N1-N1: N2=N1+N1:.... The construction IF A THEN __ which fails (A=0) is the single fastest BASIC operation for all three machines, but ON __ GOTO __ may be preferred for the PET under most conditions.

Timing Functions

The time for an operation in BASIC is easily determined: set up a loop to perform the operation some number of times and then read the internal clock (RTCLOK at 18, 19, 20; notice that the order of bit significance is the reverse of that given in Appendix I of the *Atari BASIC Reference Manual)* before and after the loop. The following program does this timing for any desired operation substituted for FUNCTION(A) in line 50. Loop overhead time is obtained by removing the function from the loop.

```
10 REM ** BASIC FUNCTION TIMER **
20 N=1000:OVERHEAD=1.58333333:A=-1.2
   3456789:B=9.87654321
30 FOR K=1 TO 3
40 POKE 559,0:X=PEEK(20)+PEEK(19)*
   256
50 FOR I=1 TO N:C=FUNCTION(A):NEXT I
60 Y=PEEK(20)+PEEK(19)*256:POKE 559.
   34
70 ?(1000/N)*(Y-X)/60-OVERHEAD;" ms,
   C = ",C
80 FOR J=1 TO 1000:NEXT J:NEXT K
```

Line 20 establishes parameters for the loop. The variables used in the loop should have nine significant figures because some functions are faster with fewer digits. The POKE 559,0 command in line 40 turns off the TV screen so that we can obtain times independent of screen support. The clock is read in lines 40 and 60 with the difference printed in 70. The K loop (lines 30-80) repeats the measurement so that we may see any clock rollover and roundoff effects, and the J loop in line 80 allows us to observe the results between runs.

The time data in the table demonstrate that Atari BASIC operates in the millisecond time domain which corresponds to a few thousand machine cycles. Addition and subtraction require two milliseconds. Multiplication and division are several times longer. Logarithms, exponentiation, trigonometric functions, and square roots take about a tenth of a second. It is clear that we should avoid using the latter functions in loops whenever possible.

Integer powers up to 12 or more are actually faster by direct multiplication. As an example,

BASIC Operation Times (milliseconds) [a]

Arithmetic Functions			
A + B	2.0	A*B	3 - 12[b]
A - B	2.1	A/B	8[c]
SQR	99	A^B	150
COS	51[f]	CLOG(B)	84
SIN	51[f]	LOG(B)	89
ATN	79[f]	EXP(B)	76

Assignments		Special Functions	
A = #[d]	1.15	PEEK( )	3.1
A = B[e]	1.18	POKE_,_	2.5
C$ = B$	1.5	FRE(0)	2.5
A = B + 1	2.0	RND(0)	9.5
A = A(3,3)	4.4	ABS( )	1.7
A(3,3) = A	4.0	INT( )	1.8
		SGN(+)	1.8
		SGN(-)	2.1
		ADR	2.5

Strings [g]		Graphics	
ASC	2.6	GRAPHICS	15-81
CHR$	2.5	COLOR	1.1
LEN	2.6	SETCOLOR	3.1
STR$	2.5	SOUND	2.9
VAL	3.7	PLOT	2.9
C$ = B$	1.5	LOCATE	4.7
C$ = B$(I,I)	3.9	POSITION	1.1
A$(I,I) = B$	3.6	STICK/STRIG	2.8
C$(I,J) = B$(K,L)	6.1		

Branches and Loops		
line look up	0.041 ms per line	
FOR/STEP/NEXT	1.7 (all in one line) STEP adds no time	
GOSUB/RETURN	1.7 (to line 2, return to line 4)	
GOTO	(2.0 to line 2)	
ON N GOTO_,_,	(1.2 + N)	
IF__THEN__	false	true
A = 0	1.4	2.5
A = # or var.	1.7	2.9
A	0.52	1.7
TRAP (set)	2.0	
LPRINT with no printer	930	
A(3,4) = A with DIM A(3,3)	3.5	
GOTO 1 with no line 1	1.7	
X = USR(addr,A,B)	3.5, 4.6, 6.1	
(# variables passed:	0 , 1 , 2)	

[a] Measured with the screen off and the display processor on; multiply by 1.45 to get normal graphics mode 0 time.

[b] Multiplication time varies from 3.1 to 12.3 ms depending on the sum, S, of digits in the multiplier only. T(ms) = 2.99 + .1154*S (see text).

[c] Division takes 8 + /-2 ms with rare extremes of 5.3 and 12.3 ms.

[d] # means 1.23456789 was entered in the BASIC statement.

[e] All Atari BASIC functions require 0.035 ms longer to get a variable than read the same number in the BASIC line.

[f] Trig functions take the same time in degree and radian modes.

[g] String operations involve 10 characters except as noted.

R2 = X*X + Y*Y + Z*Z takes only 23 ms, while the more typical R2 = X^2 + Y^2 + Z^2 requires 460 ms. The SQR function does offer a one-third savings compared to R^(0.5), but 0.1 second is still a long time.

The time required for trig functions suggests that it might be quicker to cast problems in a geometric format and use triangle ratios directly. A better solution is to calculate the trig functions separately and pass the values to the loop as variables. The binary operations addition, subtraction, and division show little effect of operand order, digit size, or the number of digits.

Multiplication is more complicated in Atari BASIC. It depends almost exclusively on the multiplier, the left member of the product A*B. Both the number and magnitude of the digits in the multiplier are important, but in a simple way. The sum, S, of all the digits in the multiplier determines multiplication time according to the relation, T(ms) = 2.99 + 0.1154*S. So, small numbers should be multipliers and larger ones multiplicands.

An example of this occurs in the Timer program above, where a two-byte number is read from memory with the statement: PEEK(20) + PEEK(19)*256. This statement has the preferred form because the most probable sum of digits in an unknown byte is 10 compared to 2 + 5 + 6 = 13 for the multiplicand. This kind of information should allow time savings every time a program is written.

Looking Up Variables

Something that doesn't appear in the table is the observability of differences in lookup time for variables. Comparison of reading times for variables separated by 35 positions in the variable name table failed to show any time differences. The idea that a low position in the variable name table would yield shorter access times for loop variables is not borne out in practice. Another great idea ambushed by the facts. It is also possible to compare read times for constants and variables since BASIC treats floating point numbers from any source the same way. Variables require 0.035 ms longer than constants in all operations.

A closer look at the table indicates that the one millisecond time scale probably represents the overhead time associated with BASIC itself. Even the functions ABS and SGN, which interact with only the single sign bit of a number, require about two ms for execution. I had expected that the more direct byte manipulations of memory such as PEEK, POKE, and strings would be very fast compared to floating point number juggling. Such is not the case, as can be seen by comparing the times for C$=B$, 1.5 ms, and A=B, 1.2 ms, where both involve ten characters.

Matrix element assignments are significantly slower than variable or string assignments. Calculation of indexed element locations in the string array table probably accounts for the extra time in both matrix and substring operations. Atari's special graphics functions all proceed with reasonable alacrity.

Even the GRAPHICS command (which takes 80 ms in mode 8) is not slow, considering that it completely rewrites screen memory. The principal use for speedy graphics functions is in writing games, and one caveat in this area is that the often used random number generator is quite slow at 9.6 ms. BASIC game designers who need random numbers would do well to prepare a table outside the main game loop.

Probably the most interesting time-saving features are in the branches and loops section of the table. The time required to compare each line number with the destination line number is only 0.04 ms, which can add up in a hurry, or perhaps I should say slowly. In the megapass interior loop of the program mentioned earlier, finding the FOR statement in line 5 took a little over three minutes, but it would have required over two hours in the original form of the program. Each of the branch times in the table should have appropriate line hookup times added. I really don't suggest that you do such calculations, but rather that you realize the implications and organize your programs accordingly.

A one-line FOR/NEXT loop takes 1.65 ms per cycle; placing the NEXT statement in the following line increases the repeat time to 1.71 ms. This means that BASIC uses 0.06 ms to fetch the next line. The savings of in-line FOR/NEXT loops are small compared to other time-savers. The megapass loop above took only one minute per line for fetching the next line or about one percent of the total loop time. Inclusion of a STEP in the FOR/NEXT counter adds no time because the *step is always there*, with a default value of one.

Fast GOSUBs

As the table shows, a GOSUB-RETURN sequence takes less time than a GOTO. This is unexpected. Particularly in view of the fact that branches with returns (GOSUBs) must first leave their intended return address on a "stack" in the computer, for later reference. I suspected some sort of error in at least one of these measurements, but several more measurements in different program environments gave consistent results. Why? Anyone know?

The conditional branch commands ON __ GOTO __,__,__ and IF __ THEN __ vary in time requirements depending on the way they are used. "The road not taken" with A=0:IF A THEN __ is the quickest thing BASIC can do (or not do), taking 0.52 ms on the Atari. This quick test could be very useful in determining when to leave a many-pass loop because it is so much faster than anything else. The IF construction is faster than ON __ GOTO __ for simple decisions, but the latter is superior to a sequence of IF statements for multiple branches.

It is also worth noting that the more frequently chosen destinations should be moved to the front of the GOTO list because each position costs one ms per branch. The TRAP statement is included among conditional branches because that's what it is, and because it is occasionally used to make exit decisions in loops. The time required for trap branching is essentially the time needed to try the operation, establish an error condition, then branch. The fastest trap I've found is to GOTO a nonexistent line 0. TRAP is useful to test whether a disk drive or printer is on-line, but these operations can take many seconds before an error is established.

USR Times

The last entry in the table is the USR function which calls a machine language subroutine and passes variables to the subroutine. BASIC converts the floating point variables into two-byte integers and leaves them in designated memory registers. The three times listed correspond to passing none, one, or two variables. The subroutine tested here performed the housekeeping required by USR (clearing the processor stack) and returned.

Minimum time for machine language interfacing is over three ms; thus, USR calls will not be an effective way to accomplish isolated operations quickly. A better approach would be to construct entire loops or functions which can take advantage of machine language speed, particularly integer arithmetic, without repeated returns to BASIC.

Adding It All Up

When I first needed to know how long the Atari takes to do things, I was surprised that such data had not already been published. After taking the measurements, I find it much easier to understand. The results often vary in different program environments, and complete definition of "program environment" is not easy. Even so, the relative times for alternative operations should be consistent in other situations. You should be able to make better programming choices from the data presented here. A number of general observations about Atari BASIC are worth repeating:

- Nothing much happens in less than 1.2 ms.
- Constants are faster than variables, but not enough to get excited about.

- Multiplication is a complicated affair in which we want to put the least first.
- Logs, roots, trigs, and powers take a while.
- Despite their simplicity, strings are slower than floating point numbers.
- Access times for matrix elements and substrings are much longer than variables and whole strings.
- Lookup times within the variable name table and variable value table were too short to measure.
- Runtime stack operations don't appear to be very time-consuming.
- Calling the next line costs only 0.06 ms which, by itself, isn't enough to justify line packing.
- Special number modes such as degrees, radians, and scientific notation have no measurable effect on operation times.
- The single most effective time-saver is to turn off the screen.

Programs should be organized to isolate the most time-consuming parts so that special attention is needed only in these sections. The entry routine placed at the back of the program should take care of program setup, including all input, disk access, and other slow interactive processes.

The main routine may have large parts which are not repeated and use little time. The time-consuming parts should be moved to the front of the program as a subroutine and carefully optimized using the timing information in this article, line packing, or anything else that leads to maximum efficiency. The latter part of the main routine cleans up after the fast subroutines and delivers the results to an output routine which displays and prints them.

If the program is interactive and includes frequent reruns, then reentry points which take advantage of the original setup should be provided. The sequence in the program listing will be (1) branch to entry, (2) optimized subroutines, (3) main routine, (4) output, and (5) entry. I seldom succeed in preparing a program in this manner from the beginning, but reorganization with these goals in mind is very effective.

References

D. T. Piele, "Prime Time," *Creative Computing 8*, June 1982, p. 107.

Ed Stewart, "Unleash the Power of Your Atari CPU," **COMPUTE!**, April 1981, p. 102.

Bill Wilkinson, "Insight: Atari," **COMPUTE!**, January – May 1982.

Lane Winner, "The Atari Tutorial Part 6: Atari BASIC," *Byte*, February 1982, p. 91, and *De Re Atari*, chap. 10, Atari, Inc., 1981. ©

CALL NOW
TOLL FREE INFORMATION
PRODUCT OR SHIPPING
800-821-2169
CALIFORNIA RESIDENTS CALL 213/996-5722

ATARI 800	529.00
NEC 8023 A	469.00
OKIDATA 82 A	439.00
MX-80 FT	489.00
HAYES SMARTMODEM	209.00
HAYES MICROMODEM II	269.00
SMITH CORONA TP-1	599.00
SIGNALMAN MODEM	85.00
NEC COLOR MONITOR	299.00
NEC GREEN MONITOR	109.00
VERBATIM DISKETTES	25.00/box

PLUS THE LARGEST SELECTION OF SOFTWARE YOU HAVE EVER SEEN

unicomm™ INC
THE SOFTWARE AND COMPUTER SERVICE STORES
18639 1/2 VENTURA BLVD. TARZANA, CA. 91356
TOLL FREE 800/821-2169 CALIF. 213/996-5722
FOR FREE QUARTERLY NEWSLETTER DROP US A LINE

STOP PLAYING GAMES
NEW Atari Commodore 64

- Calculate odds on HORSE RACES with ANY COMPUTER using **BASIC**.
- SCIENTIFICALLY DERIVED SYSTEM really works. TV Station WLKY of Louisville, Kentucky used this sytem to predict the odds of the 1980 Kentucky Derby. See the Wall Street Journal (June 6, 1980) article on Horse-Handicapping. This system was written and used by computer experts and is now being made available to home computer owners. This method is based on storing data from a large number of races on a high speed, large scale computer. 23 factors taken from the "Daily Racing Form" were then analyzed by the computer to see how they influenced race results. From these 23 factors, ten were found to be the most vital in determining winners. NUMERICAL PROBABILITIES of each of these 10 factors were then computed and this forms the basis of this REVOLUTIONARY NEW PROGRAM.
- SIMPLE TO USE: Obtain "Daily Racing Form" the day before the races and answer the 10 questions about each horse. Run the program and your computer will print out the odds for all horses in each race. COMPUTER POWER gives you the advantage!
- YOU GET: 1) Cassette.
  2) Listing of BASIC program for use with any computer.
  3) Instructions on how to get the needed data from the "Daily Racing Form"
  4) Tips on using the odds generated by the program.
  5) Sample form to simplify entering data for each race.

————————————*MAIL COUPON OR CALL TODAY*————————————

3G COMPANY, INC. DEPT. CO **(503) 357-9889**
RT. 3, BOX 28A, GASTON, OR 97119

Yes, I want to use my computer for FUN and PROFIT. Please send me ______ programs at **$24.95 each.** Circle the cassette you need: TRS-80, Color-80, Apple, PET/CBM, VIC-20, Commodore 64, Sinclair Timex 1000 or Atari

Enclosed is: ☐ check or money order ☐ MasterCard ☐ Visa

Card No. ______________________ Exp. date
NAME ______________________
ADDRESS ______________________
CITY ______________ STATE ________ ZIP ________

START USING YOUR COMPUTER FOR FUN and PROFIT!

www.commodore.ca

Versatile Data Acquisition With VIC

Doug Horner and Stan Klein

This simple method of adjusting the VIC's internal jiffy clock can slow it down to match your timing needs making possible "variable speed" machine language subroutines. You can save a good amount of money by transforming a VIC into this special-purpose tool. You can even use this to speed up games.

Home computers are finding their "homes" in labs, more and more frequently. Their flexibility and low cost make them excellent substitutes for more expensive special equipment. One common use is as a data acquisition device. Data acquisition systems monitor and record information on experiments in progress. For example, a chemist may use a special electrode to measure the concentration of a particular component in a chemical solution. As the concentration changes, the electrode sends a varying voltage to an analog-to-digital converter. The converter changes the voltage signal to binary data which can be recorded and stored for later analysis.

To log the data, the chemist could use a special-purpose data acquisition system perhaps costing thousands of dollars and useful only for a particular type of experiment. On the other hand, a microcomputer could be programmed to perform the same function. Moreover, to perform another type of experiment, the chemist need only modify the program instead of buying new equipment. When the data is stored, the computer might also be useful in analyzing it.

Surprisingly Simple

There is a surprisingly simple method for converting the VIC into a data acquisition system. A good acquisition system is based on a clock which uses interrupts to sample the user port at adjustable, fixed intervals. Data acquisition software is usually complicated because you must worry about interrupts generated from the jiffy clock.

A simpler scheme is to append the data acquisition routine to the front of the interrupt service routine which is already functioning in connection with the jiffy clock. Every 16.667 milliseconds, VIC interrupts whatever it is doing to look at the keyboard and update the jiffy timer. Here's how to attach your own program to the jiffy service routine and how to set the jiffy clock to any rate of data acquisition.

To change the number of interrupts per second, just POKE different numbers into the low timer latch (37158) and the high timer latch (37159). Under normal operating conditions, these bytes are loaded with 137 in the low latch and 66 in the high latch. An interrupt is generated and the latches are reloaded into the counters whenever the counters are decremented to zero. The number of cycles between interrupts is two cycles greater than the number in the latches.

You might expect the counter to be loaded with 16667 less two, since the normal interrupts are every 1/60 of a second; but 66*256 + 137 = 17033 rather than 16665. This means simply that the "1 MHz" counter decrements at $1.022*10^6$ Hz, not at an even rate of $1.00*10^6$ Hz. So, to make the jiffy clock interrupt at a rate different than the normal 1/60 per second, just multiply the desired number of microseconds per interrupt by 1.022 and subtract two from that number. Example: for a millisecond interrupt (1000*1.022)-2 = 1020, so you would POKE 3 into the high byte at location 37159, and 252 into the low byte at location 37158 (3*256 + 252 = 1020) – and now you have an interrupt every millisecond.

There are limits to this method of changing the jiffy clock to produce varied interrupts. At the slow end, the largest number that could be loaded is $FFFF, or 65535. For the longest time interval

COMPU SEN$E

CARDBOARD 6

$87.95

An expansion interface for the VIC-20. Allows expansion to 40 K or accepts up to six games. May be daisy chained for more versatility.

CARDBOARD 3

$39.95

Economy expansion interface for the VIC-20

CARD "?" CARD/PRINT

$79.95

Universal Centronics Parallel Printer Interface for the VIC-20 or CBM-64. Use an Epson MX-80 or OKIDATA or TANDY or just about any other.

CARDETTE

$39.95

Use any standard cassette player/recorder with your VIC-20 or CBM-64

LIGHT PEN

$29.95

A light pen with six good programs to use with your VIC-20 or CBM-64

Prices subject to change.
TO ORDER: P. O. BOX 18765
WICHITA, KS 67218
(316) 263-1095
Personal Checks Accepted (Allow 3 Weeks)
or C.O.D. (Add $2) Handling Charges $2.00

VIC-20 & 64 &

★ PET OWNERS ★

NEW AUTHENTIC PROGRAMS

CASINO CRAPS

- Any bet made in Vegas, now can be made at home.
- The Field Hardways-Place Bets-Come-Pass Line
- Find a winning system, without losing a dime.

8K version (1 player) $10.95
16K version (5 players) $12.95

KONNECT FOUR

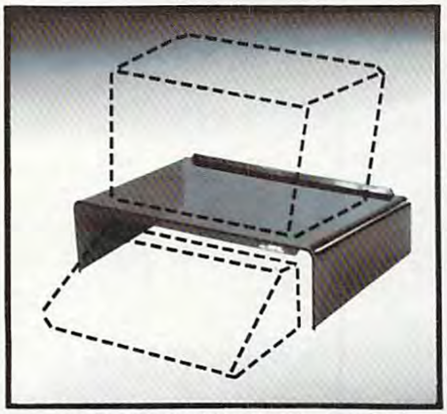
- Now play this popular game against your pet.
- Excellent sound & graphics
- Real time clock
- Three levels of play
- Can fit into 8K
- Fun & Educational for all ages

ONLY $10.95

G P Microsystems
72-31 67th Place
Glendale, N.Y. 11385

Please include $1.50 shipping & handling for each program. Indicate version.

The "Right" Angle in Personal Computing



COMPUMATE 101

The microelectronic revolution brought the reality of the personal computer into our homes and offices. And with it, the need for an effective human interface to insure the productivity of your system.

The **COMPUMATE 101** is ergonomically angled for optimum monitor viewing. The unique wedge design has also been dual-engineered as a printer stand featuring improved readability.

Manufactured in rugged smoked gray acrylic plastic, the versatile **COMPUMATE 101** provides operating ventilation for detached keyboard computer docking.

Trimmable support ribs accommodate side entry of flat data cables and its raised configuration allows excellent space saving paper feed management for the printer application.

The **COMPUMATE 101** nominal dimensions are 20.5″ wide x 12.0″ deep, 5.5″ high at the crest of the angle.

COMPUMATE 101 adds professional features at a price the personal computer user can justify.

Priced at **$39.95**

Standard Shipping FOB Factory Via UPS

• Mastercard and Visa Accepted •
Phone 1 (314) 968-6557

Please Allow 4 weeks for delivery.

PC TECHNOLOGY

PO Box 1018 • Ballwin, MO 63011

COMMADORE 64
VIC-20

P.O. BOX 725, Glendora, CA 91740

8 Expansion Connectors
Each Switched Individually
Fully Enclosed Chassis
Master Power Switch with 2 110v AC OUTLETS for computer and accessories
RIBBON CABLE Connection for convenient placement
LED DISPLAY RESET Button
120 day chassis 1 yr power supply WARRANTIES
finger tip selection of game and other Cartridges
Optional 5 volt Power Supply removes power load from your computer
THE SOFT-AWARE BOX the most advanced expansion chassis
$149.00 each
Power Supply $35.00 each

Shipped within 48 hours of order

SOFT-AWARE
MICROCOMPUTER PERIPHERALS AND SOFTWARE

P.O. Box 725, Glendora, CA 91740

VIC-20 and CBM 64 are trademarks of Commodore Business Machines

www.commodore.ca

Interruptions Can Make Your Games Run Faster

Ottis Cowper, Technical Editor

This is a very powerful programming technique, *the interrupt driven subroutine*, which has a much wider range of applications than merely gathering data from the user port. For example, how would you like your computer to handle two jobs at once? Actually, the 6502 microprocessor is a sequential device and can only do one operation at a time, but the VIC's hardware interrupts occur so frequently (60 times per second) that a machine language interrupt routine can appear to work concurrently with BASIC.

A Demonstration

As a demonstration, make the additions and changes shown in Program 1 to the program in the article. (This demonstration is for the *unexpanded* VIC and requires a joystick. Remove or disable any expansion modules.) Since the DATA statements contain a machine language routine, they *must* be typed in exactly as shown. Be sure to save a copy of the program before you RUN since an error in an interrupt routine almost always causes your system to lock you out. For those interested in the operation of the routine, a disassembly of the code is provided in Program 2.

When you RUN the program, you should see a bar appear in the center of the screen. Try moving your joystick left and right and notice how smoothly the bar moves. Type in a new value for the high and low bytes of the timer. Higher timer values slow down the bar movement; lower values speed it up. Compare this to the slow and jerky movement you're used to in BASIC, and imagine how an interrupt joystick or character movement routine would improve your favorite game.

The main point is that the joystick reading and bar movement are totally independent of BASIC. To prove this to yourself, hit the STOP key. You'll see the message BREAK IN 35. The BASIC program has ended, but the interrupt routine is not affected. The bar movement continues as before. To disable the routine, hit the RUN/STOP and RESTORE keys at the same time.

How To Add It To Your Programs

Here is the procedure for adding an interrupt driven routine to your BASIC program (example lines from the program given in the article are noted in parentheses):

1. Reserve room for the new routine somewhere in memory (line 10).
2. Load the machine language code into the protected area (line 15).
3. Disable interrupts, load the address (known as the "interrupt vector") of the new routine into locations 788 and 789, and re-enable interrupts (line 20).
4. If necessary, modify the speed of the interrupt routine by adjusting the rate of the jiffy clock (line 30).
5. It is *absolutely* essential that the appended interrupt routine end with a JuMP to the normal ROM interrupt handling routine (for the VIC, this would be JMP $EABF).

Program 1: Demonstration Program

```
11 PRINT"{CLEAR}"
12 FORI=38400TO38905:POKEI,0:NEXT
13 POKE 1,8:POKE2,10
14 FORI=0TO2:POKE7909+I,160:NEXT
15 FORZ=0TO69:READQ:POKE(28*256+Z),Q:NEXTZ
22 DATA 166,1,164,2,169,127,141,34,145,173
23 DATA 31,145,41,16,240,26,173,32,145,41
24 DATA 128,208,35,192,21,240,31,169,32,157
25 DATA 220,30,232,200,169,160,153,220,30,24
26 DATA 144,16,224,0,240,12,169,32,153,220
27 DATA 30,202,136,169,160,157,220,30,134,1
28 DATA 132,2,169,255,141,34,145,76,191,234
35 GOTO35
```

Program 2: Disassembly Of Machine Language Routine In Program 1

```
1C00 A6 01      LDX $01
1C02 A4 02      LDY $02
1C04 A9 7F      LDA #$7F
1C06 8D 22 91   STA $9122
1C09 AD 1F 91   LDA $911F
1C0C 29 10      AND #$10
1C0E F0 1A      BEQ $1C2A
1C10 AD 20 91   LDA $9120
1C13 29 80      AND #$80
1C15 D0 23      BNE $1C3A
1C17 C0 15      CPY #$15
1C19 F0 1F      BEQ $1C3A
1C1B A9 20      LDA #$20
1C1D 9D DC 1E   STA $1EDC,X
1C20 E8         INX
1C21 C8         INY
1C22 A9 A0      LDA #$A0
1C24 99 DC 1E   STA $1EDC,Y
1C27 18         CLC
1C28 90 10      BCC $1C3A
1C2A E0 00      CPX #$00
1C2C F0 0C      BEQ $1C3A
1C2E A9 20      LDA #$20
1C30 99 DC 1E   STA $1EDC,Y
1C33 CA         DEX
1C34 88         DEY
1C35 A9 A0      LDA #$A0
1C37 9D DC 1E   STA $1EDC,X
1C3A 86 01      STX $01
1C3C 84 02      STY $02
1C3E A9 FF      LDA #$FF
1C40 8D 22 91   STA $9122
1C43 4C BF EA   JMP $EABF
```

VIC-20 & C64

Exclusive needs . . . Exclusive source!

Southwest Micro Systems Inc

Hardware Peripherals:

VIC-20 Color Computer[1]	$149.00
Commodore 64[1]	475.00
VIC-1525 Printer[1]	325.00
VIC-1541 Disk Drive[1]	325.00
CIE Cartridge (IEEE-488 for C64)	95.00
VIE Cartridge (IEEE-488 for VIC-20)	75.00
RS-232R Interface for VIC or C64	45.00
SPI Parallel Interface for VIC or C64	55.00
VPI VIC Parallel Interface	45.00
VEX-3 Expander	29.95
VEX-6 Expander	85.00
V3K RAM Expansion	35.00
V8K RAM Expansion	45.00
V16K RAM Expansion	85.00
V24K RAM Expansion	115.00
40/80 Col VIC Video Expander w/16K	250.00
80 Col C64 Video Expander	150.00
C64 Z-80/80 Col CP/M Cartridge	250.00
VAC Audio Cassette Interface	25.00
VMC/CMC VIC & C64 Monitor Cables	15.00
Joy Stick (Arcade Quality)	25.00
Atari Game Interface for VIC-20	65.00

C64 Software Products:

EPYX-Temple of Apshai[3]		Disk 39.95
EPYX-Upper Reaches of Apshai[3]		Disk 19.95
EPYX-Curse of Ra[3]		Disk 19.95
EPYX-Sword of Fargoal[3]		Disk 29.95
EPYX-Crush, Crumble & Chomp[3]		Disk 29.95
Wordpro 3 + Wordprocessing[5]		85.00
Info Designs Soft Pack (G/L,A/R,A/P)[6]		475.00
Data Base for C64		75.00
Financial Spreadsheet for C64		125.00
Super Sprite	Cassette 35.00	Disk 35.00
Mail It 64	Cassette 20.00	Disk 25.00

VIC-20 Software Products:

VTE/CTE Terminal Program for VIC & C64		
Cassette		8.95
Diskette		12.95
VT-40 VIC 40 Col Terminal Communicator Cartridge with Downloading		45.00
VIC Super Expander[1]		49.95
VIC Programmers Aid Cartridge[1]		45.00
VIC Intro to Basic Part I & II[1]		45.00
Home Inventory[2]	Cassette 12.00	Disk 15.00
Household Finance[2]	Cassette 25.00	Disk 30.00
Logic Games[2]		Cassette 10.95
Action Games[2]		Cassette 15.00
City Bomber & Minefield[2]		Cassette 15.00
Black Hole Game[2]		Cartridge 35.00
Trashman Game[2]		Cartridge 35.00
Astroblitz Game[2]		Cartridge 35.00
Choplifter Game[2]		Cartridge 35.00
Serpentine Game[2]		Cartridge 35.00
Apple Panic Game[2]		Cartridge 35.00
Terraguard Game[2]		Cartridge 35.00
Videomanic Game[2]		Cartridge 35.00
Spills & Fills[2]		Cartridge 35.00
Pipes[2]		Cartridge 35.00
EPYX-Invasion of Orion (16K Extra)[3]		Cassette 24.95
EPYX-Datestones of Ryn (16K Extra)[3]		Cassette 19.95
EPYX-Rescue at Rigel (16K Extra)[3]		Cassette 29.95
EPYX-Crush, Crumble & Chomp (16K Extra)[3]		Cassette 29.95
EPYX-Plattermania[3]		Cartridge 39.95
Heswriter for VIC-20[4]		Cartridge 39.95
HES-MON for VIC-20[4]		Cartridge 39.95
HES-Turtle Graphics[4]		Cartridge 39.95
Data Base for VIC-20		Disk 55.00
Wordprocessing for VIC-20	Cassette 65.00	Disk 65.00

Dealer inquiries invited.

Immediate delivery on all items.

[1] Trademark of Commodore Int.

[2] Trademark of Creative Software

[3] Trademark of EPYX Software

[4] Trademark of Human Engineered Software

[5] Trademark of Professional Software

[6] Trademark of Info Designs Software

Yes, Please send me:

QTY.	MODEL#	NAME	PRICE
TOTAL (In Texas, add 5% sales tax)			

Your Name ________________

Address ________________

City ________ State ______ Zip ______

payment method: Check ☐ Card-Exp. Date ______

Master Card # ________________

Visa # ________________

American Express # ________________

Signature ________________

Southwest Micro Systems Inc. • 2554 Southwell • Dallas, Texas 75229 • (214) 484-7836

between interrupts, the number of microseconds would be (65535 + 2)/1.022 = 64126. The fast end limit is set by the percent of time remaining for BASIC. This percent is derived by (L-IR)/(L + 2), where L is the number POKEd in the timer latch described above, and IR is the number of cycles taken up by the unmodified interrupt service routine.

There are approximately 220 cycles in the unmodified interrupt service routine; thus, if the number POKEd into the timer approaches 220, there will be no time available for anything other than attending to the interrupt service routine.

Here's how to add your own machine language routine to the jiffy clock service routine. Normally, when the decrementing counter hits zero, the operation is transferred to the interrupt service routine whose beginning address ($EABF) is stored in 788 and 789 ($0314 and $0315). By changing the address in 788 and 789, you can tell VIC to do additional instructions in machine language and then go to $EABF to run the normal service routine.

To change the address in 788 and 789, you must disable the interrupt enable register for the jiffy clock to allow the number in these locations to be changed. POKEing location 37166 with 128 will disable the interrupt; after the addresses in 788 and 789 have been changed, POKEing location 37166 with 192 will enable the interrupts again. Here's a sample program:

```
10 POKE52,28:POKE56,28:REM SETTING UPPER ~
   BOUNDARY FOR BASIC
15 FOR Z=0 TO 9:READ Q:POKE(28*256+Z),Q:N
   EXT Z:REM MACHINE PROGRAM IN PAGE
    28
20 POKE37166,128:POKE788,0:POKE789,28:POK
   E37166,192
21 REM LINE 20 CAUSES THE INTERRUPT TO NO
   W GO TO PAGE 28
25 DATA 173,16,145,157,0,29,232,76,191,23
   4
30 INPUT"LOW";N1:INPUT"HIGH";N2:POKE37158
   ,N1:POKE37159,N2
31 REM LINE 30 CHANGES THE TIMING OF THE ~
   INTERRUPT
```

The machine language program in line 25 disassembles to:

```
1C00 LDA $9110;     Get data from user port
1C03 STA $1D00,X;   Store data in page 29 ring buffer
1C06 INX;           Increment pointer for ring buffer
1C07 JMP $EABF;     Jump to normal jiffy service
                    routine
```

This program can be used as a guide for setting up the jiffy clock for timed data acquisition. One additional consideration in terms of the percent of time left for BASIC: the above program has added an additional fourteen cycles which must be added to the IR variable. Exercise caution if data is to be gathered at faster than half-millisecond intervals. ©

Optimizing PET Speed

Michael W. Schaffer

Careful numbering of program lines in Commodore Upgrade and 4.0 BASIC can improve the execution speed of GOTOs and GOSUBs. This technique is not *applicable to the VIC-20, but the VIC is quite fast without it.*

You can improve the efficiency of certain GOTOs and GOSUBs in your programs. The technique, though simple, is apparent only if you look at a disassembly of the BASIC ROM (it's at hex B830 in 4.0 ROMs).

The major overhead in the execution of GOTOs and GOSUBs is the time taken by BASIC to find the line number you are going to (the target line number). To start the search, BASIC first compares the high-order byte of the target line number to the high-order byte of the current line number. If the target high byte is larger, then BASIC starts to search at the next line of the program. Otherwise, BASIC starts the search at the beginning of the program.

Notice that BASIC only compares the high byte of the line numbers: small jumps forward may still be searched for from the beginning of the program. By carefully numbering the lines of your program, you can avoid this waste of time. The rule for this is simple:

Minimum target line number = 256*(INT(current line #/256) + 1)

In a test program of 100 lines followed by a forward GOSUB, the speed of 100 executions of the GOSUB was improved by a factor of three by numbering the GOSUB as shown above. The amount of time saved is directly dependent on the length of your program and the position of the GOTO or GOSUB in the program, but can be significant, especially in user-interactive routines.

Program 1:
Non-optimized GOSUB And Sample Run

```
100 REM NOTICE THAT THE  HIGH BYTES ARE EQ
    UAL
250 T0=TI:FOR I=1 TO 100:GOSUB 255:NEXT:PR
    INT"NON-OPTIMIZED";(TI-T0):END
255 RETURN

NON-OPTIMIZED 63
```

Program 2:
Optimized GOSUB And Sample Run

```
100 REM NOTICE THAT THE  HIGH BYTES ARE NO
    T EQUAL
250 T0=TI:FOR I=1 TO 100:GOSUB 256:NEXT:PR
    INT"OPTIMIZED";(TI-T0):END
256 RETURN

OPTIMIZED 19
```

TI BASIC One-Liners

Michael A. Covington

The TI BASIC DEF statement can become a powerful tool in your programmer's bag of tricks. Here's how to use it.

If you've been programming in BASIC for any time at all, you've surely come across, and used, some of the built-in functions that the language provides, such as INT, SIN, COS, TAN, ATN, and LOG. But did you know that you can use the DEF statement to create functions of your own? Defining your own functions lets you type a complicated formula only once, and it allows you to build complex functions out of simple ones in a most efficient way.

Suppose, for instance, that your LOG function gives you natural (base *e*) logarithms, and you want base 10 logarithms. (If you're not sure which you've got, type PRINT LOG(10) – if the answer is 1, you're in base 10, and if it's about 2.3026, you're in base *e*.) You can convert base *e* logarithms to base 10 by dividing them by 2.302585093, so one of the options open to you is obviously to write LOG(X)/2.302585093 (or whatever) every time you need a base 10 log. But there's an easier way.

Creating Functions

To create your own function – let's call it LOG10, though some computers may insist that you name it something like FNL – just include, early in your program, a statement like this:

```
10 DEF LOG10 (X) = LOG(X)/2.302585093
```

From then on, you'll be able to use the new function LOG10 to get base 10 logarithms. Try it out with a program something like this:

```
10 DEF LOG10(X)=LOG(X)/2.302585093
20 FOR I=1 TO 10 STEP 0.1
30 PRINT I,LOG10(I)
40 NEXT I
```

and compare the results against a table of logarithms.

The DEF statement is different from most BASIC statements in that it can't refer to variables. (The X in it – it could be any variable name – is used only as a placeholder for the number within the parentheses; it is completely separate from any variable named X that you may use elsewhere in the program.) You can refer only to numbers or other functions. Some computers require that the name of the function be three letters and that the first two be FN – FNA, FNB, FNL, and so forth – although the TI-99, and many other microcomputers, allow you to name functions with the same type of names you use for variables.

Sample One Liners

So that's how it's done. Now let's look at some practical examples.

1. *Base 10 logarithms.* That's what we've just discussed. For reference, here is the statement:

```
DEF LOG10(X) = LOG(X)/2.302585093
```

(assuming your machine's LOG function gives you base *e* logs).

2. *Base 2 logarithms.* On a machine on which the LOG function gives base *e* logarithms, you can get base 2 logarithms by using:

```
DEF LOG2 (X) = LOG(X)/0.6931471806
```

If your machine's LOG function gives base 10 logarithms, you'll need to use DEF LOG2(X) = LOG(X)/0.3010299957 instead.

3. *Degrees to radians.* If X is the measure of an angle in degrees, then RAD(X) will be the same angle measured in radians, if you define the following function:

```
DEF RAD(X) = X/57.29577951
```

4. *Radians to degrees.* The opposite function, converting X in radians to DEG(X) in degrees, is:

```
DEF DEG(X) = X*57.29577951
```

5. *Arcsine* (in radians). The following definition will give you the arcsine function (which is not usually provided in implementations of BASIC, although the arctangent is).

```
DEF ASN(X) = 2*ATN(X/(1 + SQR(1-X^2)))
```

If you look through a table of trigonometric identities, you may find an apparently equivalent, but simpler, formula that would lead to the statement DEF ASN(X) = ATN(X/SQR(1-X^2)). But note that this version won't do ASN(1) correctly (it will try to divide by zero). Hence the first version is preferable.

6. *Arccosine* (in radians). If you have the arcsine function, you can get the arccosine, as follows:

DEF ACS(X) = 1.570796327-ASN(X)

Remember that the DEF statement for ASN must precede the DEF statement for ACS (you can't refer to a function until you've defined it).

7. *Rounding to a particular number of decimal places.* Where *n* stands for the number of decimal places you want, use the definition:

DEF ROU(X) = INT(((10^N)*X) + 0.5)/(10^N)

Note that you *must* substitute a number for *n*; in most implementations, *n* cannot be a variable. Hence, for example, if you want rounding to three decimal places, your statement will read DEF ROU(X) = INT(((10^3)*X) + 0.5)/(10^3). The number of decimal places can be negative, of course; if you want to round to the nearest 10, ask for -1 decimal place, and if you want to round to the nearest 1000, ask for -3 decimal places.

8. *Rounding to a particular number of significant digits.* Often, you'll find that the most convenient type of rounding involves coming up with a particular number of significant digits rather than a particular number of decimal places. You can accomplish this with the definition

DEF RSF1(X) = (N-1)-INT(LOG10(X))
DEF RSF(X) = INT(((10^RSF1(X))*X) + 0.5)/(10^RSF1(X))

Here the definition is so complex that it is best done in two stages: first we define RSF1, which is a function used internally in RSF, and then we define RSF, which is the function we actually use. *n* stands for the number of significant digits you want; as before, you must substitute a number for it when typing the definition into the computer.

A word of warning: RSF (with its subsidiary calls to RSF1, which in turn calls LOG10) can take quite a bit of time to execute (about half a second of realtime on the TI-99).

9. *Sexagesimal output: minutes.* Our practice of expressing time in hours, minutes, and seconds, and angles in degrees, minutes, and seconds, is a remnant of an ancient Babylonian base-60 (sexagesimal) number system. Often, in a computer program dealing with time or with angles, it is desirable to express the output in terms of units, minutes, and seconds. The units are obtained by taking INT(X); thus the units part of 2.5 hours = INT(2.5) = 2 hours. Here is a function that gives the minutes part:

DEF MNT(X) = INT(60*(X-INT(X)))

That is, we take the non-integer part of the value, multiply it by 60, and take the INT of that.

10. *Sexagesimal output: seconds.* The seconds part of the value, in turn, is given by:

DEF SCD(X) = 60*(60*(X-INT(X))-MNT(X))

That is, we subtract the integer part *and* the minutes; what's left gets multiplied by 60 twice.

The sexagesimal output functions can be tested by means of a program such as the following:

```
10 DEF MNT(X)=INT(60*(X-INT(X)))
20 DEF SCD(X)=60*(60*(X-INT(X))-MNT(
   X))
30 FOR H=0 TO 2 STEP 0.01
40 PRINT
50 PRINT H,"HOURS"
60 PRINT INT(H),MNT(H),SCD(H)
70 NEXT H
```

From this we learn, for example, that 0.01 of an hour is 36 seconds, and that 0.5 of an hour is 30 minutes. (If your computer uses binary, rather than BCD or Radix-100, internal representations of numbers, you may get odd errors due to rounding or lack of it. The solution would be to round the number of hours to some reasonably small number of decimal places before invoking the conversions, and perhaps to insert some rounding in the definitions of MNT and SCD themselves.)

Incidentally, for sexagesimal *input*, you don't need any special functions, only a bit of multiplication. For instance, the statements

```
10 PRINT "TYPE HOURS, MINUTES, SECON
   DS"
20 INPUT H,M,S
30 H=H+M/60+S/3600
```

will give you (as H) the number of hours expressed as a decimal.

11. *Modulo 12 arithmetic.* In dealing with hours, you'll often want to reduce numbers to modulo 12. For instance, if it's 11 a.m., then you can calculate the time four hours later by adding 11 + 4 (which gives you 15) and then taking the result modulo 12. The function definition is:

DEF MOD12(X) = 12*(X/12-INT(X/12))

(unless, of course, your computer has a built-in MOD function, which is even simpler to use). This particular function is likely to be bothered by rounding and truncation errors. On the TI-99, I get accurate results for numbers under 1000 or so, but larger numbers give slightly erroneous answers; a binary machine might be plagued by worse problems.

12. *Modulo 60 arithmetic.* The same function, giving modulo 60 answers (for dealing with minutes and seconds), is:

DEF MOD60(X) = 60*(X/60 - INT(X/60))

(as if you couldn't have guessed). The following program starts with a time expressed as H hours M minutes, and adds M1 minutes:

```
10 DEF MOD12(X)=12*(X/12-INT(X/12))
20 DEF MOD60(X)=60*(X/60--INT(X/60))
30 INPUT H,M
40 INPUT M1
50 M=MOD60(M+M1)
60 H=H+INT(M1/60)
70 PRINT H,M
```

Line 50 adds the right number to the minutes part, and line 60 adds to the hours part if necessary. ©

Guest Commentary

Is RAM Memory A Status Symbol?

Barry Miles

Many expensive technological items are bought as status symbols. Are all those Hewlett Packard HP 41c's really used to their fullest extent, for long programs and the use of ROM libraries of fancy programs, or are they merely left on the executive's desk to say "I'm so important that I can justify a purchase of the state-of-the-art programmable calculator"?

The advent of really large RAM sizes means that we should rethink the relationship between RAM and disk storage. We have for a long time lived with the idea that we should use RAM sparingly. This probably stems from the need to conserve RAM usage in a mainframe environment, so that as many users as possible may access the machine at once and so that the queuing problem is reduced to a minimum. Programmers are likely to continue to think in this way, even when the need has evaporated.

Perhaps an example should be taken from the approach used in managerial economics. In budgeting for the future, businessmen seek to identify the Principal Budget Factor – that factor which prevents the business from expanding to infinity. They then seek to make the very best use of that scarce resource, so as to maximize profits. They usually make strenuous efforts to remove the bottleneck which that resource represents, by increasing the amount of it which is available: if you are short of skilled labor, you seek to take on more people, for instance. The successful businessmen are the ones who first remove the constraint which is holding them back, then correctly identify the new constraint and seek to remove it, and so on.

What I am saying is that once RAM ceases to be a scarce resource, we should cease trying to economize in its use, especially as it becomes progressively cheaper, and particularly when it becomes cheaper than similar amounts of secondary storage (such as disks or tapes).

A potential buyer of the Sirius computer has an interesting choice before him; with a limited budget, he will need to decide between various amounts of RAM, and whether to go for double-sided disks to increase secondary storage capacity. He may choose the largest amount of RAM, out of habit, without really considering whether he will make effective use of the extra memory.

More Is Less

Again, economics may come to our aid. The Diminishing Marginal Utility theory says in this context that every extra 1K of RAM is less important to us than the previous one, to the point where more is really of no interest.

Surely we must examine whether what we are doing now will become easier, faster, or more efficient if we have more RAM, and whether there are other things which we could do with more RAM but which are impossible at present, and finally whether we should adopt a whole new approach. There is a danger of misleading ourselves or of being misled by salesmen into thinking that more RAM must be a good idea, without thinking out why. There is even a danger of rationalizing in order to justify what is really only wish-fulfillment.

We might compare this to buying a fast car. Some say that you're much safer in a fast car than in a slower car, regardless of the speed at which you are traveling. The braking system and suspension of such a car have been designed to cope with the effects of traveling quickly, and these systems therefore work very much within their capacity, and very efficiently at slower speeds. A similar argument can be made for extremely powerful hi-fi systems: distortion is less if you do not have to turn up the volume very far to get the loudness you require.

Do these arguments carry over to microcomputer memories? Probably not. The trouble is that you merely get more of the same. If you do not use it, then it just lies idle. Are you really going to write massive BASIC or machine code programs? Are you really going to handle vast amounts of

Our Top Sellers!

QUACKERS
(Like Carnival)
$15.95

No Extra Memory Needed!

HOPPER
(Like Frogger)
$20.00

DYNAMITE
VIC-20 Programs

INTRUDER-SCRAMBLE
$19.95

KONGO KONG
$19.95

SWARM
(Like Centipede)
$24.95

Arcade-Style Machine-Language Games

Over 500 Educational and Game Programs

RDERING BLANK

o: American Peripherals
122 Bangor Street
Lindenhurst, N.Y. 11757

hip to: Name ____________________
Street ____________________
Town, State, Zip ____________________
____

☐ *Check here for latest 64 Catalog*

☐ *Check here for latest VIC Catalog*

ITEM	DESCRIPTION	PRICE
	NY State Residents only add 7¼% tax	
	Shipping (If COD, add $1.50)	$1.50
	TOTAL AMOUNT	

U.S. Funds - Foriegn Countries add an additional $3.00

data? Most likely not, at least not unless you change your way of doing things to optimize the use of your principal technological factor.

New Freedoms

What I am suggesting is that disks came about because of limited RAM. Now that RAM limitations can be of increasing greater size, we should explore new freedoms. What follows may seem a little far-fetched, but may also be just around the corner.

First, we may take it that a one megabyte RAM is not likely to be filled with a BASIC or machine code program of anything near that length. The debugging alone would take too long! This leaves us with other possibilities.

We could fill a lot of the RAM with a wide range of programs, and call up any of the whole suite, instantaneously, from a special menu program.

We could have as many programming aids in our machine as we could conceivably wish for, and barely scratch the surface of our new-found capacity.

We could have a vast range of help screens available for instantaneous recall when in trouble.

We could call in a whole succession of high resolution pictures, which are usually slow to load from disk, so rapidly that even animation would be possible.

We could have split processing in one machine. After all, it is common for two processors to be in one machine, so why not a schizoid machine with each part operating independently?

We could have a really enormous amount of text in our word processor at any one time, and have many different text areas. Our word processor could perhaps interact with our accounting and data base programs in RAM.

Accounting suites of programs could be truly integrated, so that final accounts are updated after every transaction.

Our data bases could be loaded from disk into RAM first thing in the morning, and all updating could take place in RAM, so as to be almost instantaneous. All the disk activity would have to do is merely dump RAM contents, for safety's sake, at convenient time intervals. Battery backup could protect contents from voltage spikes and power failures.

It might be that disks of all types will become a thing of the past, with programs and data being loaded and dumped over the telephone by a modem, with suitable passwords and protections, into your friendly local overnight datastore. (There are problems in this, in that the use of telephone lines is subject to error, but presumably this will improve and is not an insurmountable obstacle.)

In any case, if the function of the disk unit changes from continual random access to infrequent loading and dumping, disk operating systems could be simplified at the very least. Perhaps the very small diameter disks which the major companies are now developing will become the norm; and disk units will come down in price to become a trivial expense. That, too, is an intriguing prospect.

This would all require greater addressability than even the current 16 bit machines offer, but the megabyte chip is probably just around the corner. ©

Disassemble To Printer Or Disk For Atari

Mark Chasin

If you've been wondering how to take disassemblies of machine language and either store them on a disk or print them out – here's your answer. These programs will make the Atari Assembler/Editor cartridge an even more useful programming tool.

One of the best ways to learn assembly language programming is to look at the ways professional programmers have written complex programs and to study and learn their techniques. Unfortunately, when we buy programs that were originally written in assembly language, they have already been assembled (translated) into machine language. To make sense out of this code, we must be able to disassemble (retranslate) it back into assembly language.

Fortunately, those of us who have the Atari Assembler/Editor cartridge know that Atari has the built-in ability to disassemble machine language back into assembly language, using the L option in the DEBUG mode. This option will convert the information stored in any section of memory into assembly language. This conversion is then displayed on your screen, so that you can look at any part of any machine language program in assembly language.

That's the good news. The bad news is: 1) you can look at only about 20 lines of assembly language code at a time, and 2) you have no way of storing the assembly language version for studying later, except to copy the program from the screen with pencil and paper. This article shows you how to divert the output either to a printer or to your disk and provides programs to implement these options.

Output To A Printer

In your Atari, the Input/Output Control Block (IOCB) #0 is the default IOCB for all output operations, and it is the screen editor. The output from the Assembler/Editor cartridge (and all other cartridges) is routed through this IOCB to direct the output to the screen. In your Atari, all output to any device is handled through the handler table, which is simply a series of pointers to places in the Operating System (OS), where the directions for how the Atari is to deal with each device can be found. Actually, these pointers are directed at address-1 for each set of directions. Therefore, to redirect the output of the Assembler/Editor cartridge to a printer, all we have to do is to change the pointer so that it points at the address-1 of the printer instructions in the OS.

Let's try to disassemble the first part of DOS and get a printout of the assembly language code. I'll assume that you have your system booted up with DOS 2, that the Assembler/Editor cartridge is in place in your computer, and that your printer (and interface module, if you need it) is on. First, go into DEBUG mode by typing BUG, followed by a RETURN. Your screen should say DEBUG. Next, type C346<A6,EE and another RETURN. This changes memory locations $0346 and $0347 to $A6 and $EE, respectively. By the way, the directions for dealing with a printer begin in memory location $EEA7. Remember, we point to address-1.

All output is now directed to your printer. If at this point you type L0700,0756 and hit RETURN, your printer should produce the first part of DOS 2 in assembly language, exactly as it appears in Program 1. The format of this listing is discussed in detail below.

Remember: *All* output is now directed to your printer. To get back to the screen, you'll have to change the pointer back to where it was. You'll need to type C346<A3,F6 and hit RETURN. Now you can see what you're doing, so you can go ahead with normal output.

To A Disk File

Directing the disassembled listing of some portion of memory to your disk drive is a bit more complicated and requires a brief program to handle housekeeping. This assembly language program is shown in Program 2, with the origin at $0600. Before we can direct the output to disk, we need to open a file on the disk. For the purposes of this discussion, we will open a file using IOCB #3, and we'll call the file D1:DISASSEM.

To do this, we first load the X register with #$30 (for IOCB #3), in line 110 of Program 2. We'll use this as an index into IOCB #3 throughout the program. Next, we store the command byte for the OPEN command, $03, into $0342,X in lines 120-130, and the command byte for the OPEN for WRITE command, $08, into $034A,X. Then we point to the name of the file we want to OPEN by storing the low and high bytes of the address of this string in $0344,X and $0345,X respectively, in lines 160-190. We can then OPEN the file by jumping to the CIO subroutine in line 200. The RTS in the next line returns control to your keyboard, so that you can handle the next steps manually.

The program that actually directs the output to this disk file begins on line 230 of Program 2, at $0620. We set the IOCB to #3 in line 230, and temporarily store the character being sent in the Y register in line 240. By setting the buffer size to zero in lines 250-270, we can pass one character at a time, from the accumulator, directly to the disk file. The command byte for PUT CHARACTER is $0B (lines 280-290). In line 300, we retrieve the character being sent, and we send it to the disk by calling the CIO routine in line 310. Line 320 returns control to the Assembler/Editor cartridge to fetch the next byte of the disassembly. As each character is passed to the disk in turn, the OS takes care of keeping track of how the disk file is to be organized and saves us a lot of work in the process.

It is *important*, once a file is OPENed for writing, that it be closed, or you are likely to lose the last sections of information you wanted to write to the disk. Since your keyboard is not in control during the disassembly, you need to close the file by hitting BREAK when the drive has stopped, indicating that the file has been written.

To use these programs, type them in exactly as shown in Program 2, and LIST them to your disk for safekeeping. Then type ASM and RETURN to assemble these programs. After this is completed, type BUG to enter DEBUG mode, and then G0600 to run the first program. You should hear the disk drive start as the file is OPENed. Next, type C346 ‹ IF, 06 and RETURN. This directs the output to our routine to send one character at a time to the disk (remember: address-1). Then type L0700,0756 and RETURN. This will disassemble the first part of DOS 2 to your disk. When the drive stops, hit the BREAK key to close the file. SYSTEM RESET will now set everything back the way it was before we started our tampering.

Reformatting The Output File

One last problem remains. If we refer to Program 1, we can see that the first set of numbers on each line represents the hexadecimal address of each instruction. The second set of numbers is the machine language nomenclature for the instruction, and the instruction mnemonic itself is the next set. Following the instruction is the operand. In a typical assembly language listing, two more fields would be present. Between the machine language instruction and the mnemonic would be a line number, and frequently following the operand is a comments field. The problem that remains is that the output from the L option of the Assembler/Editor cartridge is not in a form that can be used as input for the Assembler itself. That is, the disk file D1:DISASSEM that we have created cannot be used as source code – yet.

Program 3 is a BASIC program which will reorganize and reformat D1:DISASSEM into another file, D1:OUTPUT, which *can* be used as source code for the cartridge. Line 100 sets the first line number for the OUTPUT file to 1000, and lines 110-160 dimension the input, output, and blank strings, set the blank string equal to all blanks, and erase anything in the other two strings. Lines 170 and 180 open DISASSEM for input, and OUTPUT for output.

We are going to set up a loop, from lines 230-330, which will work its way through all of DISASSEM; so, in line 190, we set a trap to close the files when we get to the end. Lines 200 and 210 discard the first two lines of DISASSEM, a blank line and the word DEBUG on the second line (see Program 1), which are put in by the cartridge. Line 220 blanks out the input string, and line 240 reads the first line of DISASSEM into the input string, INTAKE$.

We would like our output to start with a line number, so line 240 handles this for us. Line 250 leaves the next two spaces blank, because that's how the Assembler/Editor expects to get its source code. Line 260 checks to see if the cartridge understood that particular byte. If it can't interpret a byte, the cartridge puts ??? into the mnemonic field. This program stores the contents of that location in memory as a .BYTE mnemonic. Line 270 fills in the remainder of the line, and line 280 puts in a comments field, with the contents as the memory location of that particular instruction, as an aid in understanding the output. Line 290 puts the output to the disk file, lines 300 and 310 rezero OUT$ and INTAKE$, line 320 increments the line number by two, and line 330 loops back to get the next line for reformatting. Line 340 closes the files and ends the program.

Program 4, the OUTPUT file structure for the first part of DOS 2, requires a few comments. The beginning of DOS is used to store certain variables. For that reason, the first part of the output file (lines 1000 – 1030) looks slightly strange. However, it should be noted that all information is there, and in a form which is understandable to the Assembler. That is, this file *can* be used as source code. Some thought must be given, however, to the interpretation of this code, as with all disassembled machine language programs.

Two final comments: First, if you want to disassemble all of DOS 2, do it in two steps; although the programs described in this article can handle all of DOS, the Assembler/Editor cartridge cannot accept an input file that large. The source code for DOS 2 using these programs is more than 300 sectors long! Second, all references to addresses in the OUTPUT file are absolute. Therefore, you will not be able to relocate this program with a different origin unless you substitute labels for all of the absolute addresses. However, you will be able to experiment with changes to DOS, or any other machine language program, if you're careful about the specific addresses in your disassembled source code.

If you are specifically interested in modifying or experimenting with DOS 2, I highly recommend the recent book by Bill Wilkinson, *Inside Atari DOS*, published by **COMPUTE! Books**. The documented source code and detailed explanations of the various subroutines within DOS make this an invaluable resource for anyone attempting to change or understand DOS. There are also some very interesting suggestions for modifications to DOS, which should be reasonably simple to implement now that you have a way to obtain the source code.

Program 1: Disassembly Of DOS

```
DEBUG
0700     00            BRK
0701     03            ???
0702     00            BRK
0703     07            ???
0704     40            RTI
0705     15 4C         ORA    $4C,X
0707     14            ???
0708     07            ???
0709     03            ???
070A     03            ???
070B     00            BRK
070C     7C            ???
070D     1A            ???
070E     01 OF         ORA    ($OF,X)
0710     00            BRK
0711     7D CB 07      ADC    $07CB,X
0714     AC OE 07      LDY    $070E
0717     FO 36         BEQ    $074F
0719     AD 12 07      LDA    $0712
071C     85 43         STA    $43
071E     8D 04 03      STA    $0304
0721     AD 13 07      LDA    $0713
0724     85 44         STA    $44
0726     8D 05 03      STA    $0305
0729     AD 10 07      LDA    $0710
072C     AC OF 07      LDY    $070F
072F     18            CLC
0730     AE OE 07      LDX    $070E
0733     20 6C 07      JSR    $076C
0736     30 17         BMI    $074F
0738     AC 11 07      LDY    $0711
073B     B1 43         LDA    ($43),Y
073D     29 03         AND    #$03
073F     48            PHA
0740     C8            INY
0741     11 43         ORA    ($43),Y
0743     FO OE         BEQ    $0753
0745     B1 43         LDA    ($43),Y
0747     A8            TAY
0748     20 57 07      JSR    $0757
074B     68            PLA
074C     4C 2F 07      JMP    $072F
074F     A9 CO         LDA    #$CO
0751     DO 01         BNE    $0754
0753     68            PLA
0754     OA            ASL    A
0755     A8            TAY
0756     60            RTS
DEBUG
```

Program 2: Disassembly To A Disk File

```
0100    *= $0600
0110 OPEN LDX #$30
0120   LDA #$03
0130   STA $0342,X
0140   LDA #$08
0150   STA $034A,X
0160   LDA #FNAME&255
0170   STA $0344,X
0180   LDA #FNAME/256
0190   STA $0345,X
0200   JSR $E456
0210   RTS
0220   *= $0620
0230 POINT LDX #$30
0240   TAY
0250   LDA #0
0260   STA $0348,X
0270   STA $0349,X
0280   LDA #$0B
0290   STA $0342,X
0300   TYA
0310   JSR $E456
0320   RTS
0330 FNAME .BYTE "D1:DISASSEM",0
```

Program 3: BASIC Reformat Of File

```
100 I=1000
110 DIM INTAKE$(45),BLK$(45),OUT$(45)
120 BLK$(1,1)=" "
130 BLK$(45,45)=" "
140 BLK$(2)=BLK$
150 INTAKE$=BLK$
160 OUT$=BLK$
170 OPEN #1,4,0,"D:DISASSEM"
180 OPEN #2,8,0,"D:OUTPUT"
190 TRAP 340
200 INPUT #1;INTAKE$
210 INPUT #1;INTAKE$
220 INTAKE$=BLK$
230 INPUT #1;INTAKE$
240 OUT$(1,4)=STR$(I)
250 OUT$(5,6)="  "
260 IF INTAKE$(22,23)="??" THEN OUT$(
    7)=".BYTE $":OUT$(14,15)=INTAKE$(
    9,10):GOTO 280
270 OUT$(7)=INTAKE$(22)
280 OL=LEN(OUT$)+1:FOR M=OL TO 21:OUT
    $(M,M)=" ":NEXT M:OUT$(22,23)=";
    ":OUT$(24,27)=INTAKE$(1,4)
290 ? #2;OUT$
300 OUT$=BLK$
310 INTAKE$=BLK$
320 I=I+2
330 GOTO 230
340 CLOSE #1:CLOSE #2:END
```

Program 4: Output File Structure For DOS 2

```
1000   BRK                ; 0700
1002   .BYTE $03          ; 0701
1004   BRK                ; 0702
1006   .BYTE $07          ; 0703
1008   RTI                ; 0704
1010   ORA    $4C,X       ; 0705
1012   .BYTE $14          ; 0707
1014   .BYTE $07          ; 0708
1016   .BYTE $03          ; 0709
1018   .BYTE $03          ; 070A
```

MORE TO SMILE ABOUT!

3 *NEW* Arcade-Style Games from Canada for the Commodore® VIC-20®, and, one for the Commodore® 64! Brought to you by JMC, your "SOURCE" for over 3,500 different books, programs and accessories, from over 85 different manufacturers, for All Major Brands of Personal Computers!
DEALER INQUIRES ALWAYS WELCOME!

JMC

NEW NEW NEW NEW

FROGGEE It's easy! Just get your Froggee from the bottom of the screen to the top. Avoid the cars and trucks, hop on the logs and the leaves. Eight levels, with crocodiles, snakes and other neat stuff out to do you in! Uses Joystick. Needs no memory expansion.
4180-020001 For 3K VIC-20® (Cassette) $29.95
4180-064001 For Commodore® 64® (Cassette) $29.95

CENTIPOD Fast paced, decending bugs, falling projectiles, bouncing spiders and more! Quick reactions needed here, just to keep alive! Uses Joystick. No memory expansion needed.
4180-020002 For 3K VIC-20® (Cassette) $29.95

MOTOR MOUSE Up and down the grandfather clock, picking-up the cheese. But, watch out! There are cats hiding in the cheese! 7 progressively harder levels and a time factor to beat. Very fast paced arcade quality game. Uses Joystick. No memory expansion needed.
4180-020003 For 3K VIC-20® (Cassette) $29.95

FROM CANADA, FOR THE VIC-20® AND FOR THE NEW COMMODORE® 64®

COMMODORE 64® SOFTWARE

EASYMAIL 64® Fully featured name and address program for business, club or organization.
4100-064204 Disk $49.95

WORD MACHINE/NAME MACHINE Perfect easy-to-understand wordprocessing product, designed as an entry level item for home. For notes to the kids, letters to friends, etc.
4100-064210 Disk $29.95

PET® EMULATOR™ An emulator that will allow a high level of existing PET® software to be executed on the COMMODRE 64®, especially educational materials.
4100-064107 Disk $29.95

COMMODORE® VIC-20® BOOKS

VIC BASIC: A User-Friendly Guide Explains how-to-do-it—make rainbows, music & more!
4690-008378 $12.95

ZAP! POW! BOOM! How to program action games on the VIC-20®
4690-009538 $12.95

KIDS AND THE VIC® Written at children, not 'down' to them. Turns kids, (and unsuspecting parents), itno computer experts in days. Includes: How to Program; How to Make Games; How to Create Study Programs; More! Each chapter contains parent sections, for working along, or in helping with the rough spots.
4560-000056 $19.95

VIC-20® PROGRAMMER S REFERENCE GUIDE Complete BASIC vocabulary guide, machine language programming, tips and more!
4100-000110 $16.95

COMPUTE!(s) FIRST BOOK OF VIC® A compilation of articles from the COMPUTE! magazine.
4105-000007 $12.95

TIMEX/SINCLAIR 1000 (ZX81) BOOKS

37 Timex/Sinclair 1000® ZX-81® Programs for Home, School & Office Easy to use guide for beginner or expert.
4080-000021 $ 8.95

101 Timex/Sinclair 1000 ZX-81® Programming Tips & Tricks Most helpful guidebook.
4080-000020 $ 7.95

The Sinclair ZX-81® Programming for Real Applications. In depth programs and uses.
4250-000090 $11.95

ATARI® 400®/800® BOOKS

YOUR ATARI® COMPUTER Comprehensive 'training manual' for 400®/800® computers.
4665-000065 458 Pages **$16.95**

ATARI® GAMES & RECREATIONS Source of pre-programmed games. Also teaches graphics and addition of color and sound.
4690-000242 $14.95

ATARI® PILOT FOR BEGINNERS Hands-on intro to ATARI® PILOT computer language.
4690-000301 $12.95

THE ATARI® ASSEMBLER Making the leap from BASIC to ATARI's® assembly language.
4690-000236 $12.95

THE VISICALC BOOK: ATARI® EDITION A program perfect for businesses and businessmen.
4690-008393 $14.95

COMPUTE!(s) FIRST BOOK OF ATARI® Compilation of articles from COMPUTE! magazine.
4105-000000 $12.95

COMPUTE!(s) SECOND BOOK OF ATARI® More articles from COMPUTE! magazine. . .
4105-000006 $12.95

KIDS AND THE ATARI® See description at left under KIDS AND THE VIC®
4560-000055 $19.95

APPLE® BOOKS

APPLE® II USER'S GUIDE Complete BASIC programming tool. Special features. 388 pages.
4665-000046 $16.95

ASSEMBLY LANGUAGE PROGRAMMING FOR THE APPLE® II Comprehensive, understandable intro. Appendices. 160 pages.
4665-000051 $12.95

6502 ASSEMBLY LANGUAGE PROGRAMMING Provides examples: simple memory load loops to complete design projects. 640 pages.
4665-000027 $16.99

BASIC FOR THE APPLE® Intro to programming and applications. Includes games, graphics, file management and word processing.
4690-000189 $14.95

KIDS AND THE APPLE® See description at left under KIDS AND THE VIC®
4560-000019 $19.95

JMC's Computer "SOURCE BOOK™" Catalog. Over 2,000 books, programs and accessories for virtually every brand of microcomputer made! 72 Pages. **0001-198207 $ 2.00 Ppd.**

COMMODORE 64®

NEW! **The COMMODORE 64® PROGRAMMER'S REFERENCE GUIDE.** Everything you need to know to get started programming Commodore's® newest, and most versatile personal computer. Step by step guides in language that is easy to understand. Tips and a whole lot more! Our most asked for publication!
4760-022056 $19.95

DEPARTMENT: C-P
1025 INDUSTRIAL DRIVE
BENSENVILLE, IL 60106-1297

QTY	NUMBER	DESCRIPTION OF ITEM	COST	TOTAL
			TOTAL	

(Orders Under $25 Please Add $2.50 Post. & Handling. Illinois Residents Please Add 5% Sales Tax. All Catalogs Shipped Ppd.)

PAYMENT ENCLOSED ☐ CASH ☐ CHECK ☐ MONEY ORDER
PLEASE CHARGE TO MY ☐ MASTERCARD ☐ VISA (Min. Chg. $25.)
CARD NUMBER ____________
EXPIRES ____________ INTRBNK # ____________
SHIP TO: ____________
STREET ADDR: ____________
CITY ____________ STATE ______ ZIP ______

JMC

PRICES AND AVAILABILITY SUBJECT TO CHANGE

```
1020  BRK                 ; 070B
1022  .BYTE $7C           ; 070C
1024  .BYTE $1A           ; 070D
1026  ORA     ($04,X)     ; 070E
1028  BRK                 ; 0710
1030  ADC     $07CB,X     ; 0711
1032  LDY     $070E       ; 0714
1034  BEQ     $074F       ; 0717
1036  LDA     $0712       ; 0719
1038  STA     $43         ; 071C
1040  STA     $0304       ; 071E
1042  LDA     $0713       ; 0721
1044  STA     $44         ; 0724
1046  STA     $0305       ; 0726
1048  LDA     $0710       ; 0729
1050  LDY     $070F       ; 072C
1052  CLC                 ; 072F
1054  LDX     $070E       ; 0730
1056  JSR     $076C       ; 0733
1058  BMI     $074F       ; 0736
1060  LDY     $0711       ; 0738
1062  LDA     ($43),Y     ; 073B
1064  AND     #$03        ; 073D
1066  PHA                 ; 073F
1068  INY                 ; 0740
1070  ORA     ($43),Y     ; 0741
1072  BEQ     $0753       ; 0743
1074  LDA     ($43),Y     ; 0745
1076  TAY                 ; 0747
1078  JSR     $0757       ; 0748
1080  PLA                 ; 074B
1082  JMP     $072F       ; 074C
1084  LDA     #$C0        ; 074F
1086  BNE     $0754       ; 0751
1088  PLA                 ; 0753
1090  ASL     A           ; 0754
1092  TAY                 ; 0755
1094  RTS                 ; 0756
```

©

NEW FOR ATARI

diskwiz

COMPLETE & AFFORDABLE
DISK EDITING REPAIR & DUPLICATION SYSTEM FOR ATARI OR PERCOM DRIVES

• Fast M/L operation • Repair DOS/NON DOS sectors • On screen Hex/ASCII editing • Print out all modes to any printer • Dumps inverse & special Grafix Char to Epson Graftrax & NEC 8023A • Fast mapping, searches • File trace • Speed check and adjust • Block move • Auto link pointers, file codes • VTOC bit map functions • Retrieves deleted files • Fix dup filename • Use nonformatable disks • Complete manual • Easy, fast, complete • Onboard disassembler • Even runs on 16K • Supports 1 or 2 drives • HEX-DEC-ASCII Converter • And More!

All this for only $25. postpaid

Don't waste your money on more expensive programs that don't deliver as much.

48 hr. shipping for cashiers checks & money orders. Allow up to 3 weeks for personal checks, — C.O.D. add $2.00. Club & dealer enquiry encouraged.

ALLEN MACROWARE
(213) 376-4105
1906 Carnegie Lane "E"
Redondo Beach, CA 90278

Atari, Epson, NEC & Percom, are trademarks of Atari, Inc., Epson America, NEC, Percom Data respectively.

www.commodore.ca

COMPUTE!'s Mapping The Atari

Author: Ian Chadwick
(Introduction by Bill Wilkinson)
Price: $14.95
On Sale: Now

TABLE OF CONTENTS

The inner workings of today's advanced personal computers unfortunately remain a mystery to many users. From beginners to machine language programmers, people are hungry for vital information about the insides of their machines. For example, there are tens of thousands of memory locations...which are safe to use? How can changing one number in a certain memory cell dramatically speed up output to the disk drive? Which memory address reveals what Operating System is in the computer? How can changing certain numbers in various memory locations improve a program's sound and graphics?

The key to finding one's way around the inside of a computer is a memory map. But often this important information is unavailable from the manufacturer. Or it can be obtained only in piecemeal fashion from scattered sources.

Now, for the first time, there is a comprehensive guidebook available for the Atari 400/800 computers which answers all of these questions, and hundreds more. *Mapping The Atari*, by Ian Chadwick, is a complete reference guide and memory map for one of the most popular of personal computers. From memory location zero to 65,535, *Mapping The Atari* is the most exhaustive memory sourcebook ever offered to Atari users.

Chadwick started by diligently assembling all the information he could find. Then he went a step further by testing this information, to verify its accuracy. And finally, he added months of his own research, delving deep into little-known areas of the Atari's memory to explore every secret. The result, *Mapping The Atari*, is an indispensable reference work for Atari programmers.

But *Mapping The Atari* is more than just a comprehensive reference book. It is also a tutorial for *all* inquisitive Atari enthusiasts – not just advanced programmers. *Mapping The Atari* explains each memory location in depth for beginning and intermediate programmers. Some descriptions of important locations fill several pages. And the book is packed with ready-to-type example programs and routines which show exactly how to put the information to work.

There's more. A special introduction by Bill Wilkinson, an author of Atari BASIC and the Atari Disk Operating System, explains how to access the Atari's memory in every available programming language. And there are *ten* appendices, covering such topics as "VBLANK Processes," "Atari Timing Values," "Color," "Sound And Music," "Player/Missile Graphics Memory Map," "Display Lists," and others. And to make the book still more useful, there are *two* indices – an Index By Label, and an Index By Subject.

Best of all, *Mapping The Atari* is from **COMPUTE! Books**, associated with **COMPUTE!** Magazine, the leading consumer publication of home, educational, and recreational computing. **COMPUTE!** has led the way for Atari owners since the computers were first introduced in 1979. In the **COMPUTE!** tradition, *Mapping The Atari* is carefully written and edited to be useful to beginners and experts alike. And it is spiral-bound to lie flat while typing programs.

Available at computer dealers and bookstores nationwide. To order directly call TOLL FREE 800-334-0868. In North Carolina call 919-275-9809. Or send check or money order to **COMPUTE! Books**, P.O. Box 5406, Greensboro, NC 27403.

Add $2 shipping and handling. Outside the U.S. add $5 for air mail, $2 for surface mail. All orders prepaid, U.S. funds only.

The Apple Hi-Res Painter

James Totten

"Hi-Res Painter" is a graphics editor for use with a 32K Apple. With it you can: use any one of six colors (or combine colors with your "pen"); select from three different drawing pens; label pictures with upper- and lowercase lettering; color in squares, rectangles; and more.

When using the Apple's hi-res graphics, it seems that a lot of work can yield few results. This is true, of course, only if you are doing your graphics manually (HPLOT 0,0 TO 45,67 etc.). Since I use the graphics considerably (they are one reason I bought the computer), I didn't enjoy taking hours to draw a fairly impressive title page or chart or some other type of picture.

Menu Options

The "Hi-Res Painter" runs from four menus: Main Menu (1), Accessory Menu (2), Diskette Menu (3), and, most important of all, the Picture Menu (4). When you start, you are automatically placed at the first menu (Main). From here you can select to go to any of the other three menus presented by just pressing the first letter of its name. This letter is highlighted on the screen.

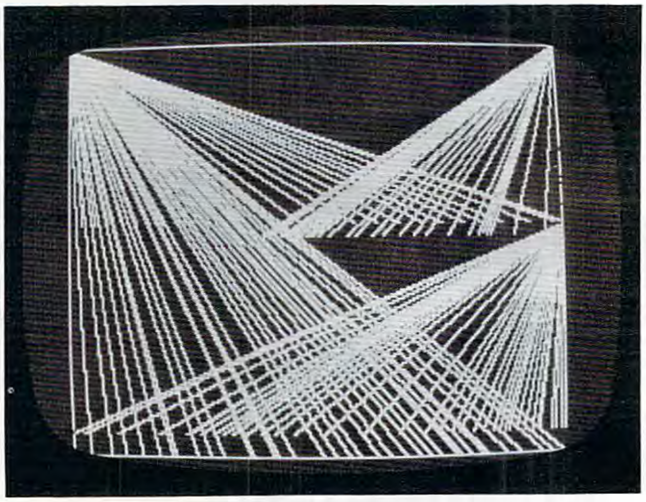
Pressing *A* will take you to the Accessory Menu (2). Here, you can choose from p)rint, f)ill, k)eyboard, and m)ain. The print option will work for those who own either a Trendcom or Silentype printer only. The *fill* option works for everyone. You select two points on the screen: the first is the upper left corner of the square you wish filled, and the other is the lower right corner. Presto! The keyboard option allows the user to change from paddle or joystick control of the pen to keyboard control of the pen. With the change, the I, J, K, M keys move the pen in the direction they are positioned. And, of course, the main option will take you to the main menu again.

The next menu in the list is the Diskette Menu, number three, and you can call that menu by pressing *D*. Here you can n)ame, d)elete, s)ave, l)oad, or r)ename any picture – s)ave will save the picture currently on the screen. Again, m)ain will return you to menu 1.

Finally, menu four is the Picture Menu, and to call it up press *P*. The available options here are: v)iew, l)abel, b)drop, c)olor, d)raw, e)rase, p)ens, and m)ain. The first option allows simply a total view (no text) of the graphics screen which you are working on. *Label* will do just that; you are asked for a date, name, or whatever to be typed in on the keyboard, and it is then transferred to a location of your choice onto the graphics screen.

The *b)drop* option stands for backdrop, and this will simply fill the screen (rather quickly) with a color of your choice. *Color* will allow you to choose a new color. Press the first letter of each as in the menu selections. *Draw* and *erase* are obvious in that they do exactly what they say. A note of warning though: if a picture is erased, it cannot be recalled unless it is on disk. The *pens* option is actually two in one. With it you can change the size of your pen (press 1, 2, or 3 and watch the screen), and turn it on or off. And again, main returns you to menu one. You can draw using paddles or a joystick, or you can switch the controls to use the keyboard.

To produce very good-looking designs, try some experiments. Fantastic pictures (such as stars on a moonlit night) can easily be created by just moving the pen in various sizes and colors.



A design created with a paddle controller using "Hi-Res Painter."

Program 1: Hi-Res Painter

```
20  LOMEM: 24576: ONERR  GOTO 1045
21  DIM PX(2),PY(2),C$(6),P$(1)
25  FOR L = 1 TO 4:MX(L) = 0:MY(L) = 0: NEXT
     L:D$ =  CHR$ (4):C = 3:P = 0:BC = 0
30 KI =  - 16384:RK =  - 16368:B0 =  - 16287
     :B1 =  - 16286:TG =  - 16301:FG =  - 16
     302
35 P$(0) = "OFF":P$(1) = "ON":C$(1) = "GREEN
     ":C$(2) = "PINK":C$(3) = "WHITE"
40 C$(4) = "BLACK":C$(5) = "ORANGE":C$(6) =
     "LT.BLUE":I = 1:P$ = "NOT NAMED"
41   IF  PEEK (233) <  > 64 THEN  PRINT D$"BL
     OAD CHARACTERS/SH2": POKE 232,0: POKE 2
     33,64
42   SCALE= 1: ROT= 0:X = 139:Y = 80
43   TEXT : HOME : NORMAL : VTAB 10: PRINT
     TAB(11)"THE HI-RES PAINTER": PRINT  TAB
     ( 7)"-=(                  )=-": PRINT
     TAB(11)"BY JAMES R. TOTTEN"
44   POKE RK,0: VTAB 24: PRINT "<< TO BEGIN P
```

```
     USH ANY KEY EXCEPT RESET >>"
45   IF  PEEK (KI) < 128 THEN 45
46   POKE RK,0
50   HGR : HCOLOR= C: POKE TG,0: POKE 34,20:
      HOME
55   PRINT "PAINTER MENU NUMBER 1 (MAIN)":
      PRINT
60   PRINT "A)CCESSORY   D)ISKETTE   P)ICTURE
         >";: GET K$
65   IF K$ =  CHR$ (27) THEN  POKE RK,0: POKE
      34,0: TEXT : HOME : END
70   IF K$ = "P" THEN 100
75   IF K$ = "A" THEN 450
80   IF K$ = "D" THEN 300
85   POKE RK,0: HOME : GOTO 55
100  POKE RK,0: HOME
105  PRINT "PAINTER MENU NUMBER 4 (PICTURE)"
      : PRINT
110  PRINT "V)IEW  L)ABEL  B)DROP  C)OLOR
      D)RAW  E)RASE  P)ENS   M)AIN  >";: GET K$
115  IF K$ = "M" THEN 85
120  IF K$ =  CHR$ (27) THEN  POKE RK,0: POKE
      34,0: TEXT : HOME : END
125  IF K$ = "E" THEN  HGR :BC = 0: GOTO 100
130  IF K$ = "V" THEN 145
132  IF K$ = "C" THEN 150
134  IF K$ = "B" THEN 240
136  IF K$ = "D" THEN 185
138  IF K$ = "P" THEN 164
140  IF K$ = "L" THEN 218
142  POKE RK,0: HOME : GOTO 105
145  POKE FG,0
146  IF  PEEK (KI) > 127 THEN  POKE TG,0:
      GOTO 100
147  GOTO 146
150  POKE RK,0: HOME : PRINT "CURRENT COLOR:
      ";: INVERSE : PRINT C$(C): NORMAL :
      PRINT
152  PRINT "G)REEN    O)RANGE    W)HITE
      B)LACK    L)T.BLUE  P)INK     >"; : GET K$
154  IF K$ = "G" THEN C = 1: GOTO 100
155  IF K$ = "P" THEN C = 2: GOTO 100
156  IF K$ = "W" THEN C = 3: GOTO 100
158  IF K$ = "B" THEN C = 4: GOTO 100
159  IF K$ = "O" THEN C = 5: GOTO 100
160  IF K$ = "L" THEN C = 6: GOTO 100
162  GOTO 150
164 XC =  INT ( PDL (0)):YC =  INT ( PDL (1) )
165  POKE RK,0: HOME : PRINT "PEN OPERATIONS
      ": PRINT
166  PRINT "S)ET CURSOR SIZE     T)URN ON/OFF
       >";: GET K$
167  IF K$ = "S" THEN 172
168  IF K$ <  > "T" THEN 165
169 P = P + 1: IF P > 1 THEN P = 0
170  HOME : PRINT : PRINT "PEN IS NOW "P$(P)
      : FOR L = 1 TO 300: NEXT L
171  GOTO 100
172  POKE RK,0: HOME : PRINT "TYPE A NUMBER
     FROM 1 TO 3 FOR CURSOR    SIZE (1=SMALL
     EST). CURSOR IS SHOWN ON   SCREEN. WHEN
      DONE, PUSH RETURN.  >";: GET K$
174  IF K$ =  CHR$ (13) THEN 100
176  IF K$ = "1" THEN CS = 0
177  IF K$ = "2" THEN CS = 4
178  IF K$ = "3" THEN CS = 8
179  HCOLOR= BC: FOR L = XC - 1 TO XC + 8:
     HPLOT L,YC - 1 TO L,YC + 8: NEXT L:
     HCOLOR= C
180  FOR L = XC TO XC + CS: HPLOT L,YC TO L,
     YC + CS: NEXT L
182  GOTO 172
185  IF K THEN 1010
186  POKE RK,0: HOME : PRINT : PRINT "TO BEG
     IN OR STOP DRAWING PUSH ANY KEY ";: GET
     K$
187  POKE FG,0: POKE RK,0
190  IF CS = 0 THEN LL = 1:RL = 279:TL = 0:B
     L = 191
191  IF CS = 4 THEN LL = 1:RL = 274:TL = 0:B
     L = 186
192  IF CS = 8 THEN LL = 1:RL = 270:TL = 0:B
     L = 182
194  HCOLOR= C
196 X =  INT ( PDL (0)):Y =  INT ( PDL (1))
198  IF X < LL THEN X = LL
200  IF X > RL THEN X = RL
202  IF Y > BL THEN Y = BL
204  FOR L = X TO X + CS: HPLOT L,Y TO L,Y +
     CS: NEXT L
205  IF  PEEK (KI) > 127 THEN  POKE TG,0: GOTO
     100
206  IF P THEN 210
208  HCOLOR= BC: FOR L = X TO X + CS: HPLOT
     L,Y TO L,Y + CS: NEXT L: HCOLOR= C
209  IF  PEEK (KI) > 127 THEN  POKE TG,0: GOTO
     100
210  IF CS = 0 THEN  IF  PEEK (B1) > 127 THEN
      CALL  - 198:XO = X:YO = Y
212  IF CS = 0 THEN  IF  PEEK (BO) > 127 THEN
      HPLOT X,Y TO XO,YO
215  GOTO 196
218  POKE RK,0: HOME : PRINT : INPUT "ENTER
     LABEL >";L$
219  IF L$ = "" THEN 218
220  HOME : PRINT : PRINT "DO YOU WANT IT ON
      TOP OR BOTTOM (T/B)? ";: GET K$
222  IF K$ = "B" THEN Y = 180: GOTO 226
224  IF K$ = "T" THEN Y = 6: GOTO 226
225  GOTO 220
226 L =  LEN (L$): IF L > 26 THEN 218
228 X = 137 -  INT ((L / 2) * 8)
230  FOR P = 1 TO L: IF  ASC ( MID$ (L$,P,1)
     ) < 62 THEN K =  ASC ( MID$ (L$,P,1)) -
     31: GOTO 232
231 K =  ASC ( MID$ (L$,P,1)) - 3
232  HCOLOR= 0: FOR L = X - 2 TO X + 7: HPLOT
     L,Y - 1 TO L,Y + 8: NEXT L: HCOLOR= 3
233  DRAW K AT X,Y:X = X + 8: NEXT P
234  HCOLOR= C: GOTO 100
240  POKE RK,0: HOME : PRINT "COLORS FOR BAC
     KDROP...": PRINT : PRINT "G)REEN  B)LUE
       P)INK  W)HITE   O)RANGE": PRINT ">";:
       GET K$
242  IF K$ = "G" THEN  HCOLOR= 1:BC = 1: GOTO
     248
243  IF K$ = "B" THEN  HCOLOR= 6:BC = 6: GOTO
     248
244  IF K$ = "P" THEN  HCOLOR= 2:BC = 2: GOTO
     248
245  IF K$ = "W" THEN  HCOLOR= 3:BC = 3: GOTO
     248
246  IF K$ = "O" THEN  HCOLOR= 5:BC = 5: GOTO
     248
247  GOTO 240
248  HPLOT 0,0: CALL 62454
250 BD = 1: GOTO 100
300  POKE RK,0: HOME
302  PRINT "PAINTER MENU NUMBER 3 (DISKETTE)
     ": PRINT
304  PRINT "N)AME  D)ELETE  S)AVE
      L)OAD  R)ENAME  M)AIN    >";: GET K$
306  IF K$ = "M" THEN 85
308  IF K$ =  CHR$ (27) THEN  POKE RK,0: POKE
     34,0: TEXT : HOME : END
310  IF K$ = "N" THEN 320
311  IF K$ = "S" THEN 335
312  IF K$ = "L" THEN 355
313  IF K$ = "R" THEN 385
314  IF K$ = "D" THEN 370
315  GOTO 300
320  POKE RK,0: HOME : PRINT "USE NO COMMAS
     OR COLONS IN NAME.": PRINT : INPUT "> "
     ;P$
```

```
325  IF P$ = "" THEN 320
330  HOME : PRINT "NAME: "P$: NORMAL
332  PRINT : PRINT "IS THIS CORRECT? ";: GET
     K$: IF K$ = "N" THEN 320
333  IF K$ = "Y" THEN 300
334  POKE RK,0: GOTO 330
335  IF P$ = "NOT NAMED" THEN  HOME : CALL  -
     198: POKE RK,0: PRINT : PRINT "PICTURE
     HAS NOT BEEN NAMED": FOR L = 1 TO 550:
     NEXT L: GOTO 300
340  POKE RK,0: HOME : PRINT "PICTURE NAME:
     "P$: PRINT
345  PRINT "SAVE WITH THIS NAME? ";: GET K$:
      PRINT K$: IF K$ = "Y" THEN 350
346  IF K$ = "N" THEN 300
347  GOTO 340
350  PRINT D$"BSAVE "P$",A$2000,L$1FFF": GOTO
     300
355  POKE RK,0: HOME : PRINT : INPUT "NAME?
     ";P$
356  IF P$ = "" THEN 355
358  HOME : PRINT "PICTURE NAME: "P$: PRINT
360  PRINT "IS THIS NAME CORRECT? ";: GET K$
     : PRINT K$
362  IF K$ = "N" THEN 300
363  IF K$ = "Y" THEN 365
364  GOTO 358
365  PRINT D$"BLOAD "P$
366  GOTO 300
370  POKE RK,0: HOME : PRINT : INPUT "NAME?
     ";P$
371  IF P$ = "" THEN 370
372  HOME : PRINT "PICTURE NAME: "P$: PRINT
375  PRINT "DELETE THIS PICTURE? ";: GET K$:
      PRINT K$
376  IF K$ = "Y" THEN 380
377  IF K$ = "N" THEN 300
378  GOTO 372
380  PRINT D$"DELETE "P$: GOTO 300
385  POKE RK,0: HOME : PRINT "USE NO COMMAS
     OR COLONS IN NEW NAME": PRINT
388  INPUT "CURRENT NAME? ";P1$: IF P1$ = ""
      THEN 385
390  INPUT "NEW NAME? ";P2$: IF P2$ = "" THEN
     385
393  HOME : PRINT "OLD NAME: "P1$: PRINT "NE
     W NAME: "P2$: PRINT
395  PRINT "ARE THESE BOTH CORRECT? ";: GET
     K$: PRINT K$: IF K$ = "N" THEN 385
396  IF K$ = "Y" THEN 400
398  GOTO 393
400  PRINT D$"RENAME "P1$","P2$: GOTO 300
450  POKE RK,0: HOME
452  PRINT "PAINTER MENU NUMBER 2 (ACCESSORY
     )": PRINT
454  PRINT "P)RINT  F)ILL  K)EYBOARD  M)AIN
      >";: GET K$
456  IF K$ = "M" THEN  POKE RK,0: HOME : GOTO
     55
458  IF K$ =  CHR$ (27) THEN  TEXT : POKE RK
     ,0: HOME : END
459  IF K$ = "P" THEN 475
460  IF K$ = "F" THEN 500
461  IF K$ = "K" THEN 465
462  GOTO 450
465  POKE RK,0: HOME : IF K THEN K = 0: GOTO
     468
466  IF  NOT K THEN K = 1
468  IF K = 0 THEN  PRINT : PRINT "KEYBOARD
     IS OFF"
469  IF K = 1 THEN  PRINT : PRINT "KEYBOARD
     IS ON"
470  FOR L = 1 TO 300: NEXT L: GOTO 450
475  POKE RK,0: HOME : PRINT "PICTURE PRINTI
     NG OPTIONS -": PRINT
476  PRINT "I)NVERSED  N)ORMAL
        R)OTATED   C)ONTINUE    >";: GET K$
478  IF K$ = "N" THEN ST = 0: GOTO 475
480  IF K$ = "I" THEN ST = 1: GOTO 475
482  IF K$ = "R" THEN RR = 1: GOTO 475
484  IF K$ = "C" THEN 488
486  GOTO 475
488  POKE RK,0: HOME : PRINT : PRINT "TURN P
     RINTER ON AND PRESS ANY KEY ";: GET K$
490  IF RR AND ST THEN  POKE 1145,88: CALL  -
     16038: GOTO 450
492  IF RR THEN  POKE 1145,120: CALL  - 1603
     8: GOTO 450
494  IF ST THEN  POKE 1400,0: CALL  - 16036:
      GOTO 450
496  CALL  - 16044: GOTO 450
500  POKE RK,0: HOME : INPUT "UPPER LEFT POI
     NT (X,Y)  >";UX$,UY$: IF UX$ = "" OR UY
     $ = "" THEN 500
505  IF ( VAL (UX$) < 0) OR ( VAL (UX$) > 27
     9) THEN 500
506  IF ( VAL (LY$) < 0) OR ( VAL (LY$) > 19
     1) THEN  VTAB  PEEK (37): GOTO 507
507  INPUT "LOWER RIGHT POINT (X,Y)  >";LX$,
     LY$: IF LX$ = "" OR LY$ = "" THEN  VTAB
      PEEK (37): GOTO 507
508  IF ( VAL (LX$) < 0) OR ( VAL (LX$) > 27
     9) THEN  VTAB  PEEK (37): GOTO 507
510  HOME : PRINT : PRINT "PRESS A KEY TO BE
     GIN FILL ";: GET K$: PRINT K$
511  HCOLOR= C
515  FOR L =  VAL (UX$) TO  VAL (LX$): HPLOT
     L, VAL (UY$) TO L, VAL (LY$): NEXT L
520  GOTO 450
1010  POKE RK,0: HOME : PRINT : PRINT "TO BE
     GIN OR STOP DRAWING PUSH RETURN ";: GET
     K$
1012  POKE FG,0: POKE RK,0
1015  IF CS = 0 THEN LL = 1:RL = 279:TL = 0:
     BL = 191
1016  IF CS = 4 THEN LL = 1:RL = 274:TL = 0:
     BL = 186
1017  IF CS = 8 THEN LL = 1:RL = 270:TL = 0:
     BL = 182
1018  HCOLOR= C
1019  FOR L = X TO X + CS: HPLOT L,Y TO L,Y +
     CS: NEXT L
1020  IF  NOT P THEN  HCOLOR= BC: FOR L = X TO
     X + CS: HPLOT L,Y TO L,Y + CS: NEXT L:
     HCOLOR= C
1021  IF  PEEK (KI) < 128 THEN 1019
1023 L =  PEEK (KI)
1024  IF L = 201 THEN Y = Y - 1: GOTO 1036
1025  IF L = 205 THEN Y = Y + 1: GOTO 1036
1026  IF L = 202 THEN X = X - 1: GOTO 1036
1027  IF L = 203 THEN X = X + 1: GOTO 1036
1028  IF L = 213 THEN X = X - 1:Y = Y - 1:
      GOTO 1036
1029  IF L = 206 THEN X = X - 1:Y = Y + 1:
      GOTO 1036
1030  IF L = 207 THEN X = X + 1:Y = Y - 1:
     GOTO 1036
1031  IF L = 172 THEN X = X + 1:Y = Y + 1:
     GOTO 1036
1032  IF (CS = 0) AND (L = 211) THEN XO = X:
     YO = Y: CALL  - 198: GOTO 1036
1033  IF (CS = 0) AND (L = 196) THEN  HPLOT
     X,Y TO XO,YO: GOTO 1036
1034  IF L = 141 THEN  POKE TG,0: GOTO 100
1035  POKE RK,0: GOTO 1021
1036  IF X < LL THEN X = LL
1037  IF X > RL THEN X = RL
1038  IF Y > BL THEN Y = BL
1039  IF Y < TL THEN Y = TL
1040  POKE RK,0: GOTO 1019
1045  HOME : PRINT : PRINT "DISK ERROR CODE
     " PEEK (222): PRINT "CHECK SYNTAX AND T
     RY AGAIN >";: GET K$
1050  POKE RK,0: HOME : GOTO 55
```

Program 2: Shape Table For Picture Labels

```
4000- 58 00 B2 00 C5 00 D8 00
4008- EC 00 02 01 15 01 29 01
4010- 3C 01 4F 01 62 01 75 01
4018- 8A 01 9D 01 B0 01 C3 01
4020- D6 01 E9 01 FE 01 12 02
4028- 26 02 3B 02 50 02 65 02
4030- 79 02 8D 02 A2 02 B6 02
4038- C9 02 DD 02 F1 02 06 03
4040- 19 03 2C 03 41 03 55 03
4048- 69 03 7D 03 91 03 A5 03
4050- B8 03 CC 03 DF 03 F2 03
4058- 06 04 19 04 2C 04 40 04
4060- 54 04 68 04 7C 04 8F 04
4068- A3 04 B6 04 C9 04 DD 04
4070- F1 04 05 05 1A 05 2E 05
4078- 41 05 54 05 67 05 7C 05
4080- 90 05 A3 05 B7 05 CC 05
4088- E0 05 F4 05 08 06 1C 06
4090- 30 06 43 06 57 06 6B 06
4098- 7F 06 94 06 A8 06 BC 06
40A0- D0 06 E4 06 F8 06 0D 07
40A8- 21 07 36 07 4B 07 5F 07
40B0- 74 07 49 09 1A 1B 1B 4A
40B8- 49 1A 1B 1B 4A 49 1A 1B
40C0- 1B 4A 49 02 00 09 4D 1A
40C8- 1B 1F 4A 4D 1A 1B 1F 4A
40D0- 4D 1A 1B 1B 4A 4D 02 00
40D8- 69 0D 1A 3B 3B 0A 0D 0D
40E0- 1A 1B 1B 4A 49 1A 1B 1B
40E8- 4A 49 02 00 69 0D 1A 3B
40F0- 3B 2A 2D 2D 1A 3B 3B 2A
40F8- 2D 2D 1A 3B 3B 0A 0D 0D
4100- 02 00 09 4D 1A 3F 3F 6A
4108- 4D 1A 3B 3F 4A 0D 15 1B
4110- 3F 77 69 11 00 6D 09 1A
4118- 1F 3B 4E 69 1A 1B 1F 0A
4120- 4D 11 3B 1F 73 09 2D 02
4128- 00 69 09 1A 1B 1F 6E 4D
4130- 1A 1B 3B 6A 0D 15 1B 1F
4138- 73 6D 15 00 49 0D 1A 1B
4140- 1F 0A 4D 11 1B 1B 53 49
4148- 11 1B 1B 53 49 11 00 09
4150- 4D 1A 1B 3B 6A 49 1A 1B
4158- 1B 6E 49 1A 1B 3B 4A 4D
4160- 02 00 09 4D 1A 3B 1B 4A
4168- 09 15 3B 1B 53 49 15 1B
4170- 1F 53 69 11 00 09 4D 1A
4178- 1F 1F 0E 2D 0D 1A 3F 3F
4180- 0E 2D 0D 1A 1F 1F 4E 4D
4188- 02 00 49 09 1A 1B 1F 4A
4190- 4D 1A 3F 3F 4E 4D 1A 1B
4198- 1F 4A 49 02 00 49 09 1A
41A0- 1B 1B 4A 49 1A 1B 1B 4A
41A8- 6D 1A 3B 1F 0A 6D 11 00
41B0- 49 09 1A 1B 1B 4A 49 1A
41B8- 3F 3F 4E 49 1A 1B 1B 4A
41C0- 49 02 00 49 09 1A 1B 1B
41C8- 4A 49 1A 1B 1B 4A 49 1A
41D0- 1B 3F 0A 6D 11 00 49 09
41D8- 1A 1F 1B 4A 69 1A 1B 1F
41E0- 0A 4D 11 1B 1B 73 49 11
41E8- 00 29 6D 1A 1F 1B 6E 29
41F0- 15 3B 3B 33 6D 29 1A 1F
41F8- 1B 0E 2D 0D 02 00 09 4D
4200- 1A 1B 3F 4A 4D 1A 1B 1F
4208- 4A 4D 1A 1B 1F 0A 2D 0D
4210- 02 00 29 6D 1A 1F 1B 4E
4218- 09 15 1B 3F 53 4D 11 1B
4220- 1B 33 2D 2D 15 00 2D 2D
4228- 15 3B 1B 53 09 0D 1A 3B
4230- 1F 4A 09 15 3B 1B 73 2D
4238- 0D 02 00 49 0D 1A 3B 1F
4240- 0A 0D 0D 1A 3B 1B 2E 2D
4248- 2D 1A 3B 1B 4A 69 02 00
4250- 2D 2D 15 1B 1B 33 2D 6D
4258- 1A 1F 1B 4A 09 15 3B 1B
4260- 73 2D 0D 02 00 29 6D 1A
4268- 1F 1B 6E 49 1A 3B 3F 6E
4270- 09 15 3B 1B 73 2D 0D 02
4278- 00 2D 2D 15 3B 1B 53 09
4280- 0D 1A 1B 1F 0A 4D 11 1B
4288- 1B 57 4D 11 00 29 6D 1A
4290- 1F 1B 6E 09 15 1B 3F 17
4298- 4D 29 1A 1F 1B 0E 2D 0D
42A0- 02 00 29 6D 1A 1F 1B 6E
42A8- 09 15 3B 3F 57 49 15 3B
42B0- 1B 73 2D 0D 02 00 49 09
42B8- 1A 1B 3F 0A 6D 11 1B 1B
42C0- 53 6D 11 1B 3B 57 49 11
42C8- 00 49 09 1A 1B 3F 0A 6D
42D0- 11 1B 1B 53 6D 11 1B 3B
42D8- 17 6D 09 02 00 49 2D 1A
42E0- 3B 1F 0A 6D 11 1B 1B 77
42E8- 6D 11 1B 3F 53 09 2D 02
42F0- 00 49 09 1A 1B 1B 0A 2D
42F8- 0D 1A 1B 1B 0A 2D 0D 1A
4300- 1B 1B 4A 49 02 00 6D 09
4308- 1A 1B 3F 4A 6D 1A 3F 1B
4310- 4A 6D 1A 1B 3F 2A 4D 11
4318- 00 29 6D 1A 1F 1B 4E 09
4320- 15 1B 3F 53 4D 11 1B 1B
4328- 53 4D 11 00 29 6D 1A 1F
4330- 1B 6E 0D 15 3B 3F 33 0D
4338- 0D 15 1B 1B 73 2D 2D 02
4340- 00 49 09 1A 3B 3F 4A 09
4348- 15 3B 3F 17 4D 29 1A 3F
4350- 3F 4A 49 02 00 4D 09 1A
4358- 3B 1F 2E 4D 15 3B 1B 33
4360- 6D 29 1A 3B 1F 4E 49 02
4368- 00 49 09 1A 3B 3F 6A 09
4370- 15 1B 1B 33 4D 29 1A 3B
4378- 3F 4A 49 02 00 49 29 1A
4380- 1F 3F 6A 29 15 3B 1B 33
4388- 4D 2D 1A 1F 3F 4A 49 02
4390- 00 49 09 1A 3B 3F 6A 09
4398- 15 3B 3F 37 4D 09 1A 3B
43A0- 3F 4A 49 02 00 09 6D 1A
43A8- 1F 3B 0A 4D 11 1B 3B 77
43B0- 4D 11 1B 1B 57 49 11 00
43B8- 49 09 1A 1F 3F 6A 29 15
43C0- 3B 1F 73 6D 15 3B 1B 53
43C8- 2D 0D 02 00 4D 09 1A 1B
43D0- 1B 6E 6D 1A 1F 3B 6E 09
43D8- 15 3B 1B 73 49 11 00 09
43E0- 4D 1A 1B 1B 0A 6D 11 1B
43E8- 3B 53 69 11 1B 3F 57 49
43F0- 11 00 49 29 1A 1B 1B 4A
43F8- 29 15 3B 1B 53 49 15 3B
4400- 1B 73 2D 0D 02 00 4D 09
4408- 1A 3B 1B 6E 4D 1A 1B 3B
4410- 6E 4D 1A 3B 1B 4E 49 02
4418- 00 29 4D 1A 1B 1F 4A 4D
4420- 1A 1B 1F 4A 4D 1A 3B 3F
4428- 4A 49 02 00 49 09 1A 3B
4430- 3B 6A 0D 15 3B 3B 33 0D
4438- 0D 15 3B 3B 73 49 11 00
4440- 49 09 1A 3B 1F 2E 4D 15
4448- 3B 1B 33 4D 29 1A 1F 1B
4450- 4E 49 02 00 49 09 1A 3B
4458- 3F 6A 09 15 3B 1B 33 4D
4460- 29 1A 3B 3F 4A 49 02 00
4468- 49 09 1A 3B 1F 2E 4D 15
4470- 3B 1B 37 0D 6D 1A 1B 1B
4478- 6E 49 02 00 49 09 1A 1F
4480- 3F 6A 29 15 3B 1F 73 6D
4488- 15 3B 1B 53 49 15 00 49
4490- 09 1A 3B 1F 2E 4D 15 1B
4498- 1B 33 4D 09 1A 1B 1B 4E
44A0- 49 02 00 49 09 1A 3F 3F
44A8- 6A 49 1A 3B 3F 4A 09 15
44B0- 1B 3F 77 49 11 00 69 09
44B8- 1A 1B 3F 0E 4D 11 1B 1B
44C0- 57 4D 15 1B 3F 53 49 11
44C8- 00 49 09 1A 1F 1B 6E 09
44D0- 15 3B 1B 33 4D 2D 1A 1F
44D8- 3F 4A 49 02 00 49 09 1A
44E0- 1F 1B 6E 09 15 1B 1F 57
44E8- 0D 0D 1A 1B 1F 4A 49 02
44F0- 00 49 09 1A 1F 1F 6E 0D
44F8- 15 3B 3B 33 0D 0D 15 1B
4500- 1F 57 49 11 00 49 09 1A
4508- 1F 1B 0E 0D 0D 1A 1B 1F
4510- 0A 0D 0D 1A 1F 1B 4E 49
4518- 02 00 49 09 1A 1F 1B 6E
4520- 09 15 3B 1F 73 6D 15 3B
4528- 1B 53 2D 0D 02 00 49 09
4530- 1A 3F 3F 4E 69 1A 1B 1F
4538- 0A 4D 11 3B 3F 77 49 11
4540- 00 29 4D 1A 3B 1B 4A 69
4548- 1A 1F 1B 4A 69 1A 3B 1B
4550- 0A 6D 11 00 09 4D 1A 3B
4558- 3B 6A 09 15 1B 1B 53 49
4560- 11 1B 1B 53 49 11 00 09
4568- 4D 1A 3B 3B 6A 09 15 3B
4570- 1B 33 2D 2D 15 3B 1B 33
4578- 4D 29 02 00 2D 6D 1A 1F
4580- 3B 0A 4D 15 1B 3F 57 4D
4588- 15 3B 1B 17 2D 6D 02 00
4590- 09 6D 1A 1F 3B 6A 49 1A
4598- 1B 1B 6E 49 1A 1F 3B 4A
45A0- 6D 02 00 2D 6D 1A 1F 3B
45A8- 0A 4D 15 3B 1B 57 4D 15
45B0- 3B 1B 17 2D 6D 02 00 2D
45B8- 2D 15 3B 1B 33 4D 09 1A
45C0- 1B 3F 6E 49 1A 1F 1B 2E
45C8- 2D 2D 02 00 2D 2D 15 3B
45D0- 1B 33 4D 09 1A 1B 3F 6E
45D8- 49 1A 1B 1B 6E 49 02 00
45E0- 29 6D 1A 1F 1B 6E 49 1A
45E8- 3F 1F 6E 09 15 3B 1B 73
45F0- 2D 0D 02 00 4D 29 1A 1F
45F8- 1B 6E 09 15 3B 3F 37 4D
4600- 29 1A 1F 1B 6E 09 15 00
4608- 29 6D 1A 1B 1F 4A 4D 1A
4610- 1B 1F 4A 4D 1A 1B 1F 0A
4618- 2D 0D 02 00 09 2D 15 1B
4620- 1F 53 09 0D 1A 3B 1B 4A
4628- 69 1A 3B 1B 0E 6D 11 00
4630- 4D 29 1A 3B 1B 6E 4D 1A
4638- 1B 3B 6E 4D 1A 3B 1B 6E
4640- 09 15 00 6D 09 1A 1B 3B
4648- 0A 4D 11 1B 1B 57 4D 11
4650- 3B 1B 17 2D 2D 15 00 4D
4658- 29 1A 3F 3B 6E 0D 15 3B
4660- 1B 33 4D 29 1A 1F 1B 6E
4668- 09 15 00 4D 29 1A 1F 1B
4670- 2E 4D 15 3B 3B 33 4D 2D
4678- 1A 1F 1B 6E 09 15 00 29
4680- 6D 1A 1F 1B 6E 09 15 3B
4688- 1B 33 4D 29 1A 1F 1B 0E
4690- 2D 0D 02 00 2D 6D 1A 1F
4698- 3B 0A 4D 15 1B 3F 57 4D
46A0- 11 1B 1B 17 6D 09 02 00
46A8- 29 6D 1A 1F 1B 6E 09 15
46B0- 3B 1B 33 0D 0D 15 1B 1F
46B8- 73 6D 15 00 2D 6D 1A 1F
46C0- 3B 0A 4D 15 1B 3F 57 0D
46C8- 0D 1A 1F 3B 2A 4D 15 00
46D0- 29 6D 1A 1F 1B 6E 49 1A
46D8- 3B 3F 4A 09 15 3B 1B 73
46E0- 2D 0D 02 00 2D 2D 15 3B
46E8- 3B 73 69 11 1B 3B 53 69
46F0- 11 1B 3B 53 2D 0D 02 00
46F8- 4D 29 1A 1F 1B 6E 09 15
4700- 3B 1B 33 4D 29 1A 1F 1B
4708- 0E 2D 0D 02 00 4D 29 1A
4710- 1F 1B 6E 09 15 3B 1B 33
4718- 4D 29 1A 3B 3B 4A 4D 02
4720- 00 4D 29 1A 1F 1B 6E 09
4728- 15 3B 1B 33 0D 0D 15 3B
4730- 1F 37 4D 29 02 00 4D 29
4738- 1A 1F 1B 0E 0D 0D 1A 1B
4740- 1F 0A 0D 0D 1A 1F 1B 6E
4748- 09 15 00 4D 29 1A 1F 1B
4750- 0E 0D 0D 1A 1B 1F 4A 4D
4758- 1A 1B 1F 4A 4D 02 00 2D
4760- 2D 15 3B 1B 73 09 0D 1A
4768- 1B 1F 0A 4D 11 3B 1B 33
4770- 2D 2D 15 00 2D 2D 15 3B
4778- 3F 37 2D 2D 15 3B 3F 37
4780- 2D 2D 15 3B 3F 37 2D 2D
4788- 15 00 00
```

©

the SOFTWARE connection

DISKETTE SPECIAL

FREE PLASTIC LIBRARY CASE WITH PURCHASE OF EVERY BOX OF 10

$24.95

Personally labeled for THE SOFTWARE CONNECTION by one of the most respected producers of magnetic media. Each diskette is single-sided and certified double density at 40 tracks. To insure extended media life, each diskette is manufactured with a reinforced hub-hole.

10 Boxes or more: $22.50/box

ATARI®

	Retail	Our Price
K-RAZY SHOOTOUT (Rom)	$49.95	**$35.00**
PAC MAN (Rom)	$44.95	**$32.00**
MINER 2049er (Rom)	$49.95	**$35.00**
GORF (Rom)	$44.95	**$32.00**
DROIDS (Rom)	$44.95	**$32.00**
NIGHT STRIKE (Rom)	$44.95	**$32.00**
LUNAR LANDER D/C 24K	$20.95	**$15.95**
STAR TREK 3.5 C 32K	$19.95	**$14.95**
SUNDAY GOLF C 16K	$14.95	**$11.95**
CHICKEN D/C 16K	$34.95	**$26.95**
TEMPLE OF APSHAI D/C 32K	$39.95	**$29.95**
UPPER REACHES C 32K	$19.95	**$14.95**
CHRUSH, CRUMBLE & CHOMP D/C 32K	$29.95	**$23.95**
ZAXXON D/C	$39.95	**$29.95**
CANYON CLIMBER D/C 16K	$29.95	**$23.95**
POOL 1.5 D 48K	$34.95	**$26.95**
ALI BABA D 32K	$32.95	**$24.95**
JAW BREAKER D/C 16K	$29.95	**$23.95**
MOUSKATTACK D 32K	$34.95	**$26.95**
APPLE PANIC D/C	$29.95	**$19.95**
SEA FOX D 48K	$29.95	**$19.95**
BUG ATTACK D/C 24K	$29.95	**$20.95**
TEXT WIZARD D 32K	$99.95	**$69.95**
SPELL WIZARD D 48K	$79.95	**$59.95**
COMPU-READ D 48K	$29.95	**$20.95**
COMPU-MATH D 48K	$39.95	**$29.95**
LETTER PERFECT D 24K	$149.95	**$115.00**
QS FORTH D 48K	$79.95	**$59.95**
VISICALC D 32K	$250.00	**$185.00**

VIC 20

	Retail	Our Price
SHAMUS (Rom)	$39.95	**$31.95**
PROTECTOR (Rom)	$43.95	**$35.95**
CROSSFIRE (Cass.)	$29.95	**$23.95**
CHOPLIFTER (Rom)	$39.95	**$31.95**
ASTROBLITZ (Rom)	$39.95	**$31.95**
VIDEOMANIA (Rom)	$39.95	**$31.95**
TRASHMAN (Rom)	$39.95	**$31.95**
APPLE PANIC (Rom)	$39.95	**$31.95**
INVASION ORION (Cass)	$24.95	**$19.95**
DATESTONES OF RYN (Cass)	$19.95	**$15.95**
SWORD OF FARGOAL (Cass)	$29.95	**$23.95**
MONSTER MAZE (Rom)	$39.95	**$31.95**
PLATTERMANIA (Rom)	$39.95	**$31.95**
VI CALC (Cass)	$14.95	**$11.95**
HOME OFFICE	$29.95	**$23.95**
VIC FORTH (Rom)	$59.95	**$47.95**

COMMODORE 64

DRAW POKER (Cass)	$16.00	**$12.80**
COMPUTER FOOTBALL STRATEGY (Cass)	$16.00	**$12.80**
PLANET MINERS (Cass)	$16.00	**$12.80**
COMPUTER STOCKS & BONDS (Cass)	$20.00	**$16.00**
TEMPLE OF APSHAI (Disk)	$39.95	**$31.95**
UPPER REACHES (Disk)	$19.95	**$15.95**
CURSE OF RA (disk)	$19.95	**$15.95**
SWORD OF FARGOAL (Disk)	$29.95	**$23.95**
JUMP MAN (Disk)	$39.95	**$31.95**
ZORK (Disk)	$39.95	**$31.95**
DEADLINE (Disk)	$39.95	**$31.95**
TURTLE GRAPHICS II (Rom)	$59.95	**$47.95**

CALL TOLL FREE 1-800-828-2838

(For Placing Orders Outside California)

For Inside California and Other Inquiries Call 1-916-989-3174

MAIL ORDERS: For fast delivery, send certified check, money orders, or Visa or Mastercard number and expiration date, for total purchase price plus 1% or $2 minimum for postage and handling. Add $5 for shipment outside the continental U.S. California Residents add 6% sales tax.

COD: and Chargecard orders call **1-800-828-2838.**
In California call **1-916-989-3174.**
Subject to stock on hand. Prices subject to change.

Catalog free with any order or send $2 postage and handling and please specify computer type.

the SOFTWARE connection
5133 Vista Del Oro Way Fair Oaks, CA 95628

NEWS&PRODUCTS

Games For TRS-80 Computers

The Cornsoft Group has introduced four recreational software items for TRS-80 computers – *Crazy Painter*, *Bounceoids*, *Avenger*, and *MicroChord*. *Crazy Painter*, *Bounceoids*, and *Avenger* are joystick-compatible arcade games. *MicroChord* is a music generation program.

Crazy Painter requires the player to paint the screen completely before moving on to the next skill level. This is complicated by a mischievous puppy, snakes, and "paint eaters" – all remove parts of the paint at different times. The player must catch the puppy while avoiding the poisonous turpentine bucket and the dreadful snake. *Crazy Painter* is available for the TRS-80 Models I and III.

Bounceoids come crashing in from space, attracting alien natives with poison darts, offworld snakes, and shaking bugs. Players must blast the bounceoids and eliminate all the other hazards to advance. During the challenge mode, the flying space flock adds suspense and excitement in a test of strategy, coordination, and targeting skills. *Bounceoids* is available for the TRS-80 Models I and III.

In *Avenger*, your Pesticraft zeros in on the invasion of space pests. Take too long to clear the pests, and the mighty Avenger appears and attempts to destroy you. Droid-filled birds and waves of space pests combine for hours of tense aerial challenges. *Avenger* is available only for the TRS-80 Color Computer.

MicroChord facilitates the creation of original music or favorite tunes. This single program, in machine language,

COMPU SENSE

CARDBOARD 3
An Economy Expansion Interface
(Motherboard)
For the VIC-20® Personal Computer

The "CARDBOARD/3" is an expansion interface designed to allow the user to access more than one of the plug-in-type memory or utility cartridges now available. It will accept up to 3 RAM or ROM cartridges at once. For example:

- 16k RAM + 16k RAM + 3k RAM
- 16k RAM + 8k RAM + Super Expander
- 16k RAM + 8k RAM + Vic-Mon
- 16k RAM + 3k RAM + Programmer's Aid
- High quality T.R.W. gold plated connectors
- This board is fused
- 90 day free replacement warranty covering everything except the fuse

$39.95

CARDBOARD 6
An Expansion Interface for VIC-20®

- Allows memory expansion up to 40K
- Accepts up to six games
- Includes a system reset button
- All slots are switch selectable
- Daisy chain several units for even more versatility

$87.95

TO ORDER:
P. O. BOX 18765
WICHITA, KS 67218
(316) 263-1095

VISA
MasterCard

Personal checks accepted
(Allow 3 weeks) or
C.O.D. (Add $2)
Handling charge $2.00
VIC-20® is a registered trademark of Commodore

PUT SOME MUSCLE IN YOUR
VIC 20

16K RAM EXPANSION
$69.90

8K RAM EXPANSION
$47.70

- •DIRECT FROM MANUFACTURER
- •HIGHEST QUALITY
- •LOWEST PRICE
- •90 DAY WARRANTY

CENTURY© MICRO
7881 La Riviera Dr. Suite 131
Sacramento, CA 95826

Add $2 for shipping & handling
(California Residents add 6% sales tax)
DEALER INQUIRES WELCOME

COMPUTER CASSETTES
100% Error-Free • Fully Guaranteed

LENGTH	12 PACK	24 PACK
C-05	79¢	69¢
C-10	89¢	79¢
C-20	99¢	89¢
Boxes	26¢	21¢

UPS $3.00 Pkg. $18.00 Case

C-10's 39¢
(Min. 500 Case Lot)
w/labels ADD 4¢,
w/boxes ADD 13¢

FOR ORDERS ONLY
1-800-528-6050
Extension 3005

master charge
VISA

MICRO-80™ INC.
2665-C Busby Road
Oak Harbor, WA 98277

www.commodore.ca

produces excellent two-note harmonics, with the aid of the easy-to-use music editor. *Micro-Chord* is available for the TRS-80 Models I and III.

The Cornsoft Group
6008 N. Keystone Avenue
Indianapolis, IN 46220
(219)257-3227

Memory Module For The VIC

Apropos Technology has released Ramax, a memory module with 27K bytes of static RAM and two expansion connectors for the VIC-20.

Features include:

– compatibility with any plug-in device for the VIC-20
– completely switchable memory in 3K and 8K sections
– a system reset switch
– fuse protection for the memory and extension connectors
– very low power usage (less than 150 ma. max.)
– fully self-contained
– six-month factory warranty.

The cost is $169, shipping included.

Apropos Technology
340 N. Lantana, Suite 821-C
Camarillo, CA 93010
(805)482-3604

Voice Box II For Atari

The Alien Group announces the *Voice Box II*, a programmable speech synthesizer for Atari 400/800 computers. The *Voice Box II* requires a 32K disk system, and has the following features:

- The ability to speak with inflection.
- The ability to speak in foreign languages with correct foreign spelling as input.
- The ability to sing with voice and three-part music.
- A library of 30 famous songs.
- A music system that allows the user to enter new songs.
- Software that can convert the bottom two rows of the Atari keyboard into a piano with a range of 3½ octaves using the shift and control keys.
- Programmable musical sound effects such as tremolo, vibrato, and glissando.
- A singing *human* face with lip-sync animation designed by Jerry White.
- A talking or singing *Alien* face with software that allows the user to change the face as he sees fit.
- A talk and spell program by Ron Kramer. Users can program any vocabulary for this spelling game. The program can speak in a foreign language, and the user must spell the correct word in English, or vice versa.

Olympic Sales Company
SERVING YOU
SINCE 1947

Telex: 67 34 77 Toll-Free Phone Orders:
Toll-free *(in CA)* 800-252-2153 800-421-8045 (out of CA)
Order Desks open 6 days a week! 7:00 AM to 6:00 PM Mon-Sat
P.O. Box 74545 216 So. Oxford Ave. Los Angeles, CA 90004
Phone: (213) 739-1130 Cable: "OLYRAV" LSA

VISA
We carry close to $5,000,000 inventory at all times. Corp. accts. invited.
Good subject to availability; this ad supercedes all previous ads; fob our warehouse; prices subject to change without notice; not responsible for typographical errors; all orders subject to verification; minimum shpg & hndlg $5.95. Send $2 (or $5 foreign) for our famous catalog.

COMMODORE 64
More features than the IBM, Tandy TRS-80® and Apple II at one-third the price! $595.00 including RF Modulator.
TWICE THE COMPUTER
FOR HALF THE PRICE!
64K=$495 NOW IN STOCK!
free RF modulator. Full color graphics, upper/lower case, music & voice synthesizer more.
Free with purchase of one 64 at $495.00 you get one 12" Green Monitor or one Datasette or $100 off on 1541 Disk Drive

COLECOVISION
including FREE Donkey Kong Cartridge. $179.95
Opt'l expansion module for using Atari software- $79.95

FRANKLIN ACE 1000
Look what you get for $1399.95!
64K Apple compatible with more features than Apple 2+—comes with disk drive/controller, 12" green monitor, & word processor software.

ATARI® 800™
800-48K computer
$499.95
NOW IN STOCK

410 prog. recorder	$ 77.95
810 disk drive	449.95
850 interface module	189.95

ATARI 400™ $197.95

commodore
VIC-20 $149.95
5K Personal Computer (Expands to 32K)

1541	Disk Drive	$379.95	*These peripherals*
1530	Datasette	69.95	*work with the*
1525E	Printer	339.95	*VIC-20 as well as*
1600	VicModem	99.95	*Commodore 64.*

Immediate delivery on all items listed above!
We have an enormous amount of software for the VIC-20.

THE HOTTEST COMPUTER PRINTER ON THE MARKET!
These are the very best in dot matrix printers, similar to Epson but faster, with more features at lower prices including 180 days warranty instead of 90 days. Compatible with Epson cables and interfaces. Immediate Delivery
- 10" carriage • 2.3K buffer
- 100 CPS Bi-directional logic seeking
- 9 x 9 dot matrix - friction & tractor
- Proportional space font
- Bit image graphics
- Epson pin & plug compatible
- 80-96-132 columns

Your Cost:$379.95
- 15" carriage
- 136-163-233 columns

Your Cost:$499.95
- Call us for information.

HEWLETT PACKARD
Personal Computer
HP-75C
(handheld)
Re:$995.00
Y/C: $799.95

Panasonic Cordless Phone $179.95

ATARI® Video Game 2600 NOW ONLY $94.95

SANYO 15" B & W Monitor
Re:$325.00 Y/C:$179.95

BMC 12" Green Monitor $99.95

Commodore 12" Color Monitor
Y/C:$299.95

Pearlcorder™ X-01
PEARLCORDER by Olympus Model X-01 – 2 speed, LCD tape counter, memory, clock; comp. w/earphone, case, batt. & more! Sugg. Retail:$269.95
Your LOW Cost:$99.95

ATARI 1200XL Re:
64K Computer $995.00
Y/C:$699.95

SONY CORDLESS TELEPHONE
Model SPP-11 Innercom, auto. redial, rechargeable & more. High quality unique Sony design. Y/C:$159.95 Sugg. Re: $299.95

Texas Instruments Home Computer
TI-99/4A 16K
$169.95 *
*your NET cost after $100 rebate from TI!
ask about FREE Speech Synthisizer OFFER!
Plus FREE $50 RF Modulator with purch of TI-99/4A

1200 Peripheral Expansion Box	219.95
1220 RS-232 Card	149.95
1240 Disk Controller Card	199.95
1250 Expan. Sys. Disk Drive	319.95
1260 Memory Exp. Card (32K)	239.95
1270 P-Code Card (req. 1600)	199.95
1600 Telephone modem	179.95
4100 Monitor	339.95
Extended Basic 79.95 LOGO	99.95
TI-59 Programmable Calculator	169.95

PLUS free Library valued at $45.00
PC-100C Printer/plotter 159.95

COMING THIS SPRING FROM TI—
TI-CC40 Computer—typewriter style keyboard, 6K RAM expandable to 22K, portable. Can use TI-59 software!
Re:$269.95 Y/C:$199.95

TI-99/2 Computer w/16 bit processor, 4.2K RAM expandable to 32K, screen display 28 x 24, typewriter style keyboard, Basic language & more!
Re:$99.95 Y/C:$89.95

TIMEX TS-1000
Timex TS 1000 Computer pay us $74.95 & get a $15.00 rebate from Timex! $59.95
FREE RF modulator (for TV hook-up)

16K RAM Expansion	$45.95
Timex Thermal printer/graphics	94.95
Craig cassette (program) recorder	59.95

TIMEX Software (75 programs for you!)

Stock Option Analyser	16.95
IRA Planner	15.95
Real Estate Investment Analysis	14.95
Personal Finance Planner	12.95
Portfolio Analysis	14.95
Budgeter	15.95
Organizer	16.95
Checkbook Manager	15.95

and more and more . . . Call us!

www.commodore.ca

Products for Commodore, Atari, Apple, and others!

NEW

THE MONKEY WRENCH II

A PROGRAMMERS AID FOR ATARI 800

NEW AND IMPROVED — 18 COMMANDS
PLUGS INTO RIGHT CARTRIDGE SLOT

$59.95

If you are a person who likes to monkey around with the ATARI 800, then THE MONKEY WRENCH II is for you!! Make your programming tasks easier, less time-consuming and more fun. Why spend extra hours working on a BASIC program when the MONKEY WRENCH can do it for you in seconds. It can also make backup copies of boot type cassette programs. Plugs into the right slot and works with ATARI BASIC cartridge.

The MONKEY WRENCH provides 18 direct mode commands. They are: AUTO LINE NUMBERING — Provides new line numbers when entering BASIC program lines. RENUMBER — Renumbers BASIC's line numbers including internal references. DELETE LINE NUMBERS — Removes a range BASIC line numbers.

VARIABLES — Display all BASIC variables and their current value. Scrolling — Use the START & SELECT keys to display BASIC lines automatically. Scroll up or down BASIC program. FIND STRING — Find every occurrence of a string, XCHANGE STRING — Find every occurrence of a string and replace it with another string. MOVE LINES — Move lines from one part of program to another part of program. COPY LINES — Copy lines from one part of program to another part of program. FORMATTED LIST — Print BASIC program in special line format and automatic page numbering. DISK DIRECTORY — Display Disk Directory. CHANGE MARGINS — Provides the capability to easily change the screen margins. MEMORY TEST — Provides the capability to test RAM memory. CURSOR EXCHANGE — Allows usage of the cursor keys without holding down the CTRL key. UPPER CASE LOCK — Keeps the computer in the upper case character set. HEX CONVERSION — Converts a hexadecimal number to a decimal number. DECIMAL CONVERSION — Converts a decimal number to a hexadecimal number. MONITOR — Enter the machine language monitor.

In addition to the BASIC commands, the Monkey Wrench also contains a machine language monitor with 16 commands used to interact with the powerful features of the 6502 microprocessor.

NEW

VIC RABBIT CARTRIDGE AND CBM 64 RABBIT CARTRIDGE

"High-Speed Cassette Load and Save!"

Expansion Connector on the VIC Cartridge

$39.95
(includes Cartridge and Manual)

"Don't waste your Life away waiting to LOAD and SAVE programs on Cassete Deck."

Load or Save 8K in approximately 30 seconds! Try it — your Un-Rabbitized VIC takes almost 3 minutes. It's not only Fast but VERY RELIABLE.

Almost as fast as VIC Disk Drive! Don't be foolish — Why buy the disk when you can get the VIC Rabbit for much, much less!

Easy to install — it just plugs in.
Expansion Connector on rear.
Works with or without Expansion Memory.
Works with VIC Cassette Deck.
12 Commands provide other neat features.
Also Available for 2001, 4001, and 8032

Now for the "64"

STCP — 300/1200 Baud

Standard Terminal Communications Package

·PFO· IOD OOA CP<D1>D2 BELL = 12:30:00 10:14:36

Don't settle for non-standard Communications Protocol! Access Micro Net, Source, Bulletin Boards, Local Mainframe, etc.

- Complete Package — Includes RS232 Interface Board and software (does not include modem)
- Communicates in Industry Standard ASCII
- Upload/Download to/from Disk
- Automatic File Translation
- Can be controlled from keyboard or user supplied basic or machine language program

Specify 3.0 or 4.0 ROMS or 8032 Commodore Computer 4040 or 8050 or PEDISK II Disk or CBM64 on 1541.

Price: $129.95

ATARI AND PET EPROM PROGRAMMER

Programs 2716 and 2532 EPROMs. Includes hardware and software. PET = $75.00 – ATARI (includes sophisticated machine language monitor) = $119.95

PET BASIC SCROLL PROGRAM

Scroll thru Basic Programs using cursor up/down keys. Specify computer. $6.00 on cassette, $9.00 on diskette.

65C02 MAE

Same as our MAE but enhanced for the new 65C02 Opcodes. Turns your computer into a development system for the new ROCKWELL 65C02 Microprocessor. $200.00 — Specify Computer.

6800 CROSS ASSEMBLER

A Cross Assembler based on the MAE that runs on the PET, Apple, or Atari but assembles opcodes for the Motorola 6800 microprocessor. Turns your computer into a development system for the Motorola 6800 Microprocessor. $200.00 — Specify Computer.

ATARI and VIC Cartridges

EHS can supply large quantities of ATARI and VIC Cartridges for software developers. If you need cartridges, call for pricing.

More than just an Assembler/Editor!

Now for the "64"

It's a Professionally Designed Software Development System

MAE

for
PET
APPLE
ATARI
~~$169.95~~
New
Price
$99.95

Blast off with the software used on the space shuttle project!

- Designed to improve Programmer Productivity.
- Similar syntax and commands — No need to relearn peculiar syntaxes and commands when you go from PET to APPLE to ATARI.
- Coresident Assembler/Editor — No need to load the Editor then the Assembler then the Editor, etc.
- Also includes Word Processor, Relocating Loader, and much more.
- Options: EPROM Programmer, unimplemented opcode circuitry.
- STILL NOT CONVINCED: Send for free spec sheet!

TRAP 65

TRAP 65 is a hardware device that plugs into your 6502's socket. Prevents execution of unimplemented opcodes and provides capability to extend the machines' instruction set.
For PET/APPLE/SYM.
Reduced from $149.95 to $69.95

5¼ INCH SOFT SECTORED DISKETTES

Highest quality. We use them on our PETs, APPLEs, ATARIs, and other computers. $22.50/10 or $44.50/20

Prowriter Printer - Excellent dot matrix print. Parallel = $489.00
Serial = $600.00 IEEE = $589.00

DC Hayes Smart Modem = $235.00
DC Hayes Micro Modem II = $289.00

Rana Disk Drive - 375
4 Drive Controller - 114

EPROMS 2716 = $4.50 2532 = $7.50
Over 40 Commodore Programs by Baker (on 4040) = $25.00

Eastern House

3239 Linda Dr.
Winston-Salem, N.C. 27106
(919) 924-2889 (919) 748-8446
Send for free catalog!

VISA
MasterCard

- The screen *never blanks out* while talking or singing.
- Singing or speaking subroutines can be incorporated into your programs, requiring as little as 100 bytes of RAM plus 5 bytes for each word.
- Sound comes out of the TV – no extra components are required. Expander module is not needed.
- Entries into the $5000 talking or singing game contest can be written using the *Voice Box II* – contest information is enclosed.

The Alien Group's Voice Box II.

The Alien Group
27 West 23rd Street
New York, NY 10010
(212)741-1770

Road Atlas For The Apple

Columbia Software has introduced a computerized road atlas for the Apple II personal computer. Called *Roadsearch,* the program simplifies the process of determining driving routes, mileages, travel times, and fuel usage.

Roadsearch develops different types of routes. One program finds the shortest practical route between cities in its data base. This program can also avoid toll or other roads. Another program develops routes which may be longer but more suitable to a user's specific needs. *Roadsearch* also contains a subroutine that estimates flying time between cities.

The atlas has a data base of 406 cities and road intersections located in the USA and Canada. Also included in the data base are about 69,000 miles of interstate and major through highways. This data base can be modified with updated road mileages.

The printed outputs are an excellent companion on any trip. They include the driving route, distances, travel times, and fuel usage tailored to vehicle average miles per gallon (mpg).

Roadsearch requires an Apple II personal computer with DOS 3.3. The price is $34.95.

Columbia Software
P.O. Box 2235
Columbia, MD 21045
(301)997-3100

THE PEOPLE'S COMPUTER SUPPLY

MAKE YOUR TIMEX/SINCLAIR ZX80/81 DO EVERYTHING FROM PLAYING GAMES TO SERIOUS BUSINESS APPLICATIONS WITH HARDWARE & SOFTWARE FROM THE PEOPLE'S COMPUTER SUPPLY.

MEMOTECH PRODUCTS	OUR PRICE
# 1 64K MEMOPAK.	$ 144.95
# 2 32K MEMOPAK.	95.95
# 3 16K MEMOPAK	54.95
# 4 NEW 16K BASELINE MEMOPAK	45.95
# 5 HIGH RES GRAPHICS	95.95
# 6 PARALLEL PRINTER INTERFACE	74.95
# 7 RS232 INTERFACE FOR PRINTER & MODEM	95.95
# 8 PRINTER CABLE SPECIFY RS232 OR CPI	19.95
# 9 NEW DIRECT CONNECT FULLSIZE KEYBOARD	99.95

No soldering, plugs into edge connector

#10 SEIKOSHA GP100A DOT MATRIX PRINTER	325.00	399.95*
SEIKOSHA GP250X DOT MATRIX PRINTER	369.95	449.95*

*Parallel Printer Package Includes Cable & CPI Interface

OTHER PRODUCTS

#1 ZON X-81 SOUND GENERATOR	$49.95
#2 HIGH QUALITY 9" GREEN PHOSPHOR MONITOR	$115.95

Requires Direct Video Mod to ZX81

FREE Plans with order, simple installation

#3 WILLIAM STUART SYSTEMS LTD SPEECH SYNTHESIS UNLIMITED VOCABULARY FOR ZX80-81 TIMEX	99.95
#4 BIG EARS SPEECH RECOGNITION SYSTEM	99.95
CRASH GUARD PROTECTION FROM ACCIDENTAL CRASHES	19.95

VISA, MASTER CARD & AMEX & MONEY ORDERS

PERSONAL CHECK ALLOW 2 WEEKS

Foreign Orders Please Add $5.50
U.S. Orders Please Add $3.00
Printer & Monitor Orders add $7.50

THE PEOPLE'S COMPUTER SUPPLY
P.O. Box 664, Sidney, Nebraska 69162
Order Phone: Tel. 308-254-3208

Model EP-2A-79

EPROM Programmer

North Star
Apple
S-100
SS-50
STD-Bus
Atari
Pet
Kim-1
Gimix

TRS-80
H-8
H-89
Ohio Scientific
SWTP
Aim-65
Sym-1
VIC-20

Three years in the field with unsurpassed performance. Software is available for the **EP-2A-79** for most all of the microcomputers including the popular CP/M, FLEX, HDOS operating systems. Write or call for specific hardware/software interfacing. Driver packages available for F-8, 6800, 6809, 8080, 8085, Z-80, 1802, 6502 and 2650 based systems.

EP-2A-79	115V 50/60 HZ	$169.00

Personality Modules

PM-0	TMS 2708	$17.00	PM-5	2716, 2758	$17.00
PM-1	2704, 2708	17.00	PM-5E	2816	35.00
PM-2	2732	33.00	PM-8	MCM68764	35.00
PM-2A	2732A	33.00	PM-9	2764	35.00
PM-3	TMS 2716	17.00	SA-64-2	TMS 2564, 25128	39.00
PM-4	TMS 2532	33.00	SA-64-3	2764, 27128	39.00

Optimal Technology, Inc.

Phone (804) 973-5482
Blue Wood 127
Earlysville, VA 22936

ARE YOU A SMART BUYER?

For **$89.95** this is a smart buy if you're looking for a place to store your computer, peripherals, and accessories without spending a fortune.

The CS 1632 computer storage cabinets compact yet functional design fits almost anywhere while housing your computer monitor, joysticks, software, books and peripherals all for only $89.95.
The slide out shelf puts the computer at the right height and position for easy comfortable operation.
The fold up locking door keeps unwanted fingers off the key board when not in use.
To store joysticks just turn them upside down and slide them into the inverted storage rack.
Twist tabs on the back of center panel allow for neat concealed grouping of wires, while power packs rest hidden behind center panel on shelf.
The slide out software tray has room for 14 cartridges or cassettes and up to 30 diskettes. Most brands of software will fit between the adjustable partitions with a convenient hook for the spare key at rear.
Stand fits Atari 400 & 800, Commodore 64 & VIC 20, Ti 99/4A and TRS-80.
Cabinet dimensions overall 36" high x 33-7/8" wide x 16" deep.
Cabinet comes unassembled. Assembly requires only a screwdriver, hammer, and a few minutes of your time.
Choice in simulated woodgrain, of warm golden oak or rich natural walnut finish.

To order CS1632, send $89.95 to:

HYTECSystems

P.O. Box 446 West Linn, OR 97068
Phone orders call, (503) 636-6888

Name ______________________
Address ______________________
City ______________ State ________ Zip ________
☐ Golden oak finish ☐ Natural walnut finish
☐ My personal check, cashiers check or money order is enclosed.
☐ Bill my VISA # ______________ Exp. Date ________
☐ Bill my Mastercard # ______________ Exp. Date ________
Card Holders Signature ______________________

Immediate shipment if in stock. If personal check is sent, allow additional 2 weeks. Prices subject to change. Shipment subject to availability. Cabinet shipped unassembled in 2 cartons. Ships UPS frt. collect FOB Portland, Oregon.

SIMULATIVE STRATEGY GAMES
from P.R. Software for your
VIC-20 or ATARI 400/800
Semi-graphic Non-Arcade
No Joysticks Required

If you want intelligent high quality, reasonably priced software that's not arcade then read on . . .

For VIC or ATARI:
FOOTBALL CHALLENGE:
Manage an NFL team against your computer or a friend. *Uses actual team statistics.* All 1982 NFL teams are included. 10 levels of computer play. A real challenge!
$15.95

DUNGEONS OF KAL
(New expanded version)
Semi-graphic text adventure in the realm of the evil two-headed ruler KAL! *Can you save mankind from KAL's awful plan of destruction?* Different each time. Not for the timid at heart!
$15.95

Above 2 programs: **Vic** version requires min 8 K expander cartridge. **ATARI** version requires standard 16K.

More strategy games for 5K standard **VIC $11.95 each:**
• Dungeon of Kal • Computer Baseball • Convoy Raider • Star Defender • At the Track • Boxer's Corner • Convoy Escort
All programs on cassette. Write for free catalog. Specify computer type.
Send Check or Money Order + $1.50 P/H to:
P.R. SOFTWARE – P.O. Box 169
South San Francisco, CA 94080
California Residents add 6½% sales tax.
VIC is a Reg. TM of CMB
ATARI is a Reg. TM of ATARI Inc.

CASSETTES ! ! !
FOR YOUR COMPUTER

- Computer Grade
- Wide Dynamic Range
- 100% Error Free
- 5 Screw Housing
- Fully Guaranteed
- Carefully Packed

All Prices Include Shipping
** Phone Orders Add $1.50 C.O.D. Fee **

COMPUTER TAPE PRICES

Length	12 LOT	24 LOT	100 LOT
C-5	.52/6.24	.38/9.12	.35/35.00
C-10	.55/6.60	.40/9.60	.35/35.00
C-20	.60/7.20	.45/10.80	.40/40.00

BASF DPS Tapes Add .05 Cents Per Tape
— Custom Lengths Available —
... Write For Volume Prices...

— Norelco Cassette Cases and Labels —
(with Cassette Orders Only)

12-24 Cases/.20 Ea.	250/.13 Ea.
12 Labels for .20	120 for 1.70

SEND MONEY ORDERS OR CHECKS TO:

CASS-A-TAPES
Box 8123-C
Kansas City, Mo. 64112
816-444-4651

Software Directory

The PC Clearinghouse Directory contains more than 21,000 software listings. The listings, arranged by application descriptions such as "GENERAL BUSINESS – Accounting" or "HOME USE – Shopping List," provide the user with a full listing of the computer software available for a particular task.

The directory lists hard to find software. Programs for such specialty applications as "feed mill systems" or "resort management" are not normally found on computer store shelves. But these and other specialized vertical market software packages are listed in the directory.

In addition to providing information on the software vendors (company name, address, phone, product line), the directory also cross-references the software with the computer hardware, allowing easy identification of the range of programs designed for use with a specific computer unit. For example, a check of the directory would reveal 785 different general business programs for the Apple personal computer.

The Clearinghouse Directory lists over 200 microcomputers and their manufacturers, and 2,900 software vendors.

PC Stores Telemart Clearinghouse
P.O. Box 1353
Middleburg, VA 22117

Resource Guide For Timex/Sinclair Users

TSG Enterprises has released *The Watchmakers Guidebook to the Timex/Sinclair Computers* (44 pages).

The book contains a directory of about 120 software suppliers, 50 hardware suppliers, and 20 ancillary suppliers. In addition, the guide contains directories of user groups and of Timex/Sinclair specific magazines and books, and an index to general personal computer magazine articles about the Timex/Sinclair computer.

The book is available by mail order ($3.95 plus $1 postage and handling) from:

TSG Enterprises
Guidebook
54 Richwood Place
Denville, NJ 07834

Word Processing For VIC-20

United Microware Industries has introduced Wordcraft 20, a personal word-processor for VIC-20 users – a fully featured cartridge program with 8K of RAM (Random Access Memory). Wordcraft 20 is available from UMI dealers for $269.95.

With Wordcraft 20, docu-

Commodore 64 Software

"SPRITEWRITER"

Multicolor and Single Color
Sprite Edit/Design
The sprite generation package with the most features available.
Append sprite data statements to any program.
Test your sprites - up to 8 sprites displayed at the X,Y location you choose. Manipulate color of sprites and background. X,Y scaling and X,Y coordinates.
Our price is $24.95 on cassette or $29.95 on diskette + $1.00 for shipping and handling.
Several new software packages will be available by the time this ad runs.

Pixell Now sells Hardware!

CBM 64 and peripherals
Amdek Monitors and Plotters - lowest prices available
Corvus Disk Drives
The complete NEC product line
NEC 6000 and 8000 Personal Computer
NEC 8800
The APC - the best personal small business machine built
Call for the most competitive prices.

Mastercard/Visa
Dealer inquiries welcome

pixell software
6595 W. Mississippi Pl. Lakewood, CO 80226
(303) 922-9197

www.commodore.ca

apple®

Apple is a Registered Trademark of Apple Computer, Inc.

APPLE® COMPATIBLE COMPUTER AN ECONOMICAL ALTERNATIVE

SYSCOM 2

$699

DISK DRIVES

MICRO-SCI	
A2 (w/cont)	$369
A40 (w/cont)	$435
A70 (w/cont)	$555

RANA	
Elite I (w/cont)	$399
Elite II (w/cont)	$539
Elite III (w/cont)	$679

FOURTH Super (w/cont)	$385

APPLE SOFTWARE

ARTSCI	
Magic Window	$65
Magic Window II	$99
Magic Words	$45
AVANT GARDE	
Zero Grav. Pinball	$20
Hi-Res Golf	$20
Hi-Res Secrets	$82
BEAGLE BROS.	
Dos Boss	$17
Alpha Plot	$28
Utility City	$21
Tip Disk #1	$15
Apple Mechanic	$21
Pronto Dos	$21
Flex Text	
Frame Up	
Type Faces	
BRODERBUND	
Choplifter	$23
Star Blazer	$22
Davids Midnight	$23
Apple Panic	$20
Alien Rain	$17
Arcade Machine	$41
CONTINENTAL	
Home Accountant	$52
1st Class Mail	$53
DATAMOST	
Snack Attack	$21
Swashbuckler	$23
EDUWARE	
Spelling Bee w/Read	$27
Alg. 1, 2 or 3	$27
Rendevous	$27
Prisoner II	$23
HAYDEN SOFTWARE	
Sargon II	$25
Piewriter	$95
INFOCOM	
Zork I, II or III	$27
Starcross	$27
Deadline	$34
INSOFT	
Graforth II	$50
Electric Duet	$20
LOTUS	
Exec. Brief Sys.	$126
MICROSOFT	
Basic Compiler	$270
Multiplan	$190
Olympic Decathalon	$20
MUSE	
Robot War	$27
Castle Wolfenstein	$20
PENGUIN	
Graphic Magician	$42
Comp. Graphics Sys.	$49
Special Effects	$29

ON-LINE	
Screenwriter	$89
Wiz & Princess	$22
Mystery House	$17
Time Zone	$65
Maurauder	$24
Frogger	$23
Cannonball Blitz	$23
Screenwriter Prof.	$135
QUALITY	
Bag of Tricks	$27
Ali Baba & 40 Thieves	$22
SENSIBLE SOFTWARE	
Sensible Speller	$85
Super Disk Copy III	$21
Multi Disk Catalog	$18
SIRTECH	
Wizardry	$35
Knight of Dia.	$24
SOFTWARE PUBLISH.	
PFS: Report	$65
PFS: Filing	$87
PFS: Graph	$87
SPINNAKER	
Snooper Troops #	$29
Snooper Troops #2	$29
Story Machine	$23
Face Maker	$23
STONEWARE	
D.B. Master	$158
D.B. Master Util #1	$70
Graphics Proc. Sys.	$46
STRATEGIC SIM.	
Computer Baseball	$27
Cytron Masters	$27
Guadalcanal	$42
Galactic Gladiators	$27
Battle of Shiloh	$27
Tigers In Snow	$27
Cosmic Balance	$27
Computer Qrtrback	$27
SUBLOGIC	
Flight Simulator	$25
Space Viking	$34
Saturn Navigator	$24
SYNERGISTIC	
Atlantis	$27
Global Prog. Line Ed.	$44
VISICORP	
Visiterm	$72
Visicalc 3.3	$175
MISCELLANEOUS	
Bandits	$23
Human Fly	$21
Master Type	$27
New Step by Step	$57
Sam (w/DAC)	$83
Ultima	$27
Zoom Graphics	$27

PRINTERS

CITOH	
Prowriter	$379
Prowriter II	$649
Starwriter	$1379
Printmaster	$1599
GEMINI 10	**$319**
GEMINI 15	**$485**

NEC	
8023 A-C	$465
3510	$1375
3530	$1595
3550 (IBM)	$1829
7710/7730	$2319
SMITH CORONA	$589
AXIOM GP-100	$269

MONITORS

NEC	
12" GRN (JB1260)	$115
12" GRN (JB1201M)	$155
12" Color Composite	$329
12" Color RGB	$689
USI (Amber)	$169

AMDEK	
V300	$139
V310 (GRN-IBM)	$169
V310-A (Amber-IBM)	$169
COLOR I	$298
COLOR II	$650

MODEMS

HAYES	
Micromodem II	$269
Stack Smartmodem	$215
Smartmodem 1200	$519

NOVATION	
Apple-Cat II	$299
212 Apple-Cat	$589
D-Cat	$155

ANCHOR AUTOMATION Signalman I or II	$79

ACCESSORIES

Wico (Joy)	$23
Wico (T-Ball)	$49

ATARI®

800 (48K)	$495
NEW 64K ATARI 1200	CALL
RAMDISK (128K)	$378
BIT 3 - 80 COL. BOARD	$279
400 KEYBOARD (In Home)	$95

810 DISK DRIVE	$419
410 RECORDER	$74
850 INTERFACE	$164
400 COMPUTER	$219
Entertainer	$66
Communicator	$298

32K RAM (Mosaic)	$99
32K RAM (Intec)	$69
64K (Intec/400)	$129
48K (Intec/400)	$95
Educator	$112
Programmer	$52

PERCOM

Single Density Master	**$399**
Double Density Master	**$539**
Double Density Dual	**$859**
Dbl Sided Dbl Density Master	**$659**
Dbl Sided Dbl Density Dual	**$949**

ADVENTURE INT'L	
Rear Guard (D)	$17
Adv. 1-12 each (C)	$18
Preppie (C/D)	$20
Diskey (D)	$33
APX	
Eastern Front (C/D)	$23
Fam. Cash Flow (D)	$17
747 Land Sim. (C/D)	$17
ATARI INC.	
Fig-Forth (C)	$30
Galaxian	$32
Defender	$32
ET	$36
Microsoft Basic (D)	$65
Macro Ass. & Edit. (D)	$65
Assembler Editor (R)	$45
Basic Cartridge (R)	$45
Pac Man (R)	$32
Centipede (R)	$32
Caverns of Mars (D)	$28
Missile Command (R)	$27
Star Raiders (R)	$32
Conv. Lang. Ea. (C)	$44
Music Composer (R)	$31
Super Breakout (R)	$27
My First Alphabet (D)	$26
Prog. 2 & 3 (ea.)(C)	$21
Word Processor (D)	$107
Pilot (Educ)	$98
Touch Typing (C)	$19
Home File Mngr (D)	$37
AUTOMATED SIMUL.	
Monster Maze (R)	$27
Invasion Orion (C/D)	$18
Temple of Aps.(C/D)	$28
Star Warrior (C/D)	$28
Dragon's Eye (D)	$20
Crush Crumble (C/D)	$20
AVALON HILL	
Empire of Over (D)	$23
B-1 Nuc. Bomber (C)	$12
BRODERBUND	
Apple Panic (C/D)	$20
Star Blazer	$22
Choplifter (D)	$23
DATA SOFT	
Text Wizard II (D)	$65
Graphics Gen. (D)	$17
Basic Compiler (D)	$65
Zaxxon (C/D)	$28
EDU-WARE	
Compu-Read (D)	$21
Compu-Math Fr. (D)	$28
Compu-Math Dec. (D)	$28
INFOCOM	
Zork I, II or III (D)	$27
Starcross	$27
Deadline (D)	$34
JV SOFTWARE	
Action Quest (C/D)	$20
Ghost Encount. (C/D)	$20

K-BYTE	
Krazy (each)	$34
LJK	
Letter Perfect (D)	$104
Data Perfect (D)	$74
ON-LINE	
Wiz & Princess (D)	$22
Crossfire (C/D)	$20
Frogger (C/D)	$23
Jawbreaker (C/D)	$21
Crossfire (R)	$28
OPTIMIZED SYSTEMS	
Max-65 (D)	$58
Basic A + (D)	$58
ROKLAN	
Gorf (D)	$27
Gorf (R)	$30
Wizard of Wor (D)	$27
Wizard of Wor (R)	$30
SIRIUS	
Space Eggs (D)	$20
Sneakers (D)	$20
Way Out (D)	$27
Bandits (D)	$23
Fast Eddy (R)	$27
SPINNAKER	
Snooper Troops #1 (D)	$30
Snooper Troops #2 (D)	$30
Storm Machine (D)	$23
Face Maker (D)	$23
STRATEGIC SIM.	
Shattered Alliance (D)	$28
Tigers In Snow (C/D)	$28
Battle of Shiloh (C/D)	$28
Battle of Norm. (C/D)	$27
Galactic Gladiator (D)	$27
Cytron Masters (D)	$27
SYNAPSE SOFTWARE	
File Mngr 800 +	$65
Protector II	$23
Shamus (C/D)	$23
Nautilus (C/D)	$23
Claim Jump (C/D)	$23
THORN EMI	
Jumbo Jet (R)	$34
Submarine Comm. (R)	$34
MISCELLANEOUS	
Ali Baba (D)	$22
Miner 2049er (R)	$35
Kid Grid (C/D)	$20
Pool 1.5 (D)	$23
Raster Blaster (D)	$20
Sam (D)	$41
Galactic Chase (C)	$17
Warlocks Revenge (D)	$24
Visicalc (D)	$169
3-D Supergraph (C/D)	$29
Starbase Hyp (D)	$17
Pogo Man (C/D)	$27
Airstrike (C/D)	$28
Sammy Sea Serp. (C)	$13
Pinball (D)	$20

EAGLE

64K RAM
780 KB Disk Storage
Word Processor
Ultracalc CP/M
C-Basic Software

EAGLE II	$2329
EAGLE IV (10M Byte Hard Disk)	$4299

commodore

VIC 64	CALL

VIC 20	$149
1541 DISK DRIVE	CALL
1525 PRINTER	CALL

1530 RECORDER	$64
1600 MODEM	$92
16K RAM	$88

VIC SOFTWARE

Avenger	$23
Superslot	$23
Super Alien	$23
Jupiter Lander	$23
Draw Poker	$23
Midnight Drive	$23
Radar Rat Race	$23
Raid on Fort Knox	$23
Sargon II Chess	$29
Super Smash	$23
Cosmic Cruncher	$23
Gorf	$29
Omega Race	$29
Money Wars	$23
Menagerie	$23

Cosmic Jailbreak	$23
Clowns	$23
Garden Wars	$23
Sea Wolf	$23
Adventureland	$29
Pirate Cove	$29
Mission Impossible	$29
The Count	$29
Voodoo Castle	$29
The Sky Is Falling	$23
Mole Attack	$23
Bingo Speed Math	$23
Home Babysitter	$23
Visible Solar System	$23
Personal Finance	$29

HES Software	
VIC Forth (R)	$45
HES Mon (R)	$29
Turtle Graphics (R)	$29
HES Writer (R)	$29
Aggressor (R)	$29
Shamus (R)	$29
Protector (R)	$33
Synthesound (R)	$49
Skier (C)	$15
Maze of Mikor (C)	$15
Tank Wars (C)	$15
Victrek (C)	$15
Pinball (C)	$13
Simon (C)	$13
Fuel Pirates (C)	$13
Pak Bomber (C)	$13
Laser Blitz (C)	$15
Tank Trap (C)	$15
Concentration (C)	$13
Dam Bomber (C)	$13

UNITED MICROWARE	
Spiders of Mars (R)	$34
Meteor Run (R)	$34
Amok (C)	$17
Alien Blitz (C)	$17
Skymath (C)	$12
Space Division (C)	$12
Super Hangman (C)	$14
The Alien (C)	$17
3D Maze (C)	$12
Kosmic Kamikaze (C)	$17
Sub Chase (C)	$17
Amok (R)	$27
Renaissance (R)	$34
Alien Blitz (R)	$27
Cloud Burst (R)	$27
Satellites (R)	$34
Outworld (R)	$34

COMPUTERS

TELEVIDEO

802	$2595
802H	$4445

NEC

PC-8001 Computer	$709
PC-8012 I/O Unit	$469
PC-8031 (Dual Drive)	$709

NORTH STAR

Advantage	$2595
Advantage (5M Byte H.D.)	$3799

TRS-80

MOD III (2 Drvs, 48K)	$1649

COSMIC COMPUTERS UNLIMITED

THE ABOVE PRICES ARE FOR PREPAID ORDERS

ORDER LINES OPEN MON-SAT 8 am - 8 pm

(714) 861-1265

228 N. PROSPECTORS RD.
DIAMOND BAR, CA 91765

Add $2.00 Shipping per software order anywhere in U.S. Add $5.00 Shipping per software for non-U.S. orders, P.O. Box or FPO-APO. Call for cost of Hardware shipping. Calif. residents add 6½% sales tax. Cashiers Checks or Money Orders filled same day. Personal checks require 4 weeks to clear. **Master Card and Visa OK for software only, add 3% surcharge.** Include card no., expiration date and signature. Prices subject to change.

APPLE IS A TRADEMARK OF APPLE COMPUTER, INC.
ATARI IS A TRADEMARK OF ATARI, INC.
IBM IS A TRADEMARK OF
INTERNATIONAL BUSINESS MACHINES CORP.
TRS-80 IS A TRADEMARK OF RADIO SHACK

NEW

SMASH HIT

STUN TRAP

an ACTION packed video game of STRATEGY and SKILL for TWO PLAYERS

for ATARI home computers with 32K memory and two joy sticks.

You are fighting your enemy in unstable space. With the shock of every missile explosion, deadly hyperspikes break out. Contact with hyperspikes causes instant disintegration. As you tunnel through space-time, weaving in and out of hyperspikes, WATCH OUT for rammers and space mines. Be on the lookout for the sudden appearance of smart bombs and streakers on your tail. The only way to come out alive is to trap your opponent in a cage of hyperspikes. Try it — with a friend.

Only $29.95 (on disc)

Distributors and Dealers Welcome
Call 1-215-485-5000

Affine

Affine, Inc.
P. O. Box 2026
Aston, Pennsylvania 19014

COMPU SENSE!

"CARD/?"
(CARD/PRINT)

UNIVERSAL CENTRONICS PARALLEL PRINTER INTERFACE FOR THE VIC-20®

Now you can use your VIC-20® with an EPSON MX-80 printer, or an OKIDATA printer, or a TANDY printer, or just about anybody's printer. And you don't have to give up the use of your user port (MODEM), or change to special printer commands, or load any special software driver programs to do it.

- Outputs standard ASCII codes to the printer.
- Plugs in the VIC-20® printer serial i/o port.
- Understands all standard VIC-20® print commands.
- No modification to your VIC-20®
- No special programs required.
- Includes all necessary cables to hook up a standard printer using centronics parallel input.
- MADE IN THE U.S.A.

The "CARD/?" is a product of CARDCO, Inc.

$79.95

TO ORDER:
P. O. BOX 18765
WICHITA, KS 67218
(316) 263-1095

Personal checks accepted
(Allow 3 weeks) or
C.O.D. (Add $2.00)
Handling charges $2.00
VIC-20* is a registered trademark of Commodore

VISA
MasterCard

ments are displayed on the screen and printed exactly as typed, so editing is visually simplified. And automatic four-direction scrolling permits complete viewing of its 99-character by 66-line page capacity.

Characters, words, and large copy blocks can be deleted, inserted, moved, and copied, and up to 40 pages can be stored on a diskette or tape.

A writer can "personalize" business letters using Wordcraft 20's mailing list files, and if electronic mail (computer to computer) is sent, it can be made unreadable to anyone without the keyword.

Wordcraft 20 supports the Commodore 1515 printer as well as a variety of serial printers.

More Wordcraft 20 features are:

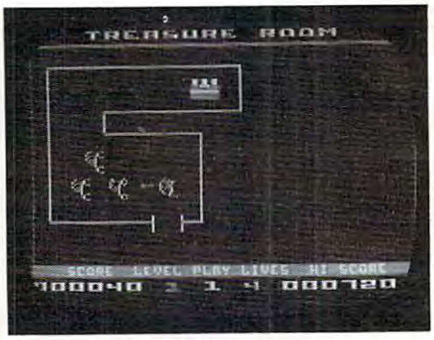
- Page width and length alteration any time
- New page control
- Automatic line centering
- Justified or ragged margins
- Tab stops
- Decimal tabs
- Multistep indentation for outlines
- Text highlighting
- Hard and soft hyphens
- Search and replace
- Mailing list files
- Paragraph merging

United Microware Industries
3503-C Temple Avenue
Pomona, CA 91768
(714)594-1351

Games For The Atari

Romox has released four games for the Atari 400/800 personal computers.

Fortune Hunter is a two-player cartridge game that offers six rooms of treasure and adventure. When you enter a room, it grows to full screen proportions, and then both your treasure and your enemies appear on the screen. Your mission: capture the treasure, and evade or destroy your enemies before your time expires. You are also challenged by deadly cobras, scorpions, genies, moving doors and lances, force fields, and relentless guards that disappear at will. *Fortune Hunter* has nine levels of difficulty; your speed and agility with your bow and arrow increase at each level.



Fortune Hunter *from Romox.*

Princess and Frog is also a two-player game in cartridge form. Your objective: make a

commodore

*VIC 20 $176
16K RAM $ 79

8K RAM MEMORY EXPANSION
.... $ 39.95

☐ Check Enclosed ☐ C.O.D.
NAME ____
STREET ____
CITY ____
STATE ____ ZIP ____
PHONE ____

Add 3% Shipping Charge.
COD's add $1.50 plus 20% Deposit
Required. CA Res. 6% Tax
Personal checks accepted
(Allow 3 weeks extra)

U.S. TECHNOLOGIES

8306 Wilshire Blvd., Suite 335
Beverly Hills, CA 90211

(213) 259-3523

www.commodore.ca

TOTAL CONTROL

COMMAND CONTROL JOYSTICK

BY WICO

- ARCADE QUALITY CONSTRUCTION
- TWO FIRE BUTTONS (TOP & BASE)
- ADAPTERS TO OTHER COMPUTERS AVAILABLE
- FULL ONE YEAR WARRANTY

FOR ATARI 29.95*
FOR APPLE . . . . . . 49.95* INCL. ADAPTOR
FOR TRS-80 . . . . . . 39.95* INCL. ADAPTOR

*ADD $3 PER ORDER FOR POSTAGE AND HANDLING • CHECK, MONEY ORDER, MASTERCARD OR VISA, C.O.D. (C.O.D. CHARGES ADDED) • FLA. RESIDENTS ADD 5% SALES TAX • FOREIGN ORDERS MUST BE PREPAID.

GATOR MARKETING ENTERPRIZES, INC.
P.O. BOX 296 • CASSELBERRY, FL 32707
(305)699-5848

DEALER INQUIRIES INVITED — PRICES SUBJECT TO CHANGE

COMMODORE 64

• HARDWARE •

FROM COMMODORE

COMMODORE 64 COMPUTER CALL

FROM QUALITY COMPUTER

TEN KEY PAD $69.95

0 thru 9 keys, plus ?, /, *, +, −, ., and ENTER keys. Easy installation.

AUDIO/VIDEO CABLE $9.95

Hook your monitor & stereo up to your 64. Instructions included on how to run external sound into the sound chip for processing.

Special program, delivery (UPS, UPS AIR), and extended one year warranty *free* with computer purchase.

• SOFTWARE •

ADD $2.00 FOR DISK VERSIONS

SPRITE SHAPER™

REGULAR VERSION $19.95

See the Sprite take form as you design it. Use several different shapes in a program. Choose color, size and more. Forms the Data & Poke Statements for you.

DELUXE VERSION $24.95

Same as above except it allows 3 colors per Sprite.

SOUND SHAPER™

REGULAR VERSION $9.95

Try different settings of ADSR, waveforms, and filters for one voice by simply pressing function keys.

DELUXE VERSION $14.95

Same as above except different settings can be made for each of the three voices. Interaction between the voices can be selected using sync and ring modulation.

QUALITY COMPUTER

801 S. VICTORIA SUITE 105
VENTURA, CA 93003
(805) 656-1330
MASTERCARD • VISA

Send 25¢ for our VIC & 64 Catalog • Dealer Inquiries Invited

COMSTAR

AIR* SHIPPING WITHIN 2 DAYS

ATARI

48K RAM (FOR 400)	$115
64K RAM (FOR 400)	135
ALIEN GROUP VOICE BOX (D.T)	139
S.A.M. (D) 8K	46
VAL FORTH (D) 24K	36
BIT 3 80 COL. BOARD	289
TECHNICAL NOTES	25
BOX OF DISKS (10)	19
PROWRITER PRINTER	419
B KEY 400 (KEYBOARD)	99
NEWPORT PROSTICK	27
PREPPIE (D.T) 16K	19
EASTERN FRONT (D.T) 16K	24
MINER 2049ER (C)	35
STARBOWL FOOTBALL (D.T) 24K	25
TEMPLE OF APSHAI (D.T) 32K	29
QIX (C)	34
FORT APOCALYPSE (D.T) 32K	24
PILOT (C)	59
BASIC A + WITH OS/A+ (D) 32K	60
ASTRO CHASE (D.T) 32K	24
BASIC COMPILER (D)	75
BAJA BUGGIES (D.T) 16K	23
ATARI BOOKKEEPER (D) 48K	119
ZAXXON (D.T)	29

VIC-20

CARDBOARD (3 SLOT EXP.)	$ 33
VIDEOPAK WITH 16K (40/80 COL)	250
VIDEOPAK WITH 64K (40/80 COL)	319
PRINTER INTERFACE (PARALLEL)	55
KIDS AND THE VIC (BOOK)	17
16K RAM	75
8K RAM	45
HES MON (ASSEMBLER) (C)	29
HES WRITER (WORD PROC.) (C)	29
TURTLE GRAPHICS (C)	29
VIC FORTH (C)	49
QUICK BROWN FOX(WORD PROC.)(C)	54
SHAMUS (C)	29
PROTECTOR (C)	33
CHOPLIFTER (C)	34
APPLE PANIC (C)	34
TRASHMAN (C)	33
UNWORD PROCESSOR (T) 5K	19
STARFIGHTER JOYSTICK	14
CARDETTE (CASS. INTERFACE)	33
ASTROBLITZ (C)	31
SWORD OF FARGOAL (T) 21K	23
VICAT (T) 8K	20
DEADLY DUCK (C)	28
TOTL MAIL LIST (T) 13K	19

HEAR ATARI SOUNDS THROUGH YOUR STEREO SPEAKERS WITH
STEREODAPTER — FOR ATARI 800
• NO ASSEMBLY REQUIRED • CAN USE STEREO HEADPHONES
• SHIELDED CABLE • ADJUST TONE & VOLUME WITH STEREO CONTROLS
STEREODAPTER WITH 16 FT CABLE $8 WITH 26 FT CABLE $10
DEALER INQUIRIES INVITED

C = CARTRIDGE D = DISK T = CASSETTE * MOST ITEMS

COMSTAR
P.O. BOX 1730 GOLETA, CA93116
(805) 964-4660

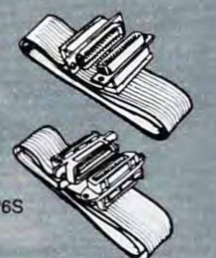
ORDERS: 800-558-8803

or send check or money order. VISA, MC add 3%. Shipping—$2 for software (call for hardware). Calif add 6% tax. COD add $2.50.

HIGH GRADE COMPONENTS

SCOOTER™

HIGH GRADE INTERFACE CABLES



Centronics-type Cable Assemblies

36-pin flat interface cable for Epson and Centronics printers. 4-ft. CCAP4P (male to male) or 4-ft. CCAP4S (male to female) Sug. Ret: **$29.80**
6-ft. CCAP6P (male to male) or 6-ft. CCAP6S (male to female) Sug. Ret: **$32.95**

RS232 Cable Assemblies

RS232 25 conductor interface cables for all standard applications.
RS232U-P5P 5-ft. (male to male) Sug. Ret: **$32.95**
RS232U-P10P 10-ft. (male to male) Sug. Ret: **$37.95**

Your computer dealer has many other Scooter™ cable configurations available along with connectors, semiconductors, switches, surge protected outlet strips, integrated circuits & sockets and electronic components.

FREE SCOOTER™ T-SHIRT!

SEND proof of purchase (sales receipt) for $20 in Scooter merchandise . . .

OR SEND the name of your computer dealer if he does not carry the Scooter™ High Grade Electronic Component line . . .

WITH THIS COUPON and your name, address and T-shirt size to: **OHM/ELECTRONICS, 746 VERMONT ST., PALATINE, IL 60067**

CM0583

POWER LINE PROBLEMS?

SPIKE-SPIKER® ...THE SOLUTION

Protects, organizes, controls computers & sensitive electronic equipment. Helps prevent software "glitches", unexplained memory loss, and equipment damage. Filter models attenuate conducted RF interference. 120V, 15 Amps. Other models available. Ask for free literature.

DELUXE POWER CONSOLE $79.95
Transient absorber, dual 5-stage filter. 8 individually switched sockets, fused, main switch, & lite.

QUAD-II $59.95
Transient absorber. Dual 3 stage filter. 4 sockets, lite.

QUAD-I $49.95
Transient absorber, 4 sockets.

MINI-II $44.95
Transient absorber, 3 stage filter, 2 sockets.

MINI-I $34.95
Transient absorber, 2 sockets.

KALGLO®
6584 Ruch Rd., Dept. CP
Bethlehem, PA 18017

215-837-0700
Out of State Order Toll Free
800-523-9685

DEALER INQUIRIES INVITED • CODs add $3.00 + Ship.

Duplication of Diskettes and Cassettes for your computer systems

Whether 10 or 10,000 copies, let RPL's specially engineered duplicating systems provide verified copies at low cost and with fast service.

For Apple, Atari, Commodore, IBM P/C, Osborne, TRS 80 and many others.

RPL
RECORDED PUBLICATIONS LABORATORIES
1100 State Street • Camden, NJ 08105
(609) 963-3000

successful journey to the castle, so that you can kiss the princess and be transformed from a frog into a prince. Your journey must be completed within 60 seconds. You must cross a field of jousting knights to reach the castle moat, and then hop from alligator to snake to the castle gates. The alligators submerge to try to catch you. Once you're at the castle, you must hop into the castle gate that has the lips. Otherwise, you remain just another frog.

Ant Eater is a two-player survival game. You're an ant who journeys to the surface of the earth in search of food for your colony below. On the earth's surface you are exposed to your dreaded enemy, the anteater. Since you know the terrain under the ground, you can lead the anteater under treacherous falling rocks that will destroy him. You can create new paths, but the anteater can travel only in already existing tunnels. You also have five deadly eggs that can be released to dispose of your enemy. If you successfully deliver all the food to the colony, you will be challenged by two anteaters in the next round, and by three in subsequent rounds. The speed also increases with each round.

Typo is an educational game that blends a space maze theme with both spelling and typing drill. The purpose of the game is to introduce the player to the typewriter-style keyboard of a personal computer. *Typo* can be used to test your typing skill; you set the desired words per minute (1 - 120 wpm) that you are chased through the maze. The drill consists of random letters, words, and phrases. You can practice spelling by putting your own word list into the program.

The suggested retail price for each game is $44.95.

Romox, Inc.
501 Vandell Way
Campbell, CA 95008
(408)374-7200

Voice Synthesizer For The Color Computer

Classical Computing has introduced *Speak Up!*, a program for Radio Shack's Color Computer. It is a voice synthesizer, 100% software, and has a small text-to-speech converter. It takes just over 7K of memory, and allows users to access it from BASIC or Extended Color BASIC. With *Speak Up!*, users can type in words and sentences to be spoken, or add speech statements to BASIC programs to make them talk.

The program is available on cassette, with both the 16K and the 32K versions on either side. The documentation includes instructions, a sample calling program in BASIC, and the text to speech rules.

Speak Up! is the first product

The First and Only System to Backup Diskettes Protected by Bad Sectoring without modification to your drive.

Super Clone™

ATARI DISK BACKUP SYSTEM $49.95

Superclone is the *only* ATARI diskette copier system that lets you backup just about ANY 'copy protected' diskette. . . including those protected by 'bad sectoring.' Bad tracks and sectors are created *without* modifications to or adjustments of your hardware. Each backup diskette generated by Superclone functions *exactly like the original*. . .self-booting, etc. (In fact, we suggest that you use the backup and save the original.)

Superclone includes:
- SCAN ANALYSIS - Map of diskette contents (Location of data, bad sectors, etc.)
- FORMATTING/BAD SECTORING - Non-ATARI DOS formatting and bad track/sector creation.
- BACKUP - Copies just about everything we can find. . . regardless of protection scheme.

Superclone is user-friendly and simple to use.

PIRATES TAKE NOTE: SUPERCLONE only allows two copies to be made of any specific diskette. . .Sorry!!!

SYSTEM REQUIREMENTS
Atari 400 or 800 Computer / 48K Memory
One Atari 810 Disk Drive / Printer Optional

Available at your computer store or direct from FRONTRUNNER. Include $2.00 ($5.00 Foreign Orders) for each system. DEALER INQUIRES ENCOURAGED.

FRONTRUNNER

TOLL FREE ORDER LINE:
(24 Hrs.) **1-800-648-4780**
In Nevada or for questions
Call: (702) 786-4600
Personal checks allow 2-3 weeks to clear. M/C and VISA accepted. Include shipping.

316 California Avenue, Suite #712
Reno, Nevada 89509 - (702) 786-4600
Others make claims. . .SUPERCLONE *makes copies!!!*
ATARI is a Trademark of ATARI, Inc.

www.commodore.ca

WE HAVE DONE IT AGAIN!

K• BYTE the company you have come to appreciate for such high quality games as Krazy Antiks, Krazy Shootout, K-star Patrol and Krazy Kritters, now brings you the same high quality wrapped up in one of the most advanced and informative instructional programs ever developed. Now, in your own home, you can teach yourself assembly language with **K-BYTE's 6502 ASSEMBLER LANGUAGE** program.

Upon completion of this self learning, self testing, menu-driven package, you will be able to enter the fascinating world of assembly language programming. This well rounded and versatile instructional package has to be experienced to be believed. Package includes disk and instruction booklet for use with your Atari Home Computer . . ., this software is distributed exclusively by

tele soft, inc.
P.O. BOX 3456, TROY, MICH 48084

Call toll free to place your order
1-800-255-2000
or in Michigan
1-800-742-4242.

This Publication is available in Microform.

University Microfilms International

Please send additional information

for ______________________ (name of publication)

Name ______________________

Institution ______________________

Street ______________________

City ______________________

State ______________ Zip ______________

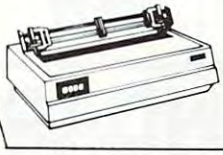
300 North Zeeb Road, Dept. P.R., Ann Arbor, Mi. 48106

WE TOOK A BIG BYTE OUT OF COMPUTER PRICING!

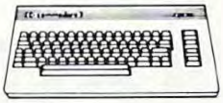
ORDERING INFO
We accept Visa. Mastercard. Money Orders or Certified Check. Personal checks require 2 weeks for bank clearance. All items factory fresh & carry manufacturer's warranty. Prices subject to change without notice.

SPECIALS OF THE MONTH

OKIDATA 82A
$419.



COMMODORE 64
$ CALL



ATARI 800
$ NEW LOWER PRICE!

COMPUTERS

ATARI 400	$197.
ATARI 800	$598.
ATARI 410	$74.
ATARI 810	$439.
COMMODORE 64	CALL
COMMODORE VIC 20	$149.
COMMODORE VIC 1530	$69.
NEC PC 8001A	$739.
NEC PC 8012A	$499.
NEC PC 8031A	$739.
SANYO MCB 1000	$1599.
TIMEX 1000	$84.
XEROX 5¼"	CALL
XEROX 8"	CALL
XEROX 630	CALL

DISKETTES

BASF	CALL
MAXELL	CALL

TERMINALS

TELEVIDEO 910	$589.
TELEVIDEO 950	$945.

PRINTERS

DIABLO 620	$1199.
DIABLO 630	$1675.
OKIDATA 82A	$419.
OKIDATA 83A	$699.
OKIDATA 84P	$1029.
EPSON	CALL
NEC 8023	$479.

SOFTWARE

MICROSOFT	CALL
MICROPRO	CALL
ALL MAJOR BRANDS	CALL

COMPUWAY, INC.

24 LUMBER ROAD
ROSLYN, N.Y. 11576

toll free 800 6451362
516 6211362

www.commodore.ca

computer case company

Attache-style cases for carrying and protecting your complete computer set-up. Accommodates equipment in a fully operational configuration. Never a need to remove equipment from case. Simply remove lid, connect power, and operate.

AP101	Apple II with Single Drive	$109
AP102	Apple II with Two Disk Drives	119
AP103	Apple II, 9 Inch Monitor & Two Drives	129
AP104	Apple III, Two Drives & Silentype Printer	139
AP105	13" Monitor with Accessories	99
AP106	AMDEK Color Monitor	119
RS201	TRS-80 Model I, Expansion Unit & Drives	109
RS204	TRS-80 Model III	129
AT301	ATARI Computers with Peripherals	109
P402	Centronics 730/737 & Radio Shack Printer	89
P403	Epson MX70/80 or Microline 82A	89
P404	Epson MX100 Printer	99
P405	IDS 560 or Prism 132 Printer	109
P406	Starwriter/Printmaster F-10 Printer	119
P407	Okidata Microline 83A or 84 Printer	99
P408	Prowriter 2 Printer	99
P409	Prowriter (Apple Dot Matrix) Printer	89
IB501	IBM Personal Computer	129
IB502	IBM Monitor	99
HP601	HP41 with Accessories	99
CM703	Commodore Model 64 with Drives	119
CM704	Commodore Model 64 with Dataset	109
NS010	North Star Advantage	139
CC80	Matching Attache Case (5")	85
CC90	Matching Attache Case (3")	75
CC91	Matching Accessory Case	95
CC92	5.25" Diskette Case	49

computer case company

5650 Indian Mound Court
Columbus, Ohio 43213
(614) 868-9464

CALL TOLL FREE
800-848-7548

offered by Classical Computing. The price is $29.95.

Classical Computing, Inc.
P.O. Box 12247
Lexington, KY 40582

Joystick For Atari, Commodore 64, And VIC-20

Kraft Systems has introduced a joystick for the Atari 400/800, Commodore 64, and VIC-20. The joystick has a spring return that provides fingertip control. Cursor positioning is determined by internal switches, made to withstand heavy use.

The joystick is an easily held, plug-in unit. An eight-foot cord is included. Kraft offers a one-year limited warranty.

Kraft Systems Company
450 W. California Ave.
Vista, CA 92083
(619)724-7146

Kraft Systems' joystick for home computers.

CALENDAR

May 14, Lesley College, Cambridge, MA. The Fifth Annual Computer Conference for Educators, sponsored by Lesley College and the Computer Education Research Coalition (CERC). The conference will be opened by Samuel Gibbon, from Bank Street College, discussing "Micros, Whales, Kids, Boats and TV." The luncheon address, "Computers in Education, The Leaderless Revolution," will be delivered by Dorothy Deringer, from the National Science Foundation. Other activities include two hands-on workshops in FORTH and Pascal, and more than 20 presentations by teachers, researchers, and software producers from the Boston area. For registration forms or additional information, contact Susan Friel or Nancy Roberts, Lesley College, 29 Everett Street, Cambridge, MA 02238; (617)868-9600.

May 19-22, Baltimore Convention Center, Baltimore. Maryland Computer Show & Office Equipment Exposition. Show manager: Dee Harris, Computer Expositions, Inc., P.O. Box 3315, Annapolis, MD 21403; (301)263-8044; toll free (800)368-2066 (outside Maryland). For further information, contact Linda Roth, 1413 K Street, NW, Suite 1200, Washington, DC 20005; (202) 289-4687.

May 21, University of Oklahoma, Norman, OK. The sixth annual Spring microComputer Show & Tell Conference. Several discussions and an on-the-spot

Look!!

COMPUTERS

ATARI

Atari 800 48K	$509.
Atari 810 Disk Drive	$429.
VIC 20	$149.
NEC PC-8001A 32K	$729.
Northstar Advantage 64K	$2669.
Televideo TS802 64K	$2589.

MONITORS

Amdek 100 12" B&W	$79.
Amdek 300A 12" Amber	$159.
Amdek Color 1	$299.
Sanyo 6013 13" Composite	$349.
NEC JC1202 DHA 12" RGB	$699.

PRINTERS

Okidata Microline 80	$324.
Okidata Microline 84P	$969.

SPECIALS!

Adds Viewpoint 3-AG	$519.
No Name 5¼" Floppy, Soft Sectored, SS, SD	
Box of 25	$1.99 Per Disk
Box of 100	$1.79 Per Disk
Casio FX-900 Solar Scientific	$26.95

NATIONAL ORDER DESK:
(215) 485-4100

ZEPHYR MICROS
323 S. 43rd St. - Suite C
Philadelphia, PA 19104

To Order: Please send cashiers or personal check (allow two weeks to clear); VISA and MASTERCARD orders add 3%; Shipping and Handling add 3%; Pennsylvania residents add 6%; Prices subject to change without notice.

www.commodore.ca

tele soft, inc.

P.O. BOX 3456, TROY, MICH 48099

Complete line of Computers . . . Software
Video Games and Accessories
CALL TODAY!

WE DEAL! WE DELIVER! CALL US NOW!

ATARI

HOME COMPUTERS

400—16K	CALL
800—48K	$525.00

ACCESSORIES

410	Cassette Recorder	$ 89.95
810	Disk Drive	499.99
850	Interface Module	169.95
825	80 Column Printer	699.95
MOSAIC	32K Ram	113.00

Texas Instruments

Expansion Box	$200.00
RS232	135.00
Disk Control Card	235.00
Disk Drive	300.00
Printer	525.00
32K Board	300.00

commodore

Commodore "64"	$525.00
Commodore Vic 20	165.00
Disk Drive	340.00
Datassette	69.00
8K Memory Expander	49.95
RS232 Interface	45.00
Vic 20 Cartridge Games	27.95
C-IEEE Interface	85.00
Cables	33.00

BUSINESS MACHINES

CBM 8032	$1100.00
CBM 8050 Dual Disk	1299.00

SOFTWARE FOR ATARI

Centipede	$34.75
Pac Man	34.75
Super Breakout	28.50
Missile Command	28.50
Star Raiders	34.75

Epyx

Andromeda	27.00
Doctor Goodeode's Cavern	24.00
Pathfinder	27.00
Match Racers	24.00

VISICALC

(For Apple, Atari, Commodore, and IBM)	200.00

TIMEX Home Computer	89.95
XEROX 820 System I	2600.00
TeleVideo 64K Computer	1500.00
HAYES MODEM 1200	575.00

ACCESSORIES

Stick Stand	$ 6.99
2 For	12.00
Atari Joy Stick	6.20
Wico Joy Stick	22.50
Wico Red Ball Joy Stick	24.80
Wico Track Ball Atari/Commandor	52.00
Wico 12' Extension Cord	6.50
Many More Accessories	CALL

CBS Software

(For Atari 400-800)

Krazy Shootout	$25.50*
Krazy Kritters	25.50*
K-Star Patrol	25.50*
Krazy Antiks	36.00
Boulders & Bombs	36.00

(For Vic 20)

K-Star Patrol	36.00
Krazy Antiks	36.00

EDYX

Crush, Crumble, Chomp	$23.00
Ricochet	15.50
Star Warrior	27.00*
Rescue at Rigel	23.00

Datasoft

Shooting Arcade	23.00
Pacific Coast Highway	23.00
Clowns and Balloons	23.00
Atari Character Generator	15.50

Adventure

Preppie	23.00
Rear Guard	15.50
Treasure Quest	23.00
3D Tic Tac Toe	12.00
Adventure Series	15.50
War	19.50
Diskey	37.00

*While supplies last.

synapse

Nautilus	23.00
Slime	23.00
Dodge Racer	21.00*
Protector	23.00
Chicken	23.00

SYDNEY DATA

Evolution	32.50

On-LINE systems

Ultima I	30.50
Ultima II	47.50
Frogger	27.00
Jaw Breaker	23.00
Crossfire	23.00

Brøderbund

Choplifter	$25.00*
Apple Panic	20.00*
Star Blazer	24.50
David's Midnightmagic	27.00
Stellar Shuttle	29.95

Specials

Gorf (Disk)	26.00*
Educator Kit	115.00*
Atari 5200	199.00
Protector	20.00*
Attack	18.00*
Blackjack Casino	18.00*
Eastern Front	20.00*

VISA & MASTERCARD ACCEPTED

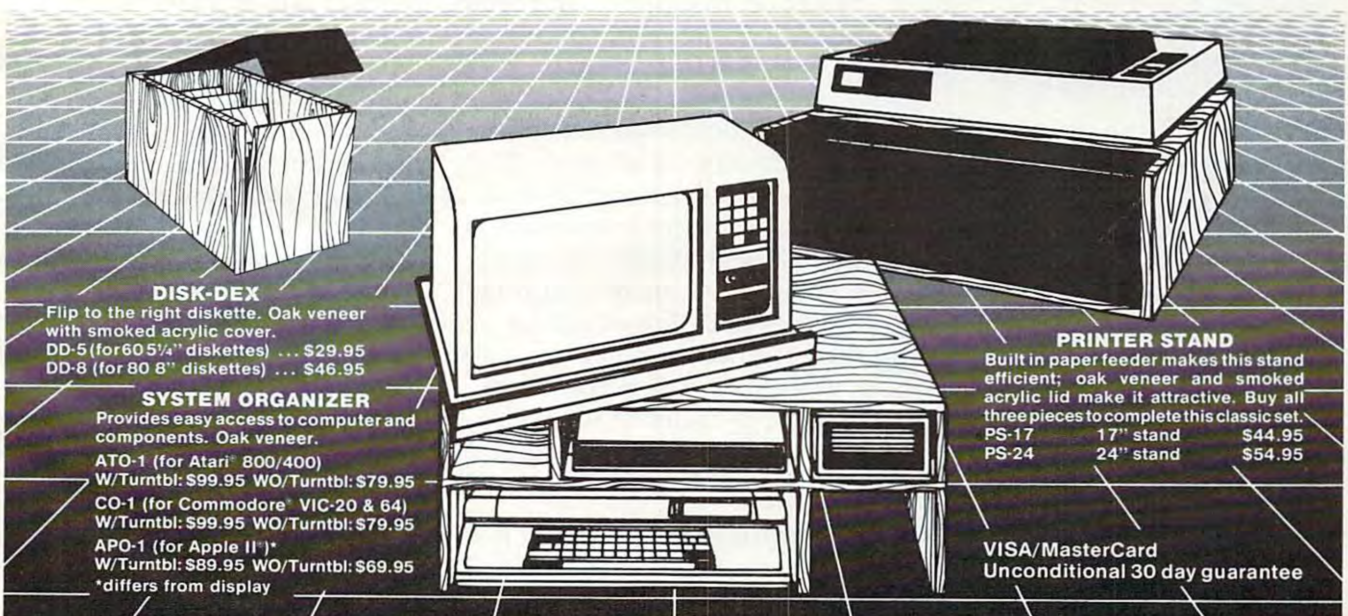
ORDERING INFORMATION

Check, Money Order, MasterCard, Visa and C.O.D. Orders accepted. Add $2.00 for C.O.D. All other orders shipped U.P.S. Michigan residents add 4% sales tax. No returns without authorization.

Hours 9 a.m. to 7 p.m. daily, Saturday 9 a.m. to 2 p.m.

CALL FREE 1-800-255-2000

IN MICHIGAN IN CANADA 1-313-524-1030



DISK-DEX
Flip to the right diskette. Oak veneer with smoked acrylic cover.
DD-5 (for 60 5¼" diskettes) ... $29.95
DD-8 (for 80 8" diskettes) ... $46.95

SYSTEM ORGANIZER
Provides easy access to computer and components. Oak veneer.
ATO-1 (for Atari® 800/400)
W/Turntbl: $99.95 WO/Turntbl: $79.95
CO-1 (for Commodore® VIC-20 & 64)
W/Turntbl: $99.95 WO/Turntbl: $79.95
APO-1 (for Apple II®)*
W/Turntbl: $89.95 WO/Turntbl: $69.95
*differs from display

PRINTER STAND
Built in paper feeder makes this stand efficient; oak veneer and smoked acrylic lid make it attractive. Buy all three pieces to complete this classic set.

PS-17	17" stand	$44.95
PS-24	24" stand	$54.95

VISA/MasterCard
Unconditional 30 day guarantee

ORGANIZE YOUR POWER

CALL NOW!

(TOLL FREE) **800-258-7862.** (IN CA CALL COLLECT) **714-652-1232.**

Dealer Inquiries Invited.

Complete line of computer hardware and software available. Call for our catalog.

COMPUTER POWER INT'L.
1779 East Florida • Hemet, CA 92343

programming contest with prizes are planned. Computer buffs not attending the conference may participate by submitting original programs for publication consideration in the *Conference Proceedings* and for a prize competition. Such programs should be submitted on the official forms. For further information, send an SASE to Show & Tell, Dr. Richard V. Andree, 601 Elm, Room 423, Norman, OK 73019; (405) 325-3410.

May 24-26, Palo Alto, California. A three-day course, "Microprocessor Background for Management Personnel." Instructor: James Arlin Cooper, Sandia Laboratories. Fee: $565, including text and program materials. Information/sponsor: Continuing Education in Engineering, Dept. 532N, University of California Extension, 2223 Fulton St., Berkeley, CA 94720; (415) 642-4151.

June 9-11, Watertown, CT. Hands-on workshop, Microcomputers in Education, sponsored by Technical Education Research Centers (TERC). The workshops are designed for teachers and administrators at all levels. Topics include microcomputers in math and science instruction, Logo, Pascal, BASIC, machine language, and microcomputers and the education of special needs students. For information, contact Ms. Sharon Woodruff, Director of Training Services, TERC, 8 Eliot St., Cambridge, MA 02138; (617) 547-3890.

June 14-16, Washington; July 12-14, Los Angeles. Technology Opportunity Conference (TOC), covering the convergence of optical storage, videodisk, and computer technology. Sponsored by the publisher and editors of *Optical Memory Newsletter Including Interactive Videodisks*. For further information, contact Ed Rothchild, TOC, P.O. Box 14817, San Francisco, CA 94114; (415) 626-1133.

June 18, University of Wisconsin-Madison. Microcomputers in Education Conference, sponsored by the Wisconsin Center for Education Research, a non-instructional department of the School of Education, University of Wisconsin-Madison. The conference will explore issues and applications of microcomputers in elementary and secondary schools. Contact Suzanne L. Zemke, WCER, Room 785A, 1025 West Johnson Street, Madison, Wisconsin 53706; (608) 263-4200.

July 20-22, and July 25-27, Eugene Hilton and Convention Center, Eugene, Oregon. Two summer conferences, sponsored by the University of Oregon's College of Education. July 20-22: Computers – Extension of the Human Mind II, an expansion of last summer's conference "computers in education" theme, with a look at specific classroom applications and current research in the field. July 25-27: Education for the Gifted – Patterns for the Future, emphasizing future directions, issues, and potential of education for the gifted. Fees: $95 each, or both for $175. For further information, contact: Summer Conference – 1983, College of Education, University of Oregon, Eugene, Oregon 97403; (503) 686-3405.

COMPUTE! *welcomes notices of upcoming events and requests that the sponsors send a short description, their name and phone number, and an address to which interested readers may write for further information. Please send notices at least three months before the date of the event, to: Calendar, P.O. Box 5406, Greensboro, NC 27403.*

New Product releases are selected from submissions for reasons of timeliness, available space, and general interest to our readers. We regret that we are unable to select all new product submissions for publication. Readers should be aware that we present here some edited version of material submitted by vendors and are unable to vouch for its accuracy at time of publication. ©

SECTOR 1

COMPUTER SOFTWARE

SPECIALS?
NO, THESE ARE OUR EVERYDAY LOW PRICES

D = Disk C = Cass R = Cart.
Prices Subject to Change
Send for Free Catalog

APPLE II®

	LIST PRICE	OUR PRICE
ARTSCI		
Magic Window II (d)	149.95	103.50
BEAGLE BROTHERS		
Pronto DOS (d)	29.95	19.50
Apple Mechanic (d)	29.50	19.50
Typefaces (d)	20.00	13.25
CONTINENTAL		
Home Accountant (d)	74.95	49.50
Tax Advantage (d)	59.95	39.50
1st Class Mail (d)	74.95	49.50
DATASOFT		
Zaxxon (d)	39.95	26.50
KENSINGTON MICROWARE		
System Saver	89.95	66.00
PENGUIN		
Complete Graphics System II (d) (paddle version)	69.95	46.25
Special Effects (d)	39.95	26.50
Graphics Magician (d)	59.95	39.50
SENSIBLE SOFTWARE		
Super Disk Copy III (d)	30.00	19.75
Sensible Speller (d)	125.00	82.50
Multi Disk Catalog III (d)	25.00	16.50
SIR-TECH		
Wizardry (d)	49.95	33.00
Knight of Diamonds (d)	34.95	23.00
Legacy of Llyglamyn (d)	39.95	26.50

AND MUCH MORE

PHONE ORDERS:
1-800-637-3095
IL, AK, & HI Call:
1-217-367-5774
HRS.: 9-6 MON.-SAT.

MAIL ORDERS TO:
SECTOR ONE
1001 BRIGHTON
URBANA, IL 61801

Add $2.00 for postage and handling within the continental United States. Add $4.00 for Canada or Mexico, $6.00 for Alaska or Hawaii, and $10.00 for other international orders ● Mastercard and Visa orders add 4% service charge (include card # and exp. date) ● Personal checks and M.O. also accepted ● Illinois residents add 5% sales tax ● Please specify computer type ● MOST ORDERS SHIPPED WITHIN 24 HRS ● All orders must be in U.S. funds.

Apple is a registered trademark of Apple Computer Inc.
Atari is a registered trademark of Atari, Inc.

ATARI®

	LIST PRICE	OUR PRICE
ADVENTURE INT'L		
War (d)	24.95	16.50
Diskey (d)	49.95	33.00
Bug Off (d/c)	29.95	19.75
Stratos (d/c)	34.95	23.00
ATARI		
Qix (R)	44.95	32.00
Dig Dug (R)	44.95	32.00
ET Phone Home (R)	49.95	35.75
AVALON HILL		
Empire of the Overmind (d/c)	35.00	23.25
Voyager (d/c)	25.00	16.50
GFS Sorceress (d/c)	35.00	23.25
BIG FIVE		
Miner 2049er (R)	49.95	33.00
CONTINENTAL		
Home Accountant (d)	74.95	49.50
Tax Advantage (d)	59.95	39.50
DATASOFT		
Micro Painter (d)	34.95	23.00
Graphic Master (d)	39.95	26.50
Graphic Generator (d)	24.95	16.50
Zaxxon (d/c)	39.95	26.50
SYNAPSE		
Flame Lords (d/c)	34.95	23.00
Drelbs (d/c)	34.95	23.00
Necromancer (d/c)	34.95	23.00
Shadow World (d/c)	34.95	23.00

AND MUCH MORE

RCE INVITES YOU TO SAVE UP TO 40%

COMPARE: OUR PRICES OUR SERVICE

RALSTON-CLEARWATERS ELECTRONICS
536 N.E. "E" Street • Grants Pass, Or. 97526
ALL BRAND NAMES ARE REGISTERED TRADE MARKS
FOR PRODUCT INFORMATION CALL (503)479-4711

THEN: ORDER TOLL-FREE 800-547-2492

IN OREGON CALL (503) 479-4711

SPECIAL! 64K COMPUTER WITH PRINTER — $1929 CALL FOR DETAILS!!

NEW PRODUCTS: 1. Commander 2400... Top quality detachable standard keyboard & keypad for your Atari 400 or 800 - From $109 to $199. 2. Run TRS-80 drives on your Apple without modification. New TRS-APPLE Interface. 3. Visicalc® Keypad for your Apple® Available soon!!!

COMMODORE 64 — $459 DRIVE — $359

LOOK AT THIS !!! NOW, NEW AND EVEN LOWER PRICES
PLUS . . . . TAKE 3% OFF THESE PRICES FOR PRE-PAYMENT!

		LIST PRICE	OUR PRICE
ATARI	400 (16K)	~~$OPEN~~	$229
	800 (48K)	~~$679~~	$498
EPSON with GRAFTRAX +	MX - 80	~~$645~~	$439
	MX - 80FT	~~$745~~	$539
	MX - 100	~~$995~~	$689
I.D.S.	Prism 80 w/color	~~$1795~~	$1329
	Prism 132 w/color	~~$1995~~	$1549
FOURTH DRIVES	1 yr. warranty		$279
Controller - w/Apple 3.3 DOS			$89

ATARI HARDWARE	
400 16K Computer	$229
800 48K Computer	$498
CX-853 16K Ram Cartridge	$ 79
410 Program Recorder	$ 75
810 Disk Drive	$429
850 Interface Module	$165
830 Modem	$149
820 40 Col Printer	$249
822 80 Col Thermal Printer	$339
825 80 Col Printer	$569
CX-30 Game Paddles	$ 19
CX-40 Joystick	$ 10
CX-40-4 Joysticks Pair	$ 19
Pointmaster Stick	$ 14
Epson Printer Cable	$ 29
Video & Audio Cable	$ 27
LeStick RAF Style Joystick	$ 36
Micro Tek 32K Ram Card	$ 99
Full-View 80-Column Card	$299
PERCOM	
Atari Single Density	$449
Atari Double Density	$599

APPLE HARDWARE	
MICRO SCI	
A2	$309
A40	$339
A70	$459
Controller: A2 3.2, 3.3 & Self Check	$ 79
A40 or A70	$ 89
RANA	
Elite I	$319
Elite II	$499
Controller: Four Drives	$109
INTERFACE CARDS	
16K RAM CARDS	
ALS	$ 89
MPC AP-16	$149
Microtek BAM-1	$ 99
Microsoft	$ 79
Promethius	$139
80 COLUMN CARDS	
M & R Sup-r-term	$249
Videx	$239
ALS Smart-term	$259
MULTI-FUNCTION CARDS	
Mountain CPS	$139
Promethius	$149
MISCELLANEOUS	
Alien Voice Box:	
with Rom	$149
without Rom	$ 99
Cool Stack w/fan	$ 69
Expand-A-Port TG	$ 45
Graphics Tablet by Versawriter	$289
Joysticks:	
Muse TG	$ 45

Kensington:	
System Saver	$ 69
Keypad ABT 15 key	$129
Paddles:	
Muse TG	$ 29
Sup-r-fan	$ 36
Universal Modulator	$ 59
MISCELLANEOUS CARDS	
CCS:	
Math Proc. 7811	$339
Ser/Int 7710-A	$129
Ser/Int 7710-D	$129
Timer 7740	$109
Cent/Par 7728	$119
MPC:	
Par/Prtr AP-80	$ 79
32K Ram AP-32	$179
Microsoft:	
Premium Pak	$499
Z-80 Card	$239
Mountain Computer:	
A/D Converter	$269
Clock/Calendar	$239
Exp Chassis	$569
Introl/BSRX-10	$179
Kbd Filter Rom	$ 49
Music System	$309
Romplus	$179
Romwriter	$159
Supertalker	$159
Videx:	
Function Strip	$ 69
Enhancer II	$119
Soft Switch	$ 27
MONITORS	
GREEN SCREENS	
BMC 12 inch	$ 89
Zenith 12 inch	$ 99
JCS 12 inch	$145
Sanyo 12 inch	$205
BLACK & WHITE	
Sanyo 9 inch	$145
Sanyo 12 inch	$189
AMBER SCREEN	
JCS	$159
USI	$169
Amdek	$ 79

COLOR	
Amdek Color I	$349
Sanyo 13 inch	$385
MODEMS	
Atari 830	$149
Anchor	$ 79
HAYES	
Chronograph	$195
Micromodem	$269
Smartmodem	$209
1200 Baud Smartmodem	$529
BIZCOMP	
Modem	$139
NOVATION	
Apple Cat II	$289
Auto Cat	$209
Cat	$144
D Cat	$159
212 Apple Cat	$649
UDS 212A	$539
PRINTERS	
IDS	
Micro Prism	$599
Prism 80 w/out Color	$849
With Color!!!	$1329
Prism 132	$1549
OKIDATA	
80	$330
82A	$419
83A	$699
84 Parallel	$1069
92 Parallel	$529
93 Parallel	$949
STAR MICRONICS	
Gemini 10	$CALL
Gemini 15	$CALL
BROTHER	
Letter Quality Serial	$899
Letter Quality Parallel	$799
SMITH CORONA	
Letter Quality	$599
INTERFACES	
Parl. & Cable	$ 69
Apple Dumpling	$129
Grappler +	$139
MicroBuffer 16K	$209
MicroBuffer 32K	$229

PRICES SUBJECT TO CHANGE WITHOUT NOTICE

TERMS:
SHIPPING: Add 6% of total transaction for UPS brown (ground) or 9% for UPS blue (air), Parcel Post, or any special arrangements. Minimum shipping charge - $6.00
PAYMENT: Cashier's checks, certified checks, money orders, and bank wires honored immediately. Visa & Master Charge accepted. Allow 20 days for personal checks to clear.
REFUNDS: 10% restocking charge on all returns or exchanges. No refunds on opened software. Call first.
GUARANTEE: All products with full manufacturer's warranty. Sanyo and Apple warranty available. We have full repair and service facilities for all electronic repairs with HP, Dynascan, Pioneer, Sanyo and Apple trained and certified technicians. For any technical service call them for instant advice or questions right on their benches at (503) 479-4150.
REPAIRS: Call for details on quality guaranteed discount repair and reconditioning service.
We have been repairing electronic equipment for 12 years and love it!

* NO SALES TAX IN OREGON!

LIKE OUR PRICES? SEND FOR OUR CATALOG!
CALL FOR COMPLETE LINE OF SOFTWARE

HARMONY VIDEO & ELECTRONICS

2357 Coney Island Ave.
Brooklyn, New York 11223
212-627-6989

Hours: Sun. 10 - 4
Mon.-Thurs. 9 - 6
Fridays 9 - 2

COMPUTERS
To Order Call Toll Free
800-221-8927

COMMODORE

VIC 20	139.95
COMMODORE 64	369.95
VIC C2N DATASETTE	64.95
1540 DISC DRIVE (VIC 20)	279.95
1541 DISC DRIVE (64)	299.95
1525P PRINTER	289.95
COMMODORE MONITOR	269.95
VIC TELEPHONE MODEM	89.95
RS 232 TERMINAL INTERFACE	42.95
IEEE-488 INTERFACE	86.95
VIC 8K MEMORY PAC	36.95
VIC 16K MEMORY PAC	79.95
MOTHER BOARD	89.95
VIC 3K SUPER EXPANDER	52.95
VIC PROGRAMMERS AID	42.95
VIC MON	43.95

ATARI

ATARI 400 W16K	189.95
ATARI 800 W48K	489.95
ATARI 410 RECORDER	59.95
ATARI 810 DISC DRIVE	399.95
ATARI 830 ACOUSTIC TEL. MODEM	139.95
ATARI 850 INTERFACE	129.95
ATARI 822 THERMOL PRINTER	269.95
ATARI 16K MEMORY EXPANDER	59.95

PRINTERS

OKIDATA 82A	229.95
CENTRONICS 1	589.95
EPSON MX80FT	429.95
NEC 8023A	439.95

INTERFACE MODULE

SERIAL INTERFACE	139.95
PARALLEL INTERFACE	149.95
RS232 CABLE	36.95
VIDEO AUDIO CABLE	26.95

MONITORS

AMDEK COLOR 1	319.95
ZENITH 9"	99.95
BMC 13" COLOR	279.95
PANASONIC 16" COLOR	329.95
HAYES SMARTMODEM	199.95
DISC DRIVE FOR ATARI	689.95
DISC DRIVE FOR COMMODORE 64	699.95

WE CARRY ALL BRANDS OF PERSONAL COMPUTERS AT FRIENDLY PRICES. WE "STOCK" ALL MAJOR BRANDS OF VCR, VHS, BETA HOME VIDEO EQUIPMENT. VIDEO TAPE-VHS & BETA; SONY T.V. AT THE GUARANTEED LOWEST PRICES IN U.S.A.

LOWEST PRICES IN COUNTRY

TO ORDER SIMPLY DIAL TOLL FREE 800-221-8927 OR (212) 627-6989 WITH YOUR MASTER CARD OR VISA. OR SEND CERTIFIED CHECK OR MONEY ORDER TO HARMONY VIDEO & ELECTRONICS, 2357 CONEY ISLAND AVENUE, BROOKLYN, N.Y. 11223. ADD APPROXIMATE SHIPPING & HANDLING. CUSTOMER SERVICE (212) 627-8960. ALL PRICES & AVAILABILITY SUBJECT TO CHANGE WITHOUT NOTICE. ALL ORDERS SHIPPED OUT OF STATE WITH NO SALES TAX.

$$$ SAVE TIME & MONEY $$$

★★★★★★★★★★★★★★★

HANNA ENTERPRISES

1303 COLUMBIA, SUITE 207
RICHARDSON TEXAS 75081

★★★★★★★★★★★★★★★

TO ORDER CALL
(214) 231-2645

Master Card & Visa
add 3% surcharge for
credit cards

F.O.B. Dallas, Texas

★★★★★★★★★★★★★★★
★★★★★★★★★★★★★★

COMMODORE

COMPUTERS
COMPUTERS
COMPUTERS

COMMODORE

NEW

B-500 (128)	**$795.00**
P-500 (128)	**$795.00**
8032	**$1,004.64**
64	**$389.35**

DRIVES
DRIVES
DRIVES

COMMODORE

MONITORS COLOR & SOUND
NEW $239.00

8250	2mg.	**$1,292.40**
8050	1mg.	**$932.50**
1541	170k	**$356.40**
1530	DATASETTE	**$63.00**

PRINTERS
PRINTERS
PRINTERS

8300	**$1,436.40**
8023	**$572.40**
1526	**$317.97**

CENTURY MICRO PRODUCTS

***** SUPER DISCOUNTS *****

APPLE	RETAIL	OUR PRICE
ASHTON—TATE		
dBase II (IBM or CP/M)	700.00	449.00
BRODERBUND		
Choplifter	34.95	25.00
Serpentine	34.95	25.00
Arcade Machine	54.95	40.00
CONTINENTAL		
The Home Accountant	74.95	51.00
1st Class Mail/Form Letter	99.95	69.00
EDU-WARE		
Compu-Read	29.95	22.00
Spelling Bee w/Read. Prim.	39.95	30.00
INFOCOM		
Zork I	39.95	29.00
Zork II	39.95	29.00
Zork III	39.95	29.00
MICROSOFT		
Multiplan	275.00	189.00
MUSE		
Castle Wolfenstein	29.95	23.00
ON-LINE		
ScreenWriter II	129.95	85.00
Frogger	34.95	24.00
General Manager	229.95	161.00
Ultima II	59.95	42.00
SORCIM		
SuperCalc	295.00	180.00
SOFTWARE PUBLISHING CORP		
PFS: File	125.00	88.00
PFS: Report	95.00	65.00
PFS: Graph	125.00	88.00
PFS: File/Report/Graph	345.00	235.00
SPINNAKER		
Snooper Troops 1	44.95	32.00
Snooper Troops 2	44.95	32.00
Story Machine	34.95	25.00
Face Maker	34.95	25.00
STONEWARE		
D.B. Master	229.00	155.00
VISICORP		
VisiCalc	250.00	175.00
VisiTrend/Plot	300.00	210.00
VisiFile	250.00	175.00
APPLEHARDWARE		
Kraft Joystick	64.95	49.00
T G Joystick	59.95	45.00
T G Game Paddles	39.95	30.00
Kensington System Saver Fan	89.95	69.00
Verbatim Diskettes/10	49.00	30.00
Hayes Micromodem II	379.00	265.00
Hayes Micromodem II w/Term. prog.	409.00	299.00
Amdek Color I Monitor	499.00	339.00
Amdek Color II Monitor	889.00	749.00
ATARI		
APX		
Family Cash Flow	22.95	17.75
Video Math Flash Cards	15.95	12.50
ATARI INC.		
Centipede	44.95	32.00
Defender	44.95	32.00
E.T. Phone Home	49.95	38.00
Galaxian	44.95	32.00
Home Filing Manager	49.95	36.00
My First Alphabet	34.95	26.00
PILOT (Home Package)	79.95	59.00
BRODERBUND		
Choplifter	34.95	25.00
Serpentine	34.95	25.00
DATASOFT		
Canyon Climber	29.95	22.00
Spell Wizard	79.97	59.00
EDU-WARE		
Compu-Read	29.95	22.00
Compu-Math/Fractions	39.95	30.00
Compu-Math/Decimals	39.95	30.00
INFOCOM		
Deadline	49.95	34.00
Zork I	39.95	27.00
Zork II	39.95	27.00
Zork III	39.95	27.00
ON-LINE		
Frogger	34.95	23.00
Ultima II	59.95	39.00
ROKLAN		
Gorf	39.95	29.00
SPINNAKER		
Snooper Troops 1	44.95	32.00
Snooper Troops 2	44.95	32.00
Story Machine	34.95	25.00
Face Maker	34.95	25.00
WICO		
Joystick	29.95	21.00
Trackball	69.95	52.00

Many more products available for
APPLE, IBM, CP/M, ATARI, COMMODORE & TRS-80
Write or call for free catalog

TO ORDER CALL 1-714-951-5596
8:00 A.M.—8:00 P.M. PST
Monday-Saturday
Orders credited for call. Prices subject to change.
Visa/Mastercard add 3%
Personal checks allow 2 weeks to clear.
CA residents add 6% sales tax.
Shipping and handling add $3.00 (hardware extra).
CENTURY MICRO PRODUCTS
P.O. Box 2520
Mission Viejo, Ca. 92690

www.commodore.ca

CAPUTE!

Modifications Or Corrections To Previous Articles

Atari Boggler

In the Atari version of this game (Program 2, p. 84) from the March 1983 issue, in line 870 the "OK" is missing from the third POKE statement.

Direct Atari Disk Access

Two changes are required to Program 3 from this article, which appeared on page 154 of the March 1983 issue. The " {CLEAR" within brackets in lines 30 and 40 should be removed. The {11 M} means type CTRL-M eleven times. The {4 DEL-LINE} means type ESCape-SHIFT-DELETE four times.

Atari Menu Printer

If a file name takes the maximum eight characters plus a three character extension, this program from the March 1983 issue (p. 165) will produce an ERROR 5 at line 780. To correct this, DIMension S$ to 14 instead of 13 in line 130.

Atari Lister

In addition to the changes to this program (January 1983 issue, p. 191) given in last month's CAPUTE!, it is also necessary to change the :FOR X=0 TO T: in line 32710 to :FOR X=1 TO T:

To avoid an ERROR 9 message, change line 32700 to

```
32700 T=0:TRAP 32705:DIM A$(5)
```

and add TRAP 40000: to the beginning of line 32705.

Apple Disk Space Messages

In certain circumstances, it is possible that this program from the January 1983 issue (p. 56) can cause DOS to wipe out the catalog for a disk. Donald Box suggests adding the following two lines to eliminate this danger:

```
35 L = PEEK(72): H = PEEK(73)
120 POKE 72,L: POKE 73,H: NEW
```

VIC Micromon

The following corrections to the Micromon code published in the November 1982 issue (p. 172) will solve the problems with disk access. (The changes are given in hexadecimal.)

LOCATION	OLD DATA	CORRECT DATA
4002	12	15
4013	19	F9
4014	43	FD
4319	20	00
431A	F9	00
431B	FD	00

©

COMPUTE! Back Issues

Here are some of the applications, tutorials, and games from available back issues of **COMPUTE!**. Each issue contains much, much more than there's space here to list, but here are some highlights:

February 1981: Simulating PRINT USING, Using the Atari as a Terminal for Telecommunications, Attach a Printer to the Atari, Double Density Graphing on C1P, Commodore Disk Systems, PET Crash Prevention, A 25¢ Apple II Clock.

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.

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, QuadraPET: Multitasking?

July 1981: Home Heating and Cooling, Animating Integer BASIC Lores 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, The Voracious Butterfly on OSI.

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.

October 1981: Automatic DATA Statements for CBM and Atari, VIC News, Undeletable Lines on Apple, PET, VIC, Budgeting on the Apple, Switching Cleanly from Text to Graphics on 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: versions for Apple, PET, and Atari), Unscramble Game (multiple computers), Maze Generator (multiple computers), Animating Applesoft Graphics, A Simple Printer Interface for the Apple II, A Simple Atari Wordprocessor, Adding High Speed Vertical Positioning to Atari P/M Graphics, OSI Supercursor, A Look At SuperPET, Supermon for PET/CBM, PET Mine Maze Game.

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.

February 1982: Insurance Inventory (multiple computers), Musical Transposition (multiple computers), Multitasking Emulator (multiple computers), Disassemble Apple Programs from BASIC, Plotting Polar Graphs on Apple, Atari P/M Graphics Made Easy, Atari PILOT, Put A Rainbow in your Atari, Marquee for PET, PET Disk Disassembler, VIC Paddles and Keyboard, VIC Timekeeping.

March 1982: Word Hunt Game (multiple computers), Infinite Precision Multiply (multiple computers), Atari Concentration Game, VIC Starfight Game, CBM BASIC 4.0 To Upgrade Conversion Kit, Apple Addresses, VIC Maps, EPROM Reliability, Atari Ghost Programming, Atari Machine Language Sort, Random Music Composition on PET, Comment Your Apple II Catalog.

April 1982: Track Down Those Memory Bugs (multiple computers), Shooting Stars Game (multiple computers), Intelligent Input Subroutines (multiple computers), Ultracube for Atari, Customizing Apple's Copy Program, Using PET/CBM In The High School Physics Lab, Grading Exams on a Microcomputer (multiple computers), Atari Mailing List, Renumber VIC Programs The Easy Way, Browsing the VIC Chip, Disk Checkout for PET/CBM.

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 Artifacting, Life Insurance Estimator (multiple computers), PET Screen Input, Getting The Most Out Of VIC's 5000 Bytes.

June 1982: Outpost Game (multiple computers), Apple Pascal Lister, Income Property (multiple computers), VIC Intelligent Videodisc System, Atari Disk Operating Systems, PET/Apple Search, A Self-modifying Atari P/M Utility, Use Atari Joysticks with VIC, VIC/PET Program Transfers.

July 1982: Gold Miner Game (Atari and VIC), IRA Planner (multiple computers), Atari Video Graphics, Apple DOS Changer, Super QuadraPET, VIC Overview, Maze Race (multiple computers), Direct Access File Editor (PET and Atari), VIC Super Expander Memory Map, Using The 6560 Video Interface Chip, PET Compactor, Headless FORTH Metacompilation, Test RAM Nondestructively (multiple computers).

August 1982: The New Wave Of Personal Computers, Household Budget Manager (multiple computers), Word Games (multiple computers), Color Computer Home Energy Monitor, Intelligent Apple Filing Cabinet, 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, Color Computer Graphics, The Apple Pilot Language, Sprites and Sound on the Commodore 64, Peripheral Vision Exerciser (multiple computers), Banish INPUT Statements (multiple computers), Charades (multiple computers), PET Pointer Sort, VIC Pause, Mapping Machine Language, Editing Atari BASIC With the Assembler Cartridge, Process Any Apple Disk File.

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

Back issues are $3 each or six for $15. Price includes freight in the US. Outside the US add $1 per magazine ordered for surface postage. $4 per magazine for air mail postage. All back issues subject to availability.

In the Continental US call
TOLL FREE 800-334-0868
(In NC Call 919-275-9809)

Or write to **COMPUTE!** Back Issues, P.O. Box 5406, Greensboro, NC 27403 USA. Prepayment required in US funds. MasterCard, Visa and American Express accepted. North Carolina Residents add 4% sales tax.

PRODUCT MART

VIC & 64

BE A COPY C.A.D.
(CASSETTE AIDED DUPLICATOR) NOW YOU CAN MAKE BACKUP COPIES OF ALL THE COSTLY, NON-SAVEABLE CASSETTE PROGRAMS YOU BOUGHT.

OUR BACKUP V1.0 UTILITY PROGRAM WILL LET YOU MAKE DUPLICATES THAT RUN.

BACKUP V1.0 WILL WORK WITH A STANDARD 5K UNEXPANDED VIC. MEMORY EXPANSION IS REQUIRED TO COPY PROGRAMS LONGER THAN 3K BYTES.

$24.95

PLUS $2.00 SHIPPING & HANDLING

CENTER LINE MFG. INC.

P.O. BOX 205
MILFORD SQUARE, PA 18935
(215) 536-2135

VISA, MASTERCARD, AND MONEY ORDERS
PA. RESIDENTS ADD 6% SALES TAX.

VIC IS A TRADEMARK OF COMMODORE

LARGEST SELECTION OF COMPUTER BOOKS ON THE EAST COAST

Books shipped within 24 hours
Toll-free order line
Retail discounts + terms
Individual orders accepted
(prepayment required)

We stock the latest books from:

Addison-Wesley
Alfred
Arcsoft
Ballinger
Birkhauser
Brady
William C. Brown
CBI
Chilton
Compusoft
Compute!
Creative Computing
Design Enterprise
Dilithium
W.H. Freeman
Harper & Row
Hayden
McGraw-Hill
Osborne
Que
Howard W. Sams
Sybex
TAB
Weber
John Wiley

Call or write for our complete catalog

THE BOOK CARRIER

9121 Industrial Court • Gaithersburg, MD 20877
301/258-1177 800/638-4108

Wasting Money? We Have the World's Most Cost Effective Development System.

- Includes Hexkit 1.0, a powerful 100% machine code editor/debugger utility program that makes coding for 8-bit Micros a snap.
- Program from Commodore VIC-20 keyboard into built-in 4K ROM emulator
- Jumper to target ROM socket
- Test programs in circuit
- Built-in EPROM programmer and power supply
- Burns & runs EPROMS for the Commodore VIC-20, too
- Comprehensive manuals
- Fits EXPANSION PORT

Send for Free Brochure

VISA AND MASTERCARD ACCEPTED

PROMQUEEN CARTRIDGE ONLY $199 U.S. $269 CAN.

+ Prices	U.S.	Can.
Promqueen 64	$299.00	$399.00
8K board w/ 1 Eprom	$ 29.95	$ 39.95
16K board w/ 1 Eprom	$ 39.95	$ 49.95
8K ROM board w/ 1 Eprom-C64	$ 39.95	$ 49.95

Distributed in U.S. by **Arbutus Total Soft, Inc.**
4202 Meridian, Suite 214
Bellingham, WA 98226
Ph. 800-426-1253, in Washington 206-733-0404

Distributed in Canada by
IBC/Distribution Canada
4047 Cambie St., Vancouver, BC V5Z 2X9
Ph. 604-879-7812

FOR ATARI®

Specialty Software

ZIZA PRESENTS

Educational Programs

• CHRISTIAN SIGNS & SYMBOLS in colorful graphics. Latin & Greek crosses, Sign of the Fish, Chrismon, Monogram of Jesus. Many more. Music. Excellent for home study or Church. Tape 16K 14.95. Disk 24K 16.95

• THE STORY OF CREATION as it is in the Book of Genesis. Text in King James version. Learn original Hebrew words. High res graphics. Over forty frames! Creation of Man in animation. A learning experience. Disk only. 48K 19.95

Ziza Presents Inc.
2257 Independence
Ann Arbor, MI 48104
Check or money order
Michigan residents add 4% tax
Atari TM of Atari Inc.

VIC-20

CASSETTE SOFTWARE FOR THE STANDARD VIC

MODULAR MUSIC _ _ _ $20.00
Easy compose & edit.
Save to tape too!

MICRO-SYNTH_ _ _ _ _ $15.00
Scales, octaves, envelopes

EL-CALC _ _ _ _ _ _ _ _ $15.00
Simplify circuit design

DEMO-VIC _ _ _ _ _ _ _ $10.00
A useful program for all VIC owners

(plus $1.50 postage & handling)
N.Y.S. Residents add 7% Sales Tax

Dealer Inquiries Invited.

Send check or money order to:

Suburban Electronics
6224 Transit Rd., Depew, N.Y. 14043

*VIC-20 is a reg. trademark of Commodore Business Machines, Inc.

VIC-20
COMMODORE 64
APPLE II
THE RECIPE BOX

Now you can easily store and recall your favorite recipes on your Commodore or Apple computer. THE RECIPE BOX is a complete menu-driven disk system that comes with these additional features:

SEARCH BY INGREDIENT — Only have a pound of hamburger in the freezer? Let THE RECIPE BOX show you all the recipes that you have on file that use hamburger, or any other ingredient you choose.

SEARCH BY CATEGORY — Code your recipes as to breakfast, lunch, dinner, snacks, etc.

SEARCH BY CATEGORY/INGREDIENT — Any combination of the above.

AUTOMATIC MEASUREMENT — THE RECIPE BOX will automatically scale up or down the amount of ingredients you need according to how many servings you want.

SCREEN OR PRINTED OUTPUT — Have printed copies to use in the kitchen or give to friends.

THE RECIPE BOX requires one disk drive and will run on a 5K VIC-20, Commodore 64 or Apple II+. Please specify. Send check or money order for $19.95 to:

Aries Marketing Co.
P.O. Box 4196
4200 Shannon Drive
Baltimore, Md. 21205
Md. residents add 5% sales tax

Now! ***THE MOST COMPLETE LIST OF EDUCATIONAL COLOR COMPUTER™ PROGRAMS IN THE UNITED STATES***

Only ***$6.00*** *per cassette*

A partial list —

- Add
- Algebra
- Alphabet
- Planetary Positions
- Flash cards for German, French, Spanish, States and Capitals
- Biology
- Weather Forecaster
- Physics

Programs for — TRS 80 Color Computer, VIC 20, Atari 400, Timex-Sinclair

Many more! From Kindergarten through graduate courses. All cassettes $6.00 each. Write for free list.

MOSES ENGINEERING COMPANY
P. O. Box 11038 • Ardmore Hwy. Station
Huntsville, Alabama 35805
(205) 837-3356

SOFTWARE COMMODORE 64

The Staff: Polyphonic Music Editor & generator. Enter up to 93 measures of 3 part harmony on easy to use graphic display. Disk: $22.95 for 64, $17.95 for VIC. Tape: $19.95 for 64, $14.95 for VIC. Add $1.50 for Postage and Handling. Check or Visa, Master Card accepted.

We have a large selection of software for the 64—Word Processors, Data Base, Mailing List, Accounting Package, Spread Sheet, Educational Applications, Home and Personal Record Keeping, Programmers Aids, Games.

ASK FOR FREE CATALOG

PROFESSIONAL MICRO SERVICE

100 W. 22nd St., P.O.B. 7268

Baltimore, Md. 21218

301-366-0010

Dealer inquiries invited.

Commodore 64 is a registered trademark of Commodore Business Machines.

VIC-20?
Stock Portfolio?

Do you know todays value of your portfolio?
Do you know the profit or loss on your portfolio?

Get it together with:

"Portfolio Manager"

Requires 16K RAM Expansion
Program on Cassette Tape: **$29.95**

Stock	# Shares	Cost / Share	% Change	Dollar Change
IBM	200	97¾	18.5	3,616.75
GM	100	95⅝	29.3	2,801.08

SEND CHECK OR MONEY ORDER TO:

BASIC BYTE, INC.

P.O. BOX 924, SOUTHFIELD, MI 48037-0924

Phone Orders: 1-800-835-2246 Ext. 237
Kansas Residents: 1-800-362-2421 Ext. 237

VISA AND MASTERCARD ACCEPTED
Michigan Residents add 4% Sales Tax.

- DEALER INQUIRIES INVITED -

New! Unique! Joy Stick Holder

TRAY APPROX 10" x 17" — JOY STICK NOT INCLUDED

Only $9.95 each

*For use on - Atari 400/800. Vic-20 Computer. Radio Shack. Texas Instruments. Sears Video Arcade & Atari VCS

- *Greater Accuracy
- *Reduces Fatigue
- *Just Snap in Place
- *Real Arcade Action
- *Higher Scoring
- *Rests on lap

DEALER INQUIRIES INVITED

Send check or money order for $9.95 + $2.00 (Postage and Handling) - Total $11.95 each.

TO: **TREND-TEK CORP.**
P.O. Box 1393, N. Miami Beach, FL 33160-1393

PLEASE PRINT

Enclosed is my check for $ ____________

Please send me ____________ Joy Stick Holders.

Name ____________

Address ____________

City ____________ State ____________ Zip ______

TRAY COLOR MAY VARY SORRY NO C.O.D.'s

VIC-COMMODORE-HOBBYIST

VIC 20 4 slot expander board	$44*
COMMODORE 64 7 slot expander board	$69*
VIC 20 24 static RAM with slots for up to 8K EPROM	$159*
COMMODORE 64 EPROM card slots for up to 4 2732 EPROMs	$59*
VIC 20/COMMODORE 64 300 baud modem with terminal emulator software	$89*
8085 based CRT electronics	$249*

*plus shipping and handling
Washington residents add sales tax

To order: phone toll free
1-800-858-8020

BAZ Electronics
P.O. Box 4895 Federal Way, WA 98003
(206) 874-3029

VISA MasterCard

TIMEX SINCLAIR 1000
SINCLAIR ZX81 SOFTWARE

CALL OR WRITE FOR FREE CATALOG

SOFTSYNC, INC.

14 E. 34th St. NY, NY 10016
212-685-2080

Intelligent Software For All Commodore Computers

Copycalc is an affordable electronic spreadsheet which turns your video screen into a window on a matrix of numbers. Cursor around the matrix, enter numbers; the totals reflect the changes. You can save the matrix to disk or tape, or print it or your printer. For $20 ($15 with another program), this program might justify the cost of your computer. Requires 6k RAM; smaller version available for a standard VIC.

Word Processor Plus was not designed to be an expensive toy; it was designed solely to facilitate correspondence, for a wide range of personal and business uses, quickly and easily, with a minimum of training and frustration on the part of its user, and at the least possible cost, both in hardware and software. The most thoroughly tested, useable word processor available at anywhere near the price, $25; 10k RAM, printer req'd.; RS-232C version available for VIC and 64.

Also available: **Baseball Manager,** a sports-documentation program; and **Inventory,** a perpetual inventory control program for a small retail business (various reports, multiple vendors); $30 each; 10k RAM req'd., printer suggested.

Prices include documentation and shipping; Calif. residents add 6%. Please specify hardware configuration when ordering. Sorry, no games available.

William Robbins, Box 3745, San Rafael, CA 94912

new•new

Anadex ®
9500 Nylon
Replacement
Cartridge Ribbons*

Anadex ® 9500 Nylon Replacement Cartridges, manufactured by Aspen Ribbons, Inc., are now available for delivery.

Prices range from $6.75 to $13.00 depending on the quantity ordered. Colors are available, by special request, for an additional $2.00 per ribbon—choose from red, green, blue, brown, or purple.

Call or write for YOUR FREE CATALOGUE!

Aspen Ribbons, Inc. is not affiliated with Anadex, Inc.

Aspen Ribbons, Inc. 1700 N. 55th Street
Boulder, CO 80301-2796 (303)444-4054
End User Orders 800-525-0646
Wholesale Orders 800-525-9966 Telex 45-0055

(*) (/)

UNICALC

(-) (+)

SCIENTIFIC CALCULATOR
PROGRAM FOR

VIC-20

- CALCULATOR DISPLAY
- TWO MEMORY REGISTERS
- ARITHMETIC, TRIG, ETC.

5k, CASSETTE $7.95 + 75¢ SHIPPING
MN RESIDENTS ADD 6% TAX

ALLEGIANCE ENTERPRISES
P.O. BOX 8939
WHITE BEAR LAKE, MN 55110

LIST OF OTHER SOFTWARE FREE
DEALERS SOUGHT

C64 FORTH
for the
Commodore 64

Fig.-Forth implementation including:

- Full feature screen editor and assembler
- Forth 79 Standard Commands with extensions
- High resolution, 16 color character and sprite graphics
- Full I/O allowing IEEE cartridge and Basic data file compability
- Three voice tone and music synthesizer
- Detailed manual with examples and BASIC-FORTH conversions
- Trace feature for Debugging

$99.95 - Disk Version
(Works with 1540 or 1541 Disk)
or Cassette Version

(Commodore 64 is a trademark of Commodore)

PERFORMANCE MICRO PRODUCTS
770 Dedham Street, S-2
Canton, MA 02021
(617) 828-1209

LIFETIME WARRANTY

99⁹⁵

32k RAM FOR ATARI 400/800

- **Gold-plated edge connectors**
- **Compatability with Atari 400/800**
- **No blur**

Dealer Inquiries Invited

800-237-8931
In Fla.: 813-577-2794

Tech•Data Corporation
3251 Tech Drive North
St. Petersburg, FL 33702

www.commodore.ca

THE MAILER

A BUSINESS LIST AND LABEL PROGRAM FOR THE COMMODORE 64 COMPUTER. SUPPLIED ON DISK IN AN ATTRACTIVE 3 RING BINDER. **$38⁰⁰**

TORPEDO

YOU'RE COMMANDER OF THE ULTIMATE WAR MACHINE. A NUCLEAR SUBMARINE. DISK OR CASSETTE. **$25.00**

RUNWAY 64

A FLIGHT SIMULATOR GAME FOR THE COMMODORE 64* COMPUTER. CASSETTE OR DISK. **$25.00**

SUSIE SOFTWARE
709 WILSHIRE DRIVE
MT. PROSPECT, IL 60056
312/394-5165

*REGISTERED TRADEMARK OF COMMODORE BUSINESS MACHINES

VIAC

VIC INTERFACE to ANY CASSETTE

This adapter will allow you to connect most any audio cassette recorder to the VIC-20*, COM-64*, PET*, CBM* or any Commodore Computers that interface with the Datasette*. Although the VIAC is an alternative to the Datasette, it can be a powerful enhancement to your system providing new capabilities.

- Record verbal remarks directly on program tape, save memory space and run under program control.
- Selectable Read Write Polarity allows your cassette to be compatable with most any other cassette including the Datasette.
- Allows playback of audio tape to tape duplications made with another cassette. Much more! This is the original one as featured in the New Products section of COMPUTE! (Oct. 82). Other adapters do not have the features and capabilities of the VIAC. Still only $49.95

New! The VAAB: Video/Audio Adapter Box. This device in conjunction with the VIAC will allow you to playback the audio portions of your Vic & 64 tapes directly through the TV or monitor speaker and connect to Video Recorder input. Amaze your friends, add your own voice to your programs then play it back through TV speaker. Complete instructions included.

All this for only $24.95, Kit: $15.95, Plans only: $5.95.
Combo Special VIAC/VAAB $67.50.
Include $2.50 Shipping/order.
Check, money order, COD(+2.00), Visa/MC(+4%), Calif(+6% tax)

INTEGRATED CONTROLS
1240-L LOGAN AVE.
COSTA MESA, CA 92626

(714)641-0181
Dealer Inquiries Invited
***TM of Commodore**

Software For Commodore 64

COMPELLO..........	$15.95
DATAFILE..........	$15.95
FLIGHT 64........	$15.95
GUNSLINGER......	$15.95
LOAN CALC........	$ 9.95
SPACE CADET....	$15.95
SPELLATHON......	$19.95
SPRITE GEN......	$15.95

-Prices are for cassette, add $2 for disk version.
-Check, MO, or COD for total order plus $2 shipping.

See your dealer or order direct

FANTASY COMPUTERWARE
BOX 481
SIOUX FALLS, SO. DAK. 57101
(605) 335-7684

VIC-20 VIC-20 VIC-20
NO MORE CHECK WRITING
VIC-20 VIC-20 VIC-20

BILL WRITER/SUMMARY

BILL WRITER/SUMMARY was designed for home accounts on the VIC-20 COMPUTER. Four(4) options are provided ranging from viewing monthly account data/checks on the screen to printing monthly account data/checks. You can use your current personal checks. **NO SPECIAL CHECKS ARE NEEDED.** Accounts paid data can be written to tape for use with BILL SUMMARY to provide yearly summaries of accounts for tax purposes. Tape drive, extra 16K memory and 80 column printer required. To order, mail check you will use in printer to **UHL RESEARCH ASSOCIATES, INC.**, 7926 Berner St., Long Beach, CA 90808 for $49.95 plus $3.00 shipping.

Use the handy reader service cards in the back of the magazine for information on products advertised in

COMPUTE!

Verbatim® Diskettes

Top-quality Verbatim® Diskettes from **Tech•Data**, your complete word and data processing supply center. Dealer inquiries invited.

Call Toll Free
1-800-237-8931.
In Florida, call
813-577-2794.

Tech•Data Corporation
3251 Tech Drive North
St. Petersburg, FL 33702

FREE

Write for your free catalog of

Software and Books

for your
PET, VIC
and
Commodore 64

TIS, inc.
Box 921 Dept. C
Los Alamos, NM 87544

SOFTWARE SUPER SAVINGS

VIC-20

	TCE	LIST
SYNTHESOUND ...	42.99	59.95
VIC FORTH	42.99	59.95
APPLE PANIC ...	32.99	44.95
ASTROBLITZ	32.99	44.95
CHOPLIFTER	32.99	44.95
SERPENTINE	32.99	44.95
TERRAGUARD	32.99	44.95
VIDEOMANIA	32.99	44.95
PROTECTOR	30.99	43.95
DEMON ATTACK ..	26.99	39.95
FAST EDDY	27.99	39.95
HESWRITER	27.99	39.95
ROBOT PANIC ...	27.99	39.95
SHAMUS	27.99	39.95
TURMOIL	27.99	39.95
TURTLE GRAPHICS	27.99	39.95
DEADLY DUCK ...	24.99	34.95
6502 DEV SYS .T	20.99	29.95
CROSSFIRE ....T	19.99	29.95
CRUSH CRUMBLE.T	19.99	29.95
SIDEWINDER ...T	20.99	29.95
SWARM! ....T	20.99	29.95
VICHECK ......T	17.99	24.95
VICALC ....T	10.99	14.95
SLIKSTICK	7.99	9.95

All Cart Except Indicated

DATA 20 40/80 VIDEO PAK $235.99
16K RAM $74.99 PRINTER INT. $54.99

P.O. Box 569 D-8
Troy, MI 48099

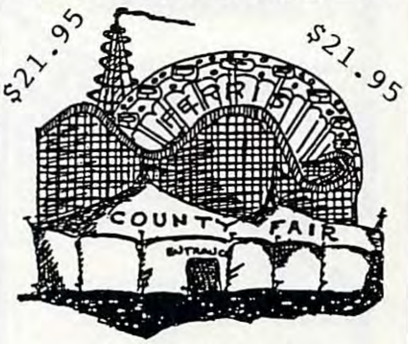
FREE Catalog

The Computer Express
(313) 528-1554

Master Charge/Visa/Checks/Money Orders/COD's Accepted.
Add $2.00 shipping USA. Michigan residents add 4% sales tax.

COMMODORE 64

SHOOTING GALLERY



100% MACHINE CODE
DEALER DISCOUNTS AVAILABLE

EMERALD SOFTWARE
122 BANGOR STREET
LINDENHURST, NY 11757
(516) 226-5849

STOP LOOKING!

THIS IS

✱ Ware It's At! ✱

FOR THE

COMMODORE 64

Pixell	
Spritewriter	c20.50/d25.50
Comm*Data	
Escape MCP	c14.00/d18.50
Centipod	" "
Pakacuda	" "
Nüfekop	
3-D Man 64	15.95
Exterminator 64	15.95
Tiger Tanks	15.95
Totl.	
Totl. Text 2.6	32.00
Totl. Time Manager	24.00
Interesting Software	
Stellar Triumph	19.95
Victory	
Grave Robbers	12.50
Adv. Pack I or II	12.50
Programmers Institute	
Color Accountant	d69.00
Tronix	
Sidewinder	23.95
Swarm	23.95
Gold Fever	23.95
Vic-20 Cartridges	
Gold Fever	16.00
Deadly Skies	16.00
Scorpion	16.00

Also software
by Sirius, Synapse
and others!
•••
Joysticks and other
accessories.

Send for
Free Catalog

Ware It's At!
7096 N. Holiday Drive
Galveston, Texas 77550

Send Check
or MO, include
$1.50 Shipping

RAM

For ATARI
64K RAM BOARD FOR THE 400

with Lifetime Warranty

- Highest quality available
- Reduces power consumption
- Reduces heat

64K Board	(400)	$150
48K Board	(400)	$115
32K Board	(400/800)	$ 90

FREE SHIPPING ANYWHERE IN U.S.A.

INTEC
PERIPHERALS
CORP
906 E. Highland Ave.
San Bernardino, CA 92404
VISA (714) 881-1533

ATARI, 400, 800 are Trademarks of ATARI, Inc.

PUBLIC DOMAIN, Inc.
— SOFTWARE —

Supporting all COMMODORE computers
Written by users, for users.
★ GAMES ★ UTILITIES ★ EDUCATIONAL ★
Over 1100 programs and growing.

VIC-20

VIC collection #1 – 70+ programs – Tape/Disk – $10.00
VIC collection #2 – 70+ programs – Tape/Disk – $10.00
VIC collection #3 – 70+ programs – Tape/Disk – $10.00

COMMODORE 64

COMMODORE 64 #1 – 25+ programs – Tape/Disk – $10.00
COMMODORE 64 #2 – 25+ programs – Tape/Disk – $10.00

PET / CBM

PET/CBM – 5 Utility – Tapes/Disks – $10.00 each
PET/CBM – 11 Game – Tapes/Disks – $10.00 each
PET/CBM – 6 Educational – Tapes/Disks – $10.00 each
Price includes shipping and handling.

We are YOUR world wide user software connection.
An alternative to the high cost of software.

CHECK, MONEY ORDERS,
VISA and MASTERCARD accepted.

For A Free Catalog Write:

Public Domain, Inc.
5025 S. Rangeline Rd., W. Milton, OH 45383
Phone (513) 698-5638

Dealer inquiries welcome.

BEAT THE HIGH COST OF SOFTWARE

Before you buy any more software, you owe it to yourself to join SOFTRADERS™, the fastest growing worldwide trading network. Members swap software and info for all computers.

Annual membership includes:

- Quarterly trading directories
- Monthly and flash updates
- Personalized trader listings
- Trader support systems
- Plus much more

Imagine having access to hundreds, even thousands of programs, each costing no more than the price of a stamp or phone call. Join now to beat the price increase and find out about the new member $$ offer. $49.95 U.S. $55.95 FOREIGN. SASE for info.

SOFTRADERS™ INTERNATIONAL
1610 Shomaker Dr.
Murphysboro, IL 62966

$450^00 WEEKLY

working one or two hours a day with your personal computer. GUARANTEED. Simple program process. No special skills or experience. Free details/application.

BOND INDUSTRIES
7115 Blanco Road
Dept. 114-178
San Antonio, TX 78216

SMALL BUSINESS PROGRAMS for ATARI®

GENERAL LEDGER SYSTEM

A complete system in one program. Designed by accountants to handle any combination of 200 Balance Sheet, Income and Expense accounts. Menu driven for easy entry. Maintains and prints to the screen or printer Cash Disbursements, Cash Receipts, Journal Entries, Trial Balance, Income Statement and Balance Sheet. Put your computer to work for you!

48K, DISKETTE ONLY, PRINTER OPTIONAL
ONLY $69.95

MAIL ORDER INVENTORY

With this new system you get results. Designed for quick inquiry and update. You maintain current inventory, reorder points, part costs, selling price and sales information. You also produce picking lists, time-to-buy reports, sales and inventory reports.

48K, DISKETTE ONLY, PRINTER OPTIONAL
ONLY $69.95

BULK RATE MAILER

Use this program to maintain your mailing lists and presort by zipcode add/delete/inquiry by partial fields of last name, city or zipcode.

24K, DISKETTE ONLY, PRINTER
ONLY $29.95

YOU SAVE MONEY! GET ALL THREE ONLY $150.00

TRADEWINDS SOFTWARE
1205 N. Genessee, L.A., CA 90046 (213) 656-2139
MasterCard — Visa — Checks — C.O.D.'s

FANTASTIC NEW SOFTWARE for your COMMODORE 64

LARGEST SELECTION OF 64 SOFTWARE ANYWHERE !!!!

• NEW FAST MOVING CYCLE GAME • • • • • • •

LAZER BLAZER

Now Available

$24.95

Play against the Android or another human. One or two joysticks required.

(Indicate DISK or TAPE when ordering)

NEW GAMES • BUSINESS • PERSONAL EDUCATIONAL • SOFTWARE

15 DAY FREE HOME TRAIL ON ALL MERCHANDISE
VISA , MASTER CHARGE & C.O.D. ORDERS ACCEPTED

FREE NEW CATALOG SENT WITH PURCHASE OR SEND $1.00 (Refunded with first order).

A-1 COMPUTER SERVICES
7103 W. CLEARWATER, H-115
KENNEWICK, WA 99336
(509) 783-4980
or
(509) 783-9566

• DEALER INQUIRIES WELCOME ! ! •

APPLE / ATARI / COMMODORE

MEASURE & CONTROL TEMPERATURE

DISPLAY GRAPHICS
HARD COPY OUTPUT
ALARMS & SETPOINTS
DISK FILE DATA STORAGE

1–256 Sensors
Precise to 1/100 Degree
Complete Software
$129.00 Package

American Data Cable, Inc.
2864 Ray Lawyer Drive, #205-352
P.O. Box 2212 • Placerville, CA 95667
(916) 622-3465

VIC/20-C/64

UTILITY FILE

Electric/Water/Gas/Oil/Propane
Residential-Commerical

An extensive energy consumption data processing program to calculate, display and file. Named unit no. - meter readings (prior-present), costs (daily, interval, subtotal, totals), dates - daily usage - plus cost projections.

Any additional entry is minimized as program or data tape will return all data relative to next entry, printer option included.

Tape . . . **$17.95** Check/M.O./VISA/MasterCard
Disc. . . . **$20.95** (U.S. Funds) (Include Exp. Date)
S & H . +**$2.00** N.Y. Add Sales Tax
Specify 20/64 - Tape Disc. Sinclair/Atari Write
★**New Tenant File (For Landlords) - Same Price**
Cassette Tapes (10 pk.) - **$14.95**

FABTRONICS
51 Quarry St., Brockport N.Y. 14420
Dealers Welcome VIC/20 Requires +3K Min.
VIC/20 - C/64 Reg. T.M. Commodore Bus. Mach Inc.

www.commodore.ca

SCORE=00170 HI-SCORE=05000 SCORE=00000

Advertisers Index

COMPUTE!

For Fastest Service,
Call Our **Toll-Free**
US Order Line
800-334-0868
In NC call 919-275-9809

My Computer Is:

☐ PET ☐ Apple ☐ Atari ☐ OSI ☐ VIC-20 ☐ TI 99/4A ☐ Sinclair ZX-81
☐ Radio Shack Color Computer ☐ Other ________ ☐ Don't yet have one...

☐ $20.00 One Year US Subscription
☐ $36.00 Two Year US Subscription
☐ $54.00 Three Year US Subscription

(Readers outside of the US, please see our foreign readers subscription card or inquire for rates).

Name ____________________
Address ____________________
City ________ State ________ Zip ________

☐ Payment Enclosed ☐ VISA ☐ Bill me
☐ MasterCard ☐ American Express
Account No. ____________ Expires ______/______

Your subscription will begin with the first available issue.
Please allow 4-6 weeks for delivery of first issue.

335101

COMPUTE!

Foreign Readers

Subscription rates outside the US:

☐ $25.00 Canada
☐ $38.00 Europe, Australia/Air Delivery
☐ $48.00 Middle East/Air Delivery
☐ $68.00 Elsewhere/Air Delivery
☐ $25.00 International Surface Mail (lengthy, unreliable delivery)

Name ____________________
Address ____________________
City ________ Postal Code ________
Country ____________________

Payment must accompany this card.
Payment in US Funds drawn on a US Bank; International Money Order; or charge card: ☐ VISA ☐ MasterCard ☐ American Express
Account No. ____________ Expires ______/______

Your subscription will begin with the first available issue.
Please allow 6-12 weeks for delivery of first issue.

335101

COMPUTE! Books

Quan.	Title	Price	S/H	Total
______	The Beginner's Guide to Buying A Personal Computer	$3.95 +	$1.00*	______
______	COMPUTE!'s First Book of Atari	12.95 +	2.00*	______
______	Inside Atari DOS	19.95 +	2.00*	______
______	COMPUTE!'s First Book of PET/CBM	12.95 +	2.00*	______
______	Programming the PET/CBM	24.95 +	3.00**	______
______	Every Kid's First Book of Robots and Computers	4.95 +	1.00*	______
______	COMPUTE!'s First Book of VIC	12.95 +	2.00*	______
______	COMPUTE!'s Second Book of Atari	12.95 +	2.00*	______
______	COMPUTE!'s First Book of Atari Graphics	12.95 +	2.00*	______
______	Mapping The Atari	14.95 +	2.00*	______

For air mail outside US: *$5.00 / **$10.00

For Fastest Service
Call Our **TOLL FREE**
US Order Line
800-334-0868
In NC call 919-275-9809

All orders must be prepaid (money order, check, or charge). All payments must be in US funds. NC residents add 4% sales tax.

☐ Payment enclosed
Please charge my: ☐ VISA ☐ MC ☐ Am. Express
Acc't No. ____________
Expires ______/______

Name ____________________
Address ____________________
City ________ State ________ Zip ________
Country ____________________

Allow 4-5 weeks for delivery.

5 6 7 8 9 10 11 12

The Editor's Feedback:

Computer: ☐ Pet ☐ Apple ☐ Atari ☐ OSI ☐ VIC-20 ☐ TI 99/4A ☐ Sinclair ZX-81
☐ Radio Shack Color Computer ☐ Other ________ ☐ Don't yet have one...

Are you a **COMPUTE!** Subscriber? ☐ Yes ☐ No I would like to see:

☐ More ☐ Fewer Specific applications programs.
☐ More ☐ Fewer BASIC programs.
☐ More ☐ Fewer Machine language programs.
☐ More ☐ Fewer Tutorials.
☐ More ☐ Fewer Educational articles.
☐ More ☐ Fewer Detailed explanations of programs.
☐ More ☐ Fewer Games.
☐ More ☐ Fewer Reviews of game software.
☐ More ☐ Fewer Reviews of business software.
☐ More ☐ Fewer Reviews of educational software.
☐ More ☐ Fewer Reviews of hardware.

What do you like best about **COMPUTE!**?

What do you like least?

5 6 7 8 9 10 11 12

Place
Stamp
Here

COMPUTE! Magazine
P.O. Box 914
Farmingdale, NY 11737

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE! Magazine
P.O. Box 914
Farmingdale, NY 11737

Place
Stamp
Here

COMPUTE! Magazine
Post Office Box 5406
Greensboro, NC 27403

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE! Books
Post Office Box 5406
Greensboro, NC 27403

COMPUTE!'s FREE Reader Information Service

Use these cards to request FREE information about the products advertised in this issue. Clearly print or type your full name and address. Only one card should be used per person. Circle the numbers that correspond to the key number appearing in the advertisers index.

Send in the card and the advertisers will receive your inquiry. Although every effort is made to insure that only advertisers wishing to provide product information have reader service numbers, **COMPUTE!** cannot be responsible if advertisers do not provide literature to readers.

Please use these cards *only* for subscribing or for requesting product information. Editorial and customer service inquiries should be addressed to: **COMPUTE!**, P.O. Box 5406, Greensboro, NC 27403. Check the expiration date on the card to insure proper handling.

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new subscription to **COMPUTE!**: 12 monthly issues for $20.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration: 7/31/83 C0583

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new subscription to **COMPUTE!**: 12 monthly issues for $20.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration: 7/31/83 C0583

COMPUTE!

101	102	103	104	105	106	107	108	109	110	111
112	113	114	115	116	117	118	119	120	121	122
123	124	125	126	127	128	129	130	131	132	133
134	135	136	137	138	139	140	141	142	143	144
145	146	147	148	149	150	151	152	153	154	155
156	157	158	159	160	161	162	163	164	165	166
167	168	169	170	171	172	173	174	175	176	177
178	179	180	181	182	183	184	185	186	187	188
189	190	191	192	193	194	195	196	197	198	199
200	201	202	203	204	205	206	207	208	209	210
211	212	213	214	215	216	217	218	219	220	221
222	223	224	225	226	227	228	229	230	231	232
233	234	235	236	237	238	239	240	241	242	243
244	245	246	247	248	249	250	251	252	253	254
255	256	257	258	259	260	261	262	263	264	265
266	267	268	269	270	271	272	273	274	275	276
277	278	279	280	281	282	283	284	285	286	287
288	289	290	291	292	293	294	295	296	297	298
299	300	301	302	303	304	305	306	307	308	309
310	311	312	313	314	315	316	317	318	319	320
321	322	323	324	325	326	327	328	329	330	331
332	333	334	335	336	337	338	339	340	341	342
343	344	345	346	347	348	349	350			

Circle 101 for a one year new subscription to **COMPUTE!**: 12 monthly issues for $20.

Please print or type your full name and address. Limit one card per person.

Name

Address

City

State/Province Zip

Country

Please include zip code. Expiration: 7/31/83 C0583

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 27346 PHILADELPHIA, PA

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 11747
Philadelphia, PA 19101

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 27346 PHILADELPHIA, PA

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 11747
Philadelphia, PA 19101

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 27346 PHILADELPHIA, PA

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!
P.O. Box 11747
Philadelphia, PA 19101

Charter Subscription Offer

One year, 12 issue subscription

☐ $15 US
☐ $20 (US Funds) Canada
☐ $45 (US Funds) Air Mail

☐ Payment Enclosed
☐ Bill-Me
☐ Mastercard
☐ VISA
☐ American Express
Acct. No. ____________________
Exp. Date __________/__________

Name ____________________
Address ____________________
____
City __________ State __________ Zip __________
Country ____________________

335901

Charter Subscription Offer

One year, 12 issue subscription

☐ $15 US
☐ $20 (US Funds) Canada
☐ $45 (US Funds) Air Mail

☐ Payment Enclosed
☐ Bill-Me
☐ Mastercard
☐ VISA
☐ American Express
Acct. No. ____________________
Exp. Date __________/__________

Name ____________________
Address ____________________
____
City __________ State __________ Zip __________
Country ____________________

[illegible]

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!'s Gazette for Commodore
P.O. Box 961
Farmingdale, NY 11737

NO POSTAGE
NECESSARY
IF MAILED
IN THE
UNITED STATES

BUSINESS REPLY MAIL
FIRST CLASS PERMIT NO. 2312 GREENSBORO, NC

POSTAGE WILL BE PAID BY ADDRESSEE

COMPUTE!'s Gazette for Commodore
P.O. Box 961
Farmingdale, NY 11737

THE LEADING EDGE IN PRINTERS

ONE GREAT LINE. ONE GREAT WARRANTY.

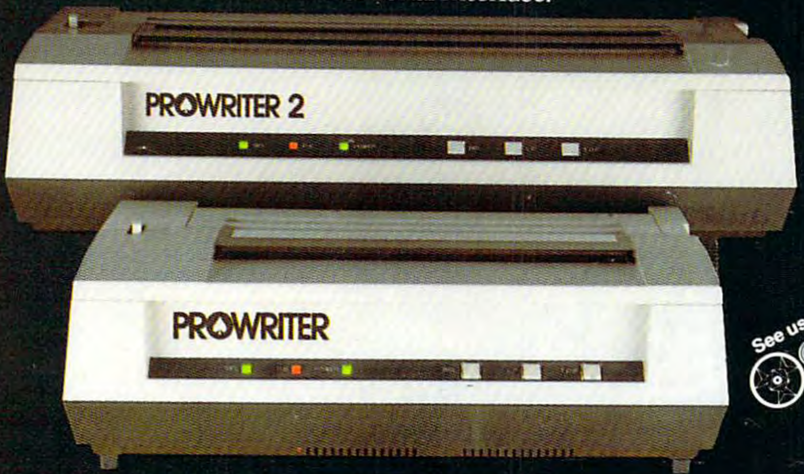
Finally, there's one full family of printers that covers every business or word processing application—all from C. Itoh, a company known for packing more product into less price; and all distributed exclusively by Leading Edge, a company known for searching out and providing that very thing. Which means that one call to one source can get you any printer, any time you need it, for any purpose. All backed by a full years' warranty from Leading Edge. (Try *that* on any other line of printers.)

THE PRO'S.

The Prowriters: business printers—and more. The "more" is a dot-matrix process with more dots. It gives you denser, correspondence quality copy (as opposed to business quality copy, which looks like a bad job of spray-painting).

Prowriter: 120 cps. 80 columns dot matrix compressable to 136. 10" carriage. Parallel or serial interface.

Prowriter 2: Same as Prowriter, except 15" carriage allows full 136 columns in normal print mode. Parallel or serial interface.



See us at Booth #1146
COMDEX™/SPRING '83
April 26-29, 1983
Georgia World Congress Center and
The Atlanta Apparel Mart
Atlanta, Georgia

THE STAR.

The Starwriter F-10. In short (or more precisely, in a sleek 6" high, 30-pound unit), it gives you more of just about everything—except bulk and noise—than any other printer in its price range. It's a 40 cps letter-quality daisy-wheel with a bunch of built-in functions to simplify and speed up word processing. It plugs into almost any micro on the market, serial or parallel.

THE MASTER.

The Printmaster F-10. Does all the same good stuff as the Starwriter except, at 55 cps, the Master does it faster.

Distributed Exclusively by Leading Edge Products, Inc., 225 Turnpike Street, Canton, Massachusetts 02021.
Call: toll-free 1-800-343-6833; or in Massachusetts call collect (617) 828-81[illegible] Telex 951-624.

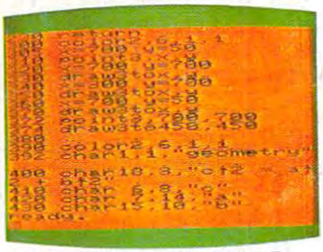
c-64
153
299
9/15-

IF YOU OWN A COMMODORE COMPUTER, YOU KNOW IT CAN DO ALL THIS.

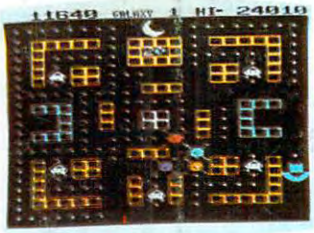
```
 WORD PROCESSING
-----------------
Dear Sir:
  Thank You for your
order of July 2 1982.
  You should expect
shipment early next
week.
  If you have any
questions, please
feel free to call.
          Sincerely,
            L.J.A.
```

BUSINESS

EDUCATION



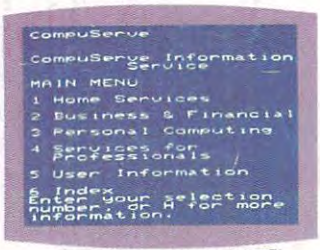
PROGRAMMING



GAMES

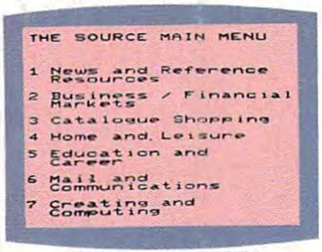
280 c-64-2800

BUT DID YOU KNOW FOR ABOUT $100, YOU CAN ALSO GET IT TO DO ALL THIS?



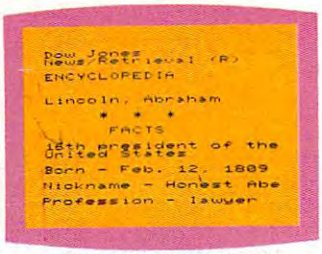
```
CompuServe

CompuServe Information
        Service
MAIN MENU
1 Home Services
2 Business & Financial
3 Personal Computing
4 Services for
  Professionals
5 User Information
6 Index
Enter your selection
number, or H for more
information.
```

COMPU SERVE™



```
THE SOURCE MAIN MENU

1 News and Reference
  Resources
2 Business / Financial
  Markets
3 Catalogue Shopping
4 Home and Leisure
5 Education and
  Career
6 Mail and
  Communications
7 Creating and
  Computing
```

THE SOURCE℠



```
Dow Jones
News/Retrieval (R)
ENCYCLOPEDIA
Lincoln, Abraham
      *  *  *
       FACTS
16th president of the
United States
Born - Feb. 12, 1809
Nickname - Honest Abe
Profession - lawyer
```

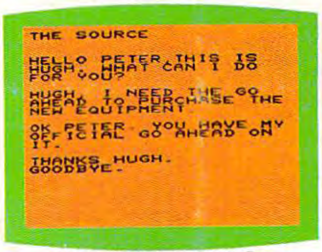
ENCYCLOPEDIA

```
COMP U STORE
CATAGORIES
-----------------------
1  APPLIANCES
2  CAMERAS & OPTICAL
   EQUIPMENT
3  FLATWARE & CRYSTAL
4  LUGGAGE
5  MUSICAL INSTRUMENTS
6  SPORTING GOODS
7  STEREO & AUDIO
   EQUIPMENT
8  TV & VIDEO
9  OTHER ELECIRONICS
10 MISCELLANEOUS
```

SHOP AT HOME

```
DOW JONES
STOCK QUOTE
REPORTER SERVICE
   STOCK          CBU
Bid/Close        55 3/4
Asked/Open       55 1/2
High             56 3/8
Low              53 3/8
Last             56 5/8
Volume (100's)   1210
```

DOW JONES NEWS/RETRIEVAL®

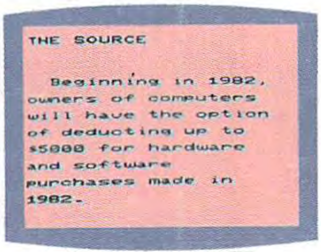


```
THE SOURCE

HELLO PETER,THIS IS
HUGH. WHAT CAN I DO
FOR YOU?
HUGH, I NEED THE GO
AHEAD TO PURCHASE THE
NEW EQUIPMENT.
OK PETER  YOU HAVE MY
OFFICIAL GO AHEAD ON
IT.
THANKS HUGH.
GOODBYE.
```

ELECTRONIC MAIL

```
Dow Jones
News/Retrieval (R)
SPORTS
Results, Standings
and Stats
Press   For
1. NHL scores/schedule
2. NHL standings
3. NBA scores/schedule
4. NBA standings
5. NFL scores/schedule
6. NFL standings
```

WIRE SERVICE NEWS

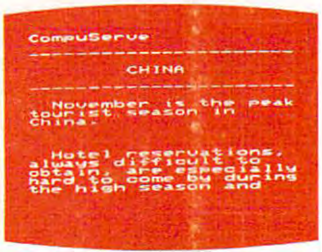


```
THE SOURCE

  Beginning in 1982,
owners of computers
will have the option
of deducting up to
$5000 for hardware
and software
purchases made in
1982.
```

TAX ADVICE

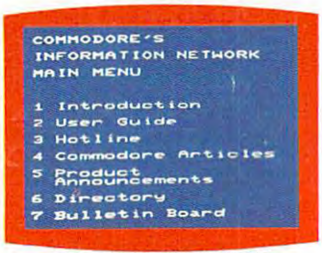
```
CompuServe

BLACKJACK

Limit  is  $500.00

WAGER?

   $200.00

FIRST CARD IS
   QUEEN OF DIAMONDS
```

GAMES



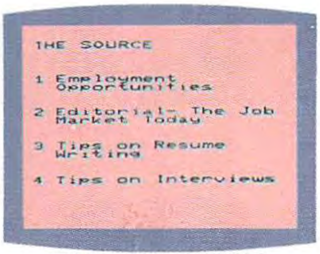
```
CompuServe
-----------------------
        CHINA
-----------------------
  November is the peak
tourist season in
China.

  Hotel reservations,
always difficult to
obtain, are especially
hard to come by during
the high season and
```

TRAVEL INFORMATION



```
COMMODORE'S
INFORMATION NETWORK
MAIN MENU

1 Introduction
2 User Guide
3 Hotline
4 Commodore Articles
5 Product
  Announcements
6 Directory
7 Bulletin Board
```

COMMODORE INFO. NETWORK



```
THE SOURCE

1 Employment
  Opportunities

2 Editorial- The Job
  Market Today

3 Tips on Resume
  Writing

4 Tips on Interviews
```

EMPLOYMENT OPPORTUNITIES

The screens at the top of the page show a few examples of how versatile the VIC 20™ or Commodore 64™ can be with the addition of Commodore software.

The screens below them give you a few examples of how much more versatile they can be with the addition of a Commodore VICMODEM.

For around $100, the Commodore VICMODEM will turn your VIC 20 or Commodore 64 computer into a telecomputer.

To make matters even better, Commodore includes a few little extras (such as a free hour's time on the two most popular telecomputing services) that add up to a value of $197.50.* A nice return on an investment of about $100.

Most computer companies think it's reasonable to ask as much as $500 for a modem that'll give you telecomputing capabilities such as ours.

However, with a VICMODEM priced at around $100, we think we're being a lot more reasonable. Don't you agree?

commodore
COMPUTER

U.S.A. - P.O. Box 500, Conshohocken, PA 19428; Canada - 3370 Pharmacy Avenue, Agincourt, Ontario, Canada M1W2K4. * Certain offers subject to change.
CompuServe is a trademark of CompuServe, Inc. and H.& R. Block Co. Dow Jones News/Retrieval Service is a registered trademark of Dow Jones & Co., Inc. The Source is a service mark of Source Telecomputing Corporation, a subsidiary of Reader's Digest Corporation, Inc.