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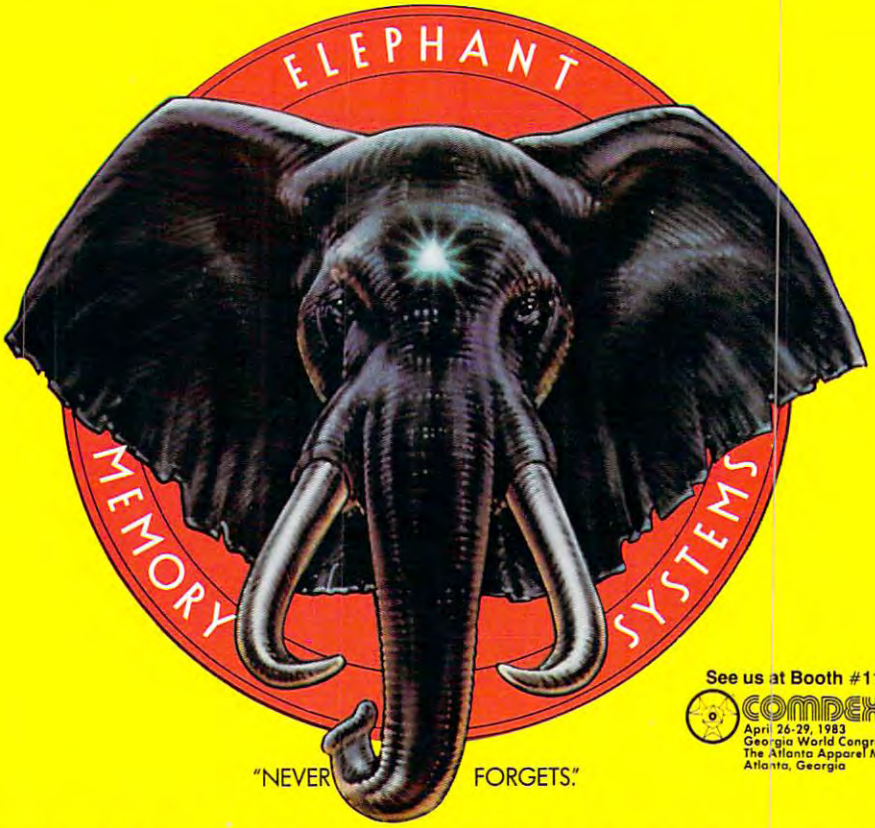

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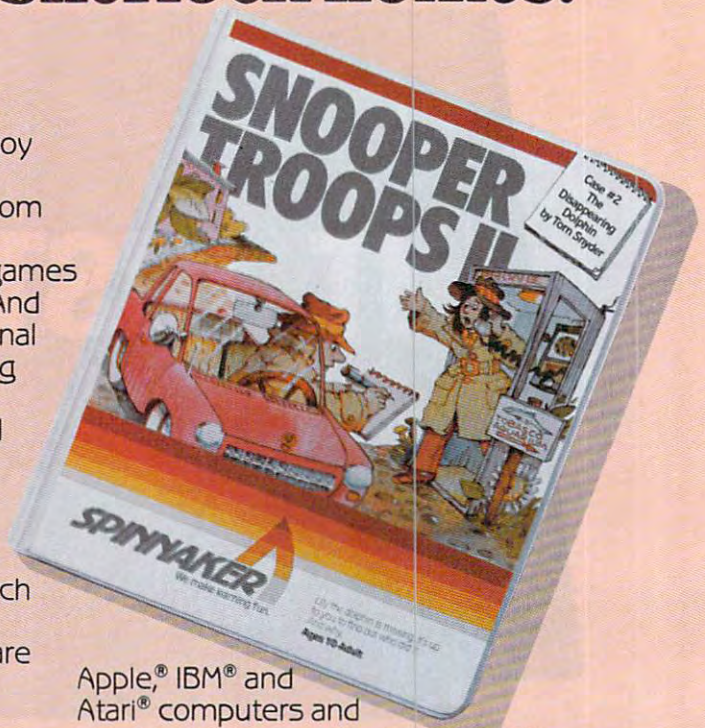

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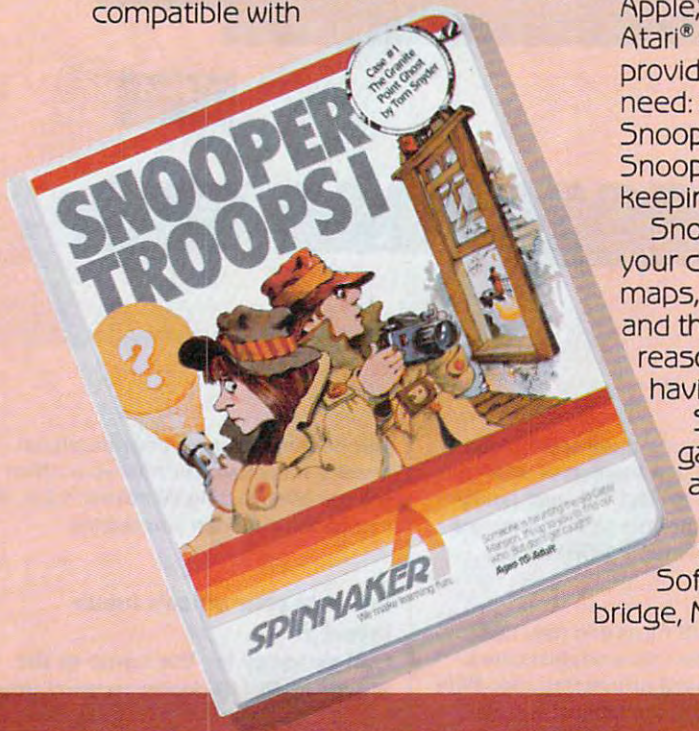

Snooper Troops detective games help your children learn to take notes, draw maps, organize and classify information and they help develop vocabulary and reasoning skills. All while your kids are having a good time.

So if you want to find educational games that are really fun, here's a clue: Snooper Troops games are available at your local software store, or by writing to: Spinnaker Software, 215 First Street, Cambridge, MA 02142.

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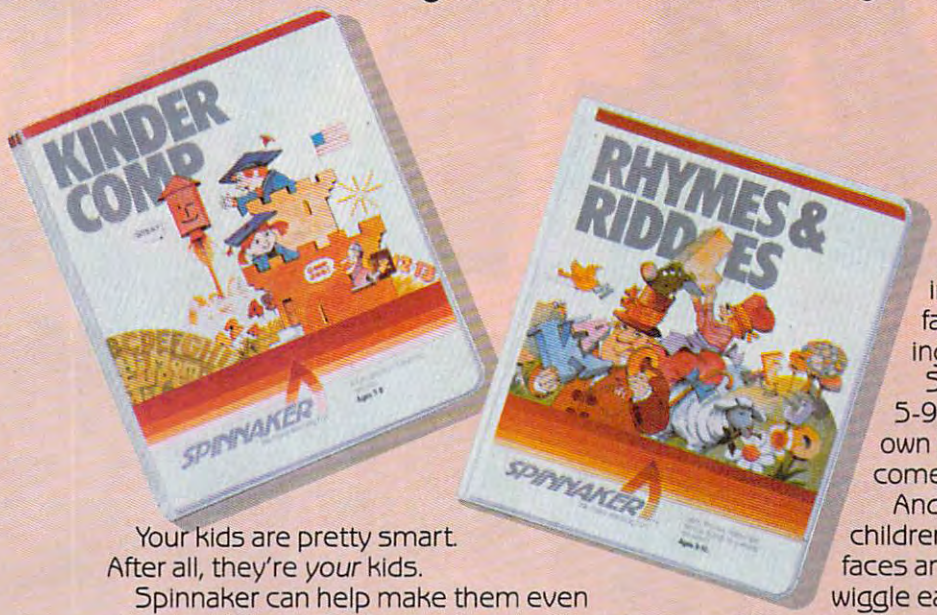

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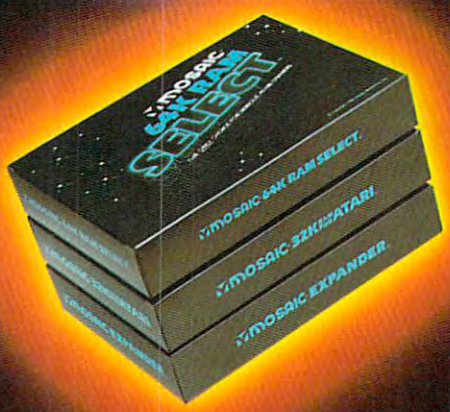

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April 1983 Vol. 5, No. 4

FEATURES

24	Selecting The Right Word Processor	Tom R. Halfhill	
32	Air Defense	T. L. Wahl	AP,AT,P,V,C,TI
50	VIC Editype: A Text Editing And Storage Program	Paul Bishop	V
56	Scriptor: An Atari Word Processor	Charles Brannon	AT
71	Retirement Planner	Steve Hamilton	AP,AT,TI,C,V

EDUCATION AND RECREATION

76	Typing Teacher	Alan McCright	TI,AP,V,AT
86	Chutes For Atari	Matt Giwer	AT
94	Cash Flow Manager	Donald W. Watson	
123	TI-99 Match-Em	C. Regena	TI
126	Atari Math Fun	Steven Neve	AT

REVIEWS

100	VIC-20/C64 Word Processor: The Quick Brown Fox	Gregg Peele	V,64
102	Atari Data Perfect	Steve Steinberg	AT
106	VIC Practi-Calc	Emily Herman	V
110	Paperclip Word Processor For PET/CBM	Louis F. Sander	P
112	Silicon Office For PET	Richard Mansfield	P
114	Turbocharger For Apple	Richard Cornelius	AP
115	Pathfinder For Atari	John DiPrete	AT
118	ZX-81 Home Computer Package For Sinclair/Timex	Arthur B. Hunkins	ZX

COLUMNS AND DEPARTMENTS

6	The Editor's Notes	Robert Lock	
12	Readers' Feedback	The Editors and Readers of COMPUTE!	
18	The Beginner's Page	Richard Mansfield	
20	Computers And Society	Jim Butterfield	
120	Questions Beginners Ask	Tom R. Halfhill	
133	Micros With The Handicapped: Developing A Communications Program	Susan Semancik & C. Marshall Curtis	V,AP,P
136	Machine Language: Numeric Input, Part II	Jim Butterfield	
138	The World Inside The Computer: Children, Computers, And Values	Fred D'Ignazio	
144	Friends Of The Turtle	David D. Thornburg	
180	Programming The TI: Secondary Education	C. Regena	TI
230	Insight: Atari	Bill Wilkinson	AT
259	Extrapolations	Keith Falkner	AP

THE JOURNAL

150	Dr. Video	Richard H. Heist	V,P,64
154	Atari Filefixer	G. L. Kopp	AT
157	Using The Atari Word Processor With An Epson Printer	Thomas Kredo	AT
158	Commodore 64 Video – A Guided Tour, Part III	Jim Butterfield	64
164	Update On Sinclair/Timex Sound	Arthur B. Hunkins	ZX
165	Computer Literacy And The Three R's On The Sinclair/Timex	Derek Stubbs	ZX
167	Center The VIC Screen	Mark LaForge	V
168	Applesoft Printer Control	Eric and Sally Martell	AP
170	Video 80: 80 Columns For The Atari	Charles Brannon	AT
184	VICword	Mark Niggemann	V
188	CRAB (Cross Reference For Atari BASIC)	Manny Juan	AT
192	Programming Characters On An Expanded VIC-20	Paul F. Schatz	V
196	Magic Commodore BASIC	David Sale	P,V,64
202	Rainbow Atari Graphics	John R. Slaby	AT
208	VIC Automatic BASIC	Karl R. Beach	V
214	Tester	Linton S. Chastain	C
215	Estimating TI-99 Memory	Michael A. Covington	TI
216	Commodore Structure-BASIC	David Williams	P,V,64
238	Hexedit: A BASIC Hex Editor For The VIC	Bill Yee	V
242	PET Searcher	Ronald A. Blattel	P
245	The Atari Return Key Mode	James Luczak	AT
248	Apple II Bar Charts	Bernard L. Webb	AP
252	Major & Minor: VIC Music Theory	M. J. Winter	V
255	Atari Digitizer	Robert E. Miller	AT

147 How To Type COMPUTE!'s Programs
148 A Beginner's Guide To Typing In Programs
266 CAPUTE! Modifications Or Corrections To Previous Articles
269 News & Products
276 Calendar
284 Product Mart
288 Advertisers Index

The Color Computer and TI-99/4A data base programs scheduled for this issue will appear next month.

GUIDE TO ARTICLES AND PROGRAMS

AP Apple, **AT** Atari, **P** PET/CBM, **V** VIC-20, **O** OSI, **C** Radio Shack Color Computer, **64** Commodore 64, **ZX** Sinclair ZX-81, * All or several of the above.

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EDITOR'S NOTES

The industry price blitz continues with VIC recently advertised at K-Mart for $139, Atari 400 falling below $200, and the Commodore 64 beginning to approach the $400+ price point. Should you wait?

After all, remember when a calculator with *memory* was only $79.95 at Sears? A brokerage house acquaintance recently remarked on the falling prices (he purchased his home computer six months ago for half again as much as it now sells for) by commenting whimsically on the prices, but concluding that he was glad he'd gone ahead and started when he did. He felt as though he was those six months further along in the personal computer revolution.

It will be interesting to see the effect of Atari's recently announced computer/keyboard upgrade for the Atari 2600 game machine. While the price of the unit is expected to be around $90 (we expect the VIC-20 to be less than $100 soon), the Atari unit does, undeniably, have an installed base of millions of potential game machines.

The bottom line, of course, is that all of these new products, price cuts, expansions, and the like simply help make the consumer computer marketplace a mass market reality that much faster. A year or so ago, we did a series on the fine art of raising funds for the purchase of microcomputers for schools. We'd like to update those suggestions and helpful hints with more recent information. After all, a year or two in this industry is a long time, and fund-raising strategies for $1200 machines are vastly different from those for $200 ones. Have you found that school systems are more likely now to provide funding directly? Have you found that parent organizations are more involved? We'd like to present the collective wealth of tactics used by you readers active in educational support. So drop us a one or two page note about your successes and plans, and we'll put them together in an upcoming issue.

In deference to potential problems with confusion of names, we've retitled our newest publication *COMPUTE!'s Commodore Gazette*. This should prevent any confusion with the quarterly magazine produced by Commodore and called *Commodore*. We've also pulled our release issue date for the new monthly to June 1983. I'm pleased to announce that Tom Halfhill of our staff, who many of you have come to appreciate as Features Editor of **COMPUTE!**, will be serving as Acting Editor of *COMPUTE!'s Commodore Gazette*.

Our **COMPUTE! Books** Division is currently undergoing substantial expansion as well. If you're presently working on a title or titles in the consumer computer end of the marketplace, we'd be interested in talking with you. Please contact Scott Card, Senior Editor, Book Division at our home office. Our first titles for the Texas Instruments personal computer and the Radio Shack Color Computer will be released soon. Our thanks to you authors who have started contributing applications articles and materials to **COMPUTE!**.

We're currently investigating the possibilities for delivering portions of our printed software in machine readable form. **COMPUTE!** currently publishes more software in each issue than any magazine in the industry, and we're aware that some mechanism for electronic delivery might be helpful to our readers.

The variety of options range from direct sale of tapes and disks to resource centers such as CompuServe and The Source. We'd like your thoughts and suggestions as well. Short comments can be directed to us on the Editor's Feedback card in the back of the magazine. If you need more room, please feel free to write us a letter. As always, your thoughts and input are invaluable to us.

Robert Lock

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BUILT-IN RAM	32K*	48K	16K	64K	16K	4K
EXPANDABLE TO	144K**	64K	48K	N/A	32K	16K
KEYBOARD FEATURES						
NUMBER OF KEYS	71	51	61	66	71	55
USER DEFINE FUNCTIONS	10	N/A	4	8	10	NONE
SPECIAL WORD PROCESSING	YES	NO	NO	NO	NO	NO
GENERATED GRAPHICS (FROM KEYBOARD)	YES	NO	YES	YES	NO	NO
UPPER/LOWER CASE	YES	UPPER ONLY	YES	YES	YES	YES
GAME/AUDIO FEATURES						
SEPARATE CARTRIDGE SLOTS	YES	NO	YES	NO	NO	NO
BUILT-IN JOYSTICK	YES	NO	NO	NO	NO	NO
COLORS	16	15	128	16	9	9
RESOLUTION (PIXELS)	256 x 192	280 x 160	320 x 192	320 x 200	256 x 192	128 x 64
SPRITES	32	N/A	4	8	N/A	N/A
SOUND CHANNELS	3	1	4	3	3	1
OCTAVES PER CHANNEL	8	4	4	9	8	10
A.D.S.R. ENVELOPE	YES	NO	NO	YES	YES	NO
PERIPHERAL SPECIFICATIONS						
CASSETTE	2 CHANNEL	1 CHANNEL	2 CHANNEL	1 CHANNEL	1 CHANNEL	1 CHANNEL
AUDIO IO	YES	NO	YES	NO	NO	NO
BUILT-IN MIC	YES	NO	NO	NO	NO	NO
DISK DRIVE CAPACITY	256K	143K	96K	170K	N/A	170K
(LOW PROFILE)	YES	NO	NO	NO	NO	NO
CP/M* COMPATIBILITY (80 column programs)						
CP/M* 2.2	YES	NO***	NO	NO****	NO	NO
CP/M* 3.0	YES	NO	NO	NO	NO	NO

* 16K user address able plus 16K graphic support
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**** Commodore 64 accepts 40 column CP/M

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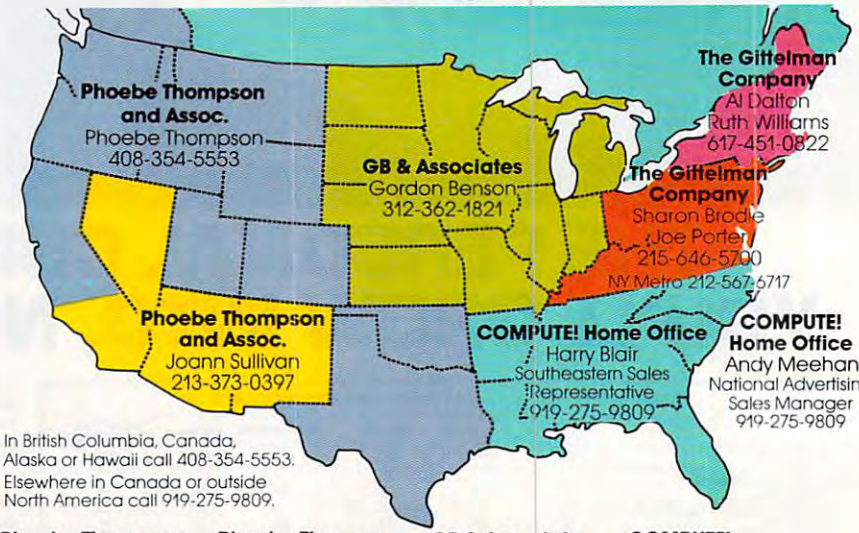

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Inside Apple

Apple Computer Inc., 20525 Mariani Avenue, Cupertino, California 95014 Vol. 1 No. 2

For the authorized Apple dealer nearest you, call 800-538-9696 (800-662-9238 in California.)

Fruitful Connections.

There are more people in more places making more accessories and peripherals for Apples than for any other personal computer in the world.

Thanks to those people — in hundreds of independent companies — you can make the humblest 1978 Apple II turn tricks that are still on IBM's Wish List for 1984.

But now we're coming out with our very own line of peripherals and accessories for Apple® Personal Computers.

For two very good reasons.

First, compatibility. We've created a totally kluge-free family of products designed to take full advantage of all the advantages built into every Apple.

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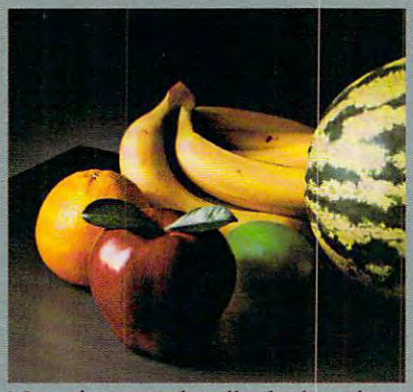

Now the same kindly dealer who keeps your Apple PC in the pink can do the same competent job for your Apple hard-disk and your Apple daisywheel printer.

So if you're looking to expand the capabilities of your Apple II or III, remember:

Now you can add Apples to Apples.

A joy to behold.

The new Apple Joystick II is the ultimate hand control device for the Apple II.

Why is it such a joy to use?

With two firing buttons, it's the first ambidextrous joystick — just as comfortable for lefties as righties.

Of course, it gives you 360° cursor control (not just 8-way like some game-oriented devices) and full X/Y coordinate control.

And the Joystick II contains high-quality components and switches tested to over 1,000,000 life cycles.

Which makes it a thing of beauty. And a joystick forever.

Gutenberg would be proud.

Old Faithful Silentype® has now been joined by New Faithfuls, the Apple Dot Matrix Printer and the Apple Letter Quality Printer.

So now, whatever your budget and your needs, you can hook your Apple to a printer that's specifically designed to take advantage of all the features built into your Apple. With no compromises.

The 7x9 Apple Dot Matrix Printer is redefining "correspondence quality" with exceptional legibility. With 144x160 dots per square inch, it can also create high resolution graphics.

The Apple Letter Quality Printer, which gets the words out about 33% faster than other daisywheel printers in its price range, also offers graphics capabilities. See your authorized Apple dealer for more information and demonstrations. Because, unfortunately, all the news fit to print simply doesn't fit.

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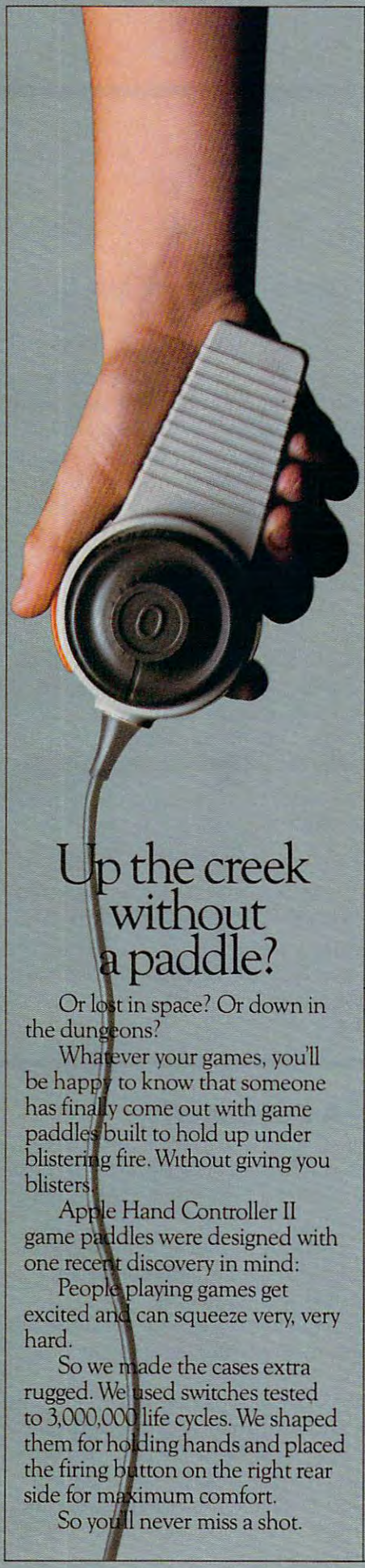

Up the creek without a paddle?

Or lost in space? Or down in the dungeons?

Whatever your games, you'll be happy to know that someone has finally come out with game paddles built to hold up under blistering fire. Without giving you blisters.

Apple Hand Controller II game paddles were designed with one recent discovery in mind:

People playing games get excited and can squeeze very, very hard.

So we made the cases extra rugged. We used switches tested to 3,000,000 life cycles. We shaped them for holding hands and placed the firing button on the right rear side for maximum comfort.

So you'll never miss a shot.

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If you work with so much data or so many programs that you find yourself shuffling diskettes constantly, you should take a look at Apple's ProFile,™ the personal mass storage system for the Apple III Personal Computer.

This Winchester-based 5-megabyte hard disk can handle as much data as 35 floppies. Even more important for some, it can access that data about 10-times faster than a standard floppy drive.

So now your Apple III can handle jobs once reserved for computers costing thousands more.

As for quality and reliability, you need only store one word of wisdom:

Apple.

Launching pad for numeric data.

Good tidings for crunchers of numerous numbers:

Apple now offers a numeric keypad that's electronically and aesthetically compatible with the Apple II Personal Computer. So you can enter numeric data faster than ever before.

The Apple Numeric Keypad II has a standard calculator-style layout. Appropriate, because unlike some other keypads, it can actually function as a calculator.

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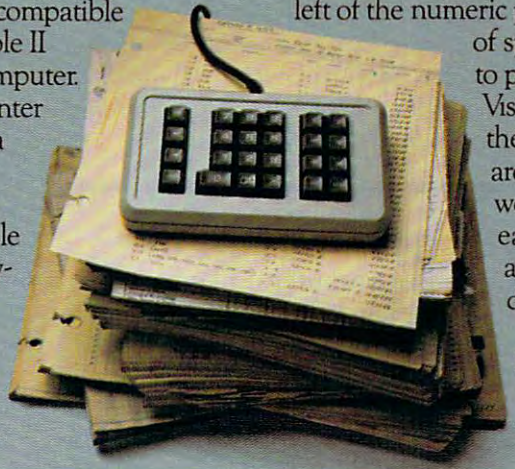
With one hand tied behind your back.



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READERS' FEEDBACK

The Editors and Readers of COMPUTE!

Make A TV Into A Monitor?

I have heard that it is possible to improve the picture quality of a computer output to a television by rewiring the TV as a monitor in some way. Would you outline the differences between a TV and a monitor for me? Is it possible and practical to convert a TV into a monitor?

Charles Coleman

It's possible, but not practical. You can bypass the receiver section of a television and route input directly to the video stages. However, this is an extremely unsafe practice. Contact with the voltages present inside a TV is likely to cause more than just an unpleasant tingle, and since many sets have a "hot" chassis it is difficult to isolate these voltages from your computer. Why risk ruining your television and computer (and possibly yourself) when a true monitor costs no more than a regular TV?

Atari Revision B

I have had an opportunity recently to upgrade my computer to a "new" version of Atari. Little did I realize at the time that a new version of the operating system was incorporated in the new Atari, rendering a large portion of my available software useless (e.g., *Ghost Hunters* by Arcade Plus).

Can other ways be devised to load the software other than via the operating system? Help?

G. Smyczynski

A few pieces of commercial software will not run on the Revision B Operating System (OS) due to illegal OS calls. Contact the software companies with regard to any updates. If you can acquire an extra 10K ROM board, you can choose either operating system (on the Atari 800 only) merely by changing boards.

Translating Programs For The TI

I own a TI-99/4A home computer. I like your magazine, but I have tried and cannot convert the programs in **COMPUTE!** to run on the TI. Especially hard to figure out are the PEEK and POKE statements.

Could you please explain how to convert the programs to TI? I do appreciate your new TI. column.

John Dobrinski

Texas Instruments appears to have developed their BASIC from a slightly different perspective than many other microcomputer BASICs. The PEEK and POKE commands allow programmers to examine and modify individual memory locations. While this may be a desirable feature on a personal computer, it could be undesirable on a large, multi-user system so no "mainframe" BASICs support these operations. TI BASIC shares this feature of minicomputer BASICs.

Fortunately, TI substitutes an impressive "library" of built-in ROM subroutines which accomplish most of the same things that PEEK and POKE are used for on other computers. For beginners this may even be an advantage, since the subroutine CALLs are usually more easily understood than the equivalent PEEKs and POKEs. For example, to read the TI joysticks you can type:

```
100 CALL JOYST(1,X,Y)
```

Contrast this with the equivalent for the VIC-20:

```
100 POKE 37154,127: X=(NOTPEEK(37151))AND 60 -
    ((PEEK(37152) AND 128)=0) : POKE 37154,255
```

Other impressive features are CALL CHAR, RESEQUENCE, and NUMBER. These provide built-in character definition, renumber, and automatic line numbering utilities.

Should I Buy A Computer?

Recently, my interest has turned toward finding out about home computers. As a start, I purchased **COMPUTE!**, and visited a few stores with home computers and software.

So far, my observations show that the home computer market is directed mostly toward games, especially space and war games.

Since there is an eleven year old in the family, my interest is also in the educational aspect of home computers.

I have two basic concerns before I spend hundreds of dollars and find that a home computer is not a waste of money, a flash in the pan, or a pie-in-the-sky promise. Please advise me where local sales personnel and even some teachers are not able to answer me:

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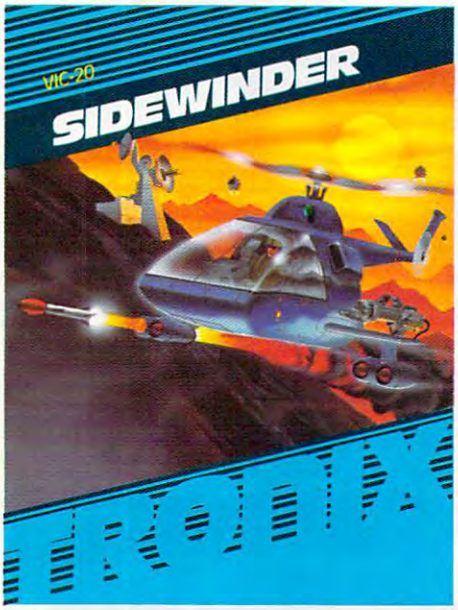
THE ULTIMATE IN FAST ACTION FOR YOUR VIC-20.



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Grab your gloves, survival pack and head-gear! Your Sidewinder commandos are whooshing off into the most frenzied fight in the far side of the galaxy! You've got to out-maneuver deadly Battle pods, dodge destructive Stalker bombs and go head-to-head with alien Oblitojets... all at speeds you wouldn't imagine possible!

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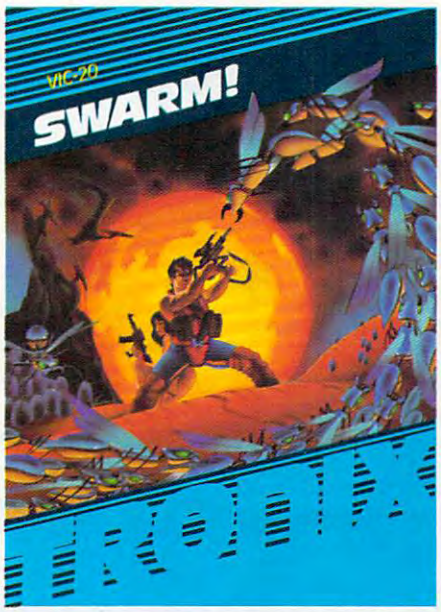

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Dive into the most awesome all-out battle ever! You'll be attacked from all directions by a barrage of deadly android wasps and alien creatures like you've never encountered before! Any contact means instant destruction! If it's not the fastest game you've ever played, you're from another planet.

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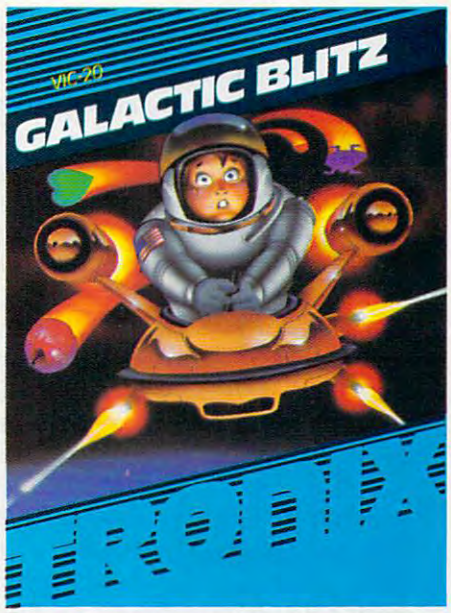

Attack Crazy Aliens!

Fall back into the far fields of the galaxy! That bumbling formation coming at you is the crazy Galactic Blitz. These aliens have 15 different play patterns. And each time you take one out of the game they come back mad as ever! So go for the galactic score full speed ahead! If you're merely a spectator, find another sport.

Suggested Retail Price $24.95

Dealer inquiries invited. Tronix games are available at your local store, or direct from us. Send a check or money order to Tronix Publishing, Inc., 701 W. Manchester Blvd., Inglewood, CA 90301.

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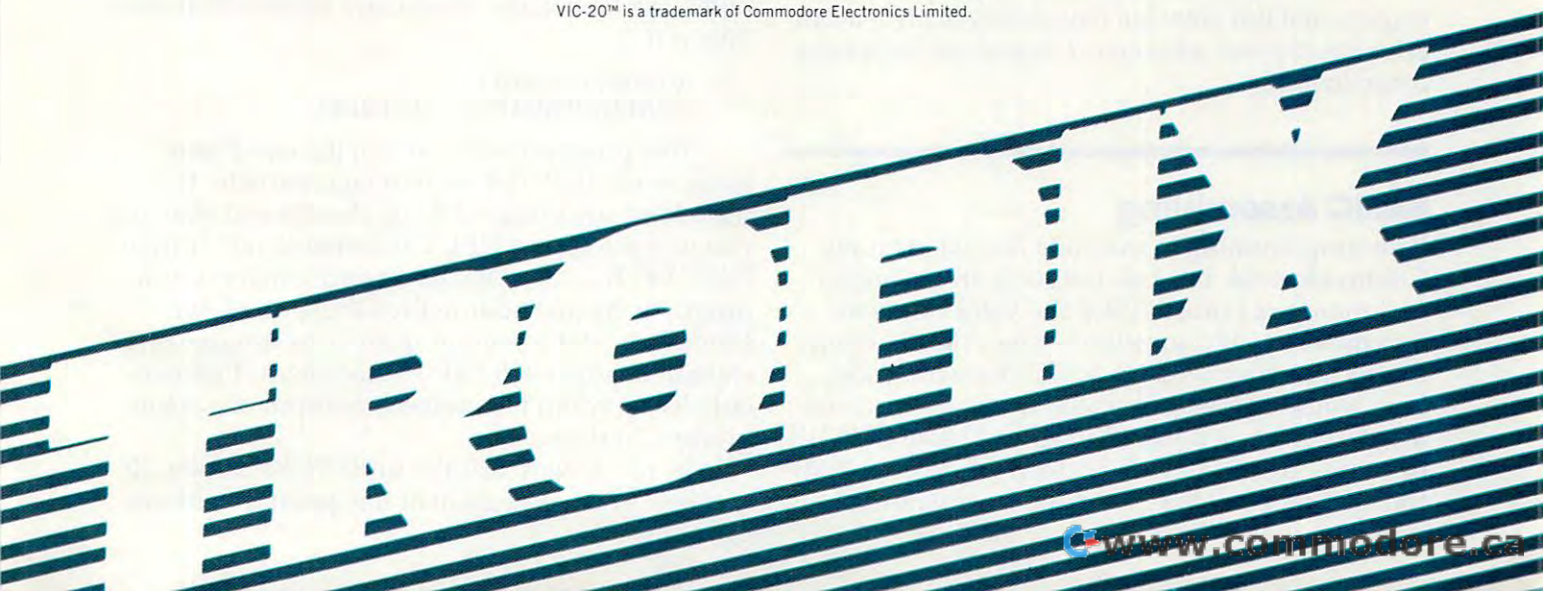

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a) guidance for a home computer, especially in education.

b) how can I put the home computer to work to pay for itself?

I can see the use of the computer as a tool in industry and small business; however, visions of incessant space invaders and missile command games and their sound effects will create a home arcade that's bound to become boring and shelved after a short period of time.

Please help, and offer me your guidance.

Cas Piotrowski

This issue of **COMPUTE!** *is representative of the mix of articles, applications, and programs we publish each month. There are two "arcade" style games, two educational games, and several dozen other programs. The majority of articles reflect the extraordinarily varied interests of* **COMPUTE!***'s readers and testify to the variety of uses to which home computers can be put.*

There are programs here which: teach touch typing, help you plan for retirement, create art on the computer screen, quickly search through records, alphabetize, draw charts and graphs, make music, assist in writing anything from a letter to a novel – and this is only one issue.

Few people buy a computer and then end up putting it in a closet with their abandoned hobbies. Personal computing can be a hobby, but is often much more. Many people find that they use personal computers as much as (even in preference to) TV. As to making your computer pay for itself, it will add speed and accuracy to virtually any mental activity. It can save you a significant amount of time organizing any of your leisure activities or assist you in your vocation. It can put you in touch with information on hundreds of subjects through the phone lines, when connected to an information service *such as CompuServe or The Source. It can help you make decisions which could save considerable amounts of money. (See the "Retirement Planner" program in this issue.)*

It's not the computer games – educational, challenging, and just plain fun though they can be – which drive business and government toward ever-increasing computerization.

BASIC Assembling

I am programming in machine language on my Commodore 64, but I do not have an assembler and therefore I must POKE the values directly into memory. My question is this: After loading the accumulator with an ASCII character code, how would I store it in screen memory, if screen memory starts at decimal 1024, and I cannot POKE in values greater than 255? (I already know about the subroutine at $FFD2.) Also, how would I execute a JMP or JSR using POKE commands?

Chris Coon

You seem to have addresses mixed up with values. It's true that any byte can only hold numbers up to 255. When machine language programmers send a character to the screen memory of the computer, they use two bytes to hold the target address. However, you can POKE from BASIC in the following way: POKE 1024,65. This will put the graphics symbol for a spade in your 64's screen. The POKE command will let you use any number less than 65536 as the address, followed by the value you want to send: POKE address, value.

Underlying your questions is an attempt to combine BASIC (POKE) with machine language (JSR, etc.). In the early days of computing, machine language programmers "hand assembled," constructing their programs with methods similar to POKEs. That was because computer memory was valuable and in short supply. Computers now have enough memory to hold an assembler *and at the same time create machine language programs elsewhere in memory. An assembler is to machine language programming what BASIC is to BASIC programming – a program to make it easy to write programs.*

You might want to get a book on machine language programming. Machine Language For Beginners *is now available from* **COMPUTE! Books**. *It contains an assembler which works on Apple, Atari, and any Commodore machine.*

Even More Perfect Commodore INPUT

Blaine Standage's article "Perfect Commodore Inputs" is interesting, but even his simple method has a simplification. I, too, have read many articles and seen many programs that use elaborate methods to eliminate the return to READY difficulty that plagues novice users of PET programs. I found a very simple method of avoiding this which also allows you to make your prompts without the added "?" when I was fooling around with OPENing files to the screen and keyboard devices. This is it:

```
10 OPEN 1,3:CMD 1
20 INPUT"PROMPT? " ;A$:PRINT
```

This program will perform the exact same thing as the INPUT# in Standage's article. It has the added advantage of being shorter and allowing you to use regular INPUT statements rather than INPUT#. In fact, you could easily convert entire programs by just adding the OPEN and CMD statements at the beginning and inserting a PRINT statement after each INPUT statement. I particularly like it when I want users to input at a colon prompt, and so on.

Here's how to exit the unRETURN mode. (If you BREAK the program at this point, it will con-

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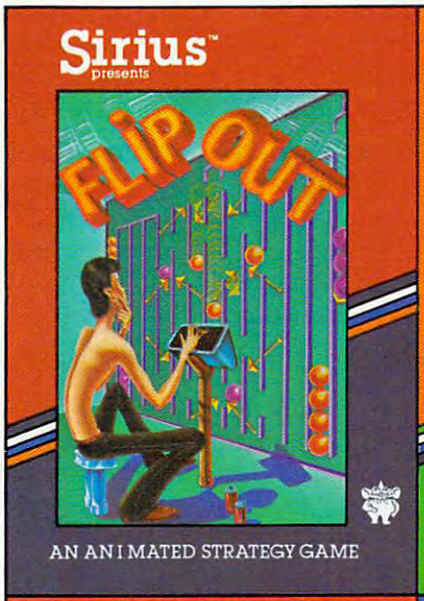
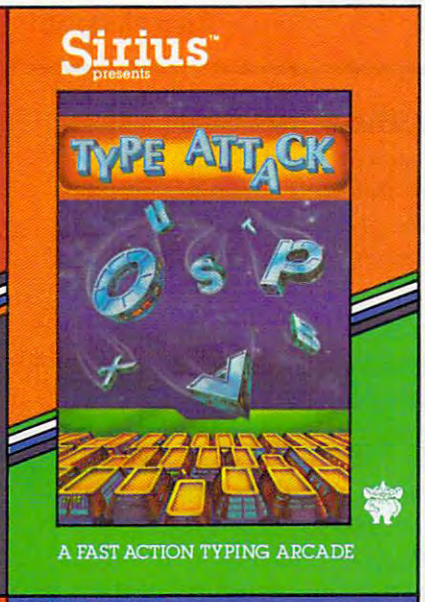
Have A Great Playday!

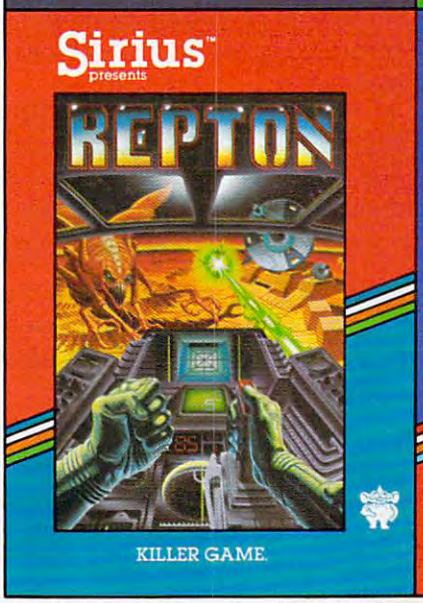
Take your marble to the top. Pick your spot and let it drop. Hope for a flip instead of a flop. Once you get it, the fun never stops! It's FLIP OUT — a crazy new strategy game for one or two players. Each marble you drop causes a chain reaction, so take your time and plan carefully. Plan right and you'll flip, if you didn't you Flip Out!

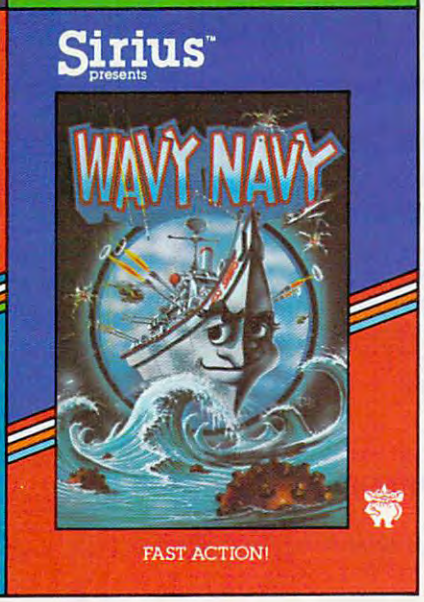




Turn your keyboard into a typing arcade! You can blast attacking letters and words right out of the sky. Type Attack was designed by a professional educator and the fast action game experts at Sirius. It features 39 preprogrammed lessons and 60 user defined lessons. Great sound, graphics and a real-time words per minute bar make improving your typing skills fun!

It is up to you to stop the invasion of the evil Quarriors and save Repton. You are armed with devastating Nuke Bombs, a Radar Screen, a Laser Gun and an Energy Shield. You'll need them all! You'll be attacked by Nova Cruisers and Single Saucers. You must avoid Spye Satellites and deadly Dyne-Beam Shooters and you must stop the Draynes from depleting the Reptonian power supply. Repton is a battle so thrilling you'll be relieved to find out you're still on earth when it's over!





Talk about adventure on the high seas! You're blasting away at a squadron of enemy bombers and Kamikaze fighters from the deck of your P.T. boat. Suddenly you notice the sea is loaded with mines and an Exocet missile is screaming toward you on the horizon. Instinctively you jerk the joystick to the starboard, keeping your thumb on the fire button. Phew! That was close! Sometimes it's hard to believe Wavy Navy's just a video game.

New Games For Your Apple II From Sirius™

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tinue to avoid sending CRLFs to the screen. That is, when you press RETURN, the information will get sent to the computer, but the cursor won't move to the next line.) So you need to: PRINT#1:CLOSE 1. Typing anything that gives you a SYNTAX ERROR also does the trick, but it isn't a particularly elegant way of exiting a program. So, at the end of the program, just put:

```
30 PRINT#1:CLOSE 1:END
```

Mits Hadeishi

A Disk Drive For The Atari 400

I was in a computer store the other day and overheard a salesman say that you could not use a disk drive with the Atari 400. Is this because of the 16K memory or because of some hardware problem?

Tom Bigelow

There is just barely enough memory in a 16K Atari 400 to load the Disk Operating System (DOS). DOS is a program which the computer then uses to manage the various functions of the disk drive (much the way that the computer's Operating System (OS) handles housekeeping for the computer itself).

However, the 400 can be expanded up to 48K, or even up to 90K, using available commercial memory expansion boards. See the ads in **COMPUTE!**.

What's Machine Language?

I recently received a program that works, but I cannot make any sense of it. Here it is:

```
100 DATA 169,64,24,105,1,32
110 DATA 210,255,201,90,208
120 DATA 246,169,13,76,210,255
130 FOR J=828 TO 844:READ X
140 POKE J,X:NEXT J
200 FOR J=1 TO 10
210 SYS 828
220 NEXT J
```

I have a number of questions....

C. P.

The questions, and Jim Butterfield's answers to them, are given below:

1. What do the numbers which follow the SYS statement reference?

This number – in this case 828 – is the address of the machine language subroutine to be called. It's a little like GOSUB 838 ... except that with SYS, the 828 is not a line number; it's the actual address where the machine code lies in the computer's memory.

2. When data numbers are POKEd into memory to accomplish machine language programming, what do those numbers mean?

In the case of your sample program, they are machine language instructions; you'll need a machine language reference manual to sort them out – and even then, you'll probably need to translate the decimal numbers into hexadecimal.

169, for example, is LDA or Load A – it brings the following value (64) into an internal chip register called A (or sometimes the Accumulator). 24 is the CLC or Clear Carry instruction – it turns off an internal flag called Carry within the chip. 105 is the ADC, or Add with Carry instruction; it asked the processor to add the following value (1) into the Accumulator. And so on... there are a lot of niggling details here, but the individual instructions are not hard. Obviously, you'll need a guide; any 6502 reference book will do the trick.

3. As a separate matter: what is meant by "setting the pointers" which indicate where BASIC programming begins?

The BASIC program that you load or type in, together with any variables it might create, must fit into a block of memory called "BASIC RAM". This block is usually set up so that you get all the spare RAM memory that's available.

If you need to set RAM aside – sometimes for special screen activities, and sometimes for machine language – you must change either where BASIC RAM starts (in VIC and Commodore 64, this is recorded in addresses 43 and 44), or where BASIC RAM ends (in VIC/64, addresses 55 and 56). To make extra room, you must move the start location upward, to leave empty space below; or the end location downward, to leave empty space above.

The addresses for start and end are stored in two bytes. To read such an address, take the contents of the first byte and add it to 256 times the contents of the second byte. On a VIC or 64, you would type:

```
PRINT PEEK(43)+256*PEEK(44)
```

to get the address where BASIC starts.

To move either pointer, you'll need to calculate the new values to be stored there, and there's extra work called for:

– When you move end-of-BASIC, follow this with a CLR command.

– When you move start-of-BASIC, store a zero just before the start location; move the pointer, and then say NEW.

To move the end-of-BASIC to 6144, we would POKE 55,0:POKE 56,24:CLR. To move the start-of-BASIC to 5121, we would POKE 5120,0:POKE 43,1:POKE 44,20:NEW. In either case, we'd cut down our available BASIC working space.

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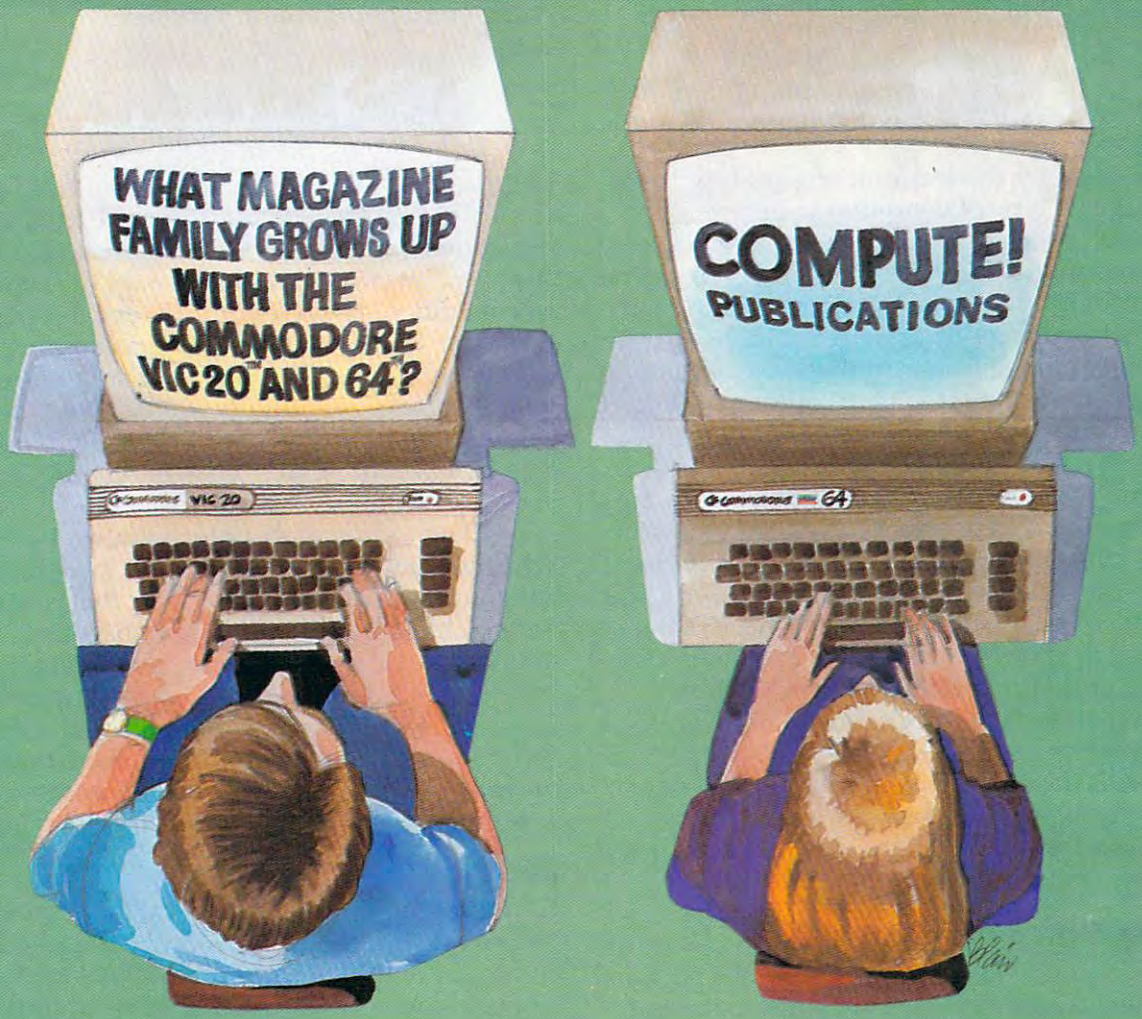

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THE BEGINNER'S PAGE

Richard Mansfield, Senior Editor

In the early days of electronic computing, there was only one type of computer program: governmental, especially military. The first electronic computer, the ENIAC, was built in Pennsylvania during World War II. Only governments could afford to build computers, and the major justification for spending money on these extraordinarily costly machines was that they could break secret codes, calculate missile trajectories, and assist in solving other war-related problems.

Four decades later, computers are becoming as common and as necessary as cars. Paralleling this is a constantly increasing array of software. *Software* means a *program*, a list of actions for the computer to take which, when followed, achieves whatever the *programmer* wants to achieve. PRINT 1+1 is a program, a piece of software, which would result in the computer displaying a "2" on a TV screen or printing it on a piece of paper. *Hardware* is the TV or printer or the computer itself. In cooking, hardware would be pans, spoons, and the stove. Software would be a recipe for stew or cupcakes.

Fifteen Categories

To get a general idea of the kinds of jobs personal computers currently tackle, we can separate programs into fifteen broad types: 1. Graphics, 2. Music, 3. Word Processing, 4. Education, 5. Home Applications, 6. Games, 7. Accounting, 8. Financial Simulation, 9. Data Base Management, 10. Languages, 11. Operating Systems, 12. Disk Operating Systems, 13. Utilities, 14. Telecommunications, 15. Artificial Intelligence.

In the next couple of columns, let's go through these classifications one by one and describe, in general terms, the characteristics of each category.

Graphics

For personal computers, graphics is most often found in game programs as an important part of the overall pleasure of the game itself. People do sometimes write "graphic demos," dazzling displays which are solely designed to be demonstrations of their computer's special color or high resolution abilities. But most graphics are written to improve a game.

Usually, the goal of graphics is to reproduce a visual concept as accurately as possible. In practice, this can require the use of *high resolution* graphics techniques. The more points of light on the TV screen (called *pixels*) that the programmer can control, the higher the resolution. Extremely high resolution can quickly use up the computer's free memory. The color and shade of each pixel has to be "remembered" in the computer's memory. A typical 21 inch color TV display would require control over roughly 500,000 pixels to achieve the resolution of broadcast TV. To animate this, you would need to change the picture 30 times per second!

There are a variety of techniques, however, which reduce the memory requirements and the programming necessary to create high resolution video. Home computer memory becomes larger and less expensive each year. The creators of the movie *TRON* demonstrated what computers can do visually. It is possible that personal computer programmers may, in the future, have that degree of control over the images on their home screens. Imagine the kinds of games we'll be playing then.

Music

A Moog synthesizer is to computer music what *TRON* is to home computer art: a hint of what's coming. Computers lend themselves very well to composition and *synthesis* (creating sounds by changing waveforms, timing, and various other elements of noise). Once a computer has memorized the kind of sound you want (violin? piano? an instrument no one has ever heard before?), it can go on to remember the melodies and the chords of a song. Then, by changing a few numbers, you can move the whole piece up or down the scale, make a symphony exclusively for tubas, add echo, whatever. In other words, your computer can be a *music processor*, a synthesizer.

This technology is available now. The new Commodore 64 computer contains an advanced music synthesis capability, a "synthesizer on a chip." What's more, Commodore has announced that it will be marketing a keyboard with three additional synthesizer chips inside that can attach to the 64 to form a complete computer musical instrument. After you've heard the sounds that can come out of this computer, you will agree that the future of music software is going to be astounding.

Next month we'll continue this overview of the types of software now available for home computers.

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Computers And Society

David D. Thornburg, Associate Editor

Jewels And Stones

Many years ago I talked to a scientist from the Far East who had just finished evaluating a series of grant proposals. I asked him about their quality. He thought for a minute and said, "They are a mixture of jewels and stones."

This January I attended the Winter Consumer Electronics Show in Las Vegas (our first impressions of this show appeared in **COMPUTE!** last month). In addition to all manner and form of new computer hardware, there were many software vendors in attendance as well. Because of my strong position in defense of certain video games, I want to devote some time to covering what I saw – it was clearly a collection of "jewels and stones."

Stones

I can't say I'm surprised, but the introduction of X-rated video games has so passed the boundaries of good taste that I can't resist commenting on them. While most of the quality software vendors exhibited their wares in the main conference hall, several vendors had to place their booths in a special room that was otherwise devoted to the promotion of X-rated video tapes.

Several companies had games to show for the Atari Video Computer System. These games all had such similar characteristics that vendor differentiation was hard to detect. I won't glorify these offerings by mentioning the names of the vendors, but I will describe the products in the hope that interested readers will learn enough here without having to enhance the profits of companies who are producing pure trash.

I have several criticisms common to all the games I saw. The strongest criticism I have is that these games degrade women. I suppose that I should be pleased that one of the games was withdrawn before the show. Since this game allowed the player to participate symbolically in racism and rape, I might even stand and applaud its departure from the marketplace – but the games that were left were hardly much better.

In addition to the degrading manner in which the game figures are treated, the game play consists of nothing more novel than a simple variant of games like *Breakout*, *Kaboom*, or a cat and mouse maze game.

If a civilization from another planet saw these cartridges, I'm sure they would wonder what motivation we have to procreate our species. I can only hope that an educated public will provide a clear message of disinterest in the current crop of X-rated "stones." Silicon is too valuable to waste on such trash.

Jewels

I've said it before, and I'll say it again – video games can be powerful educational tools. Rising from the gutter level of the X-rated offerings, I was pleased to see several games that were not only educational, but which also reinforced the idea that people should help each other.

At first glance, *Choplifter* from Brøderbund (for the Apple and Atari computer systems) looks like another shoot-em-up rescue game. You pilot a helicopter that picks up stranded people who are under attack. You must dodge or fight tanks and airplanes on your rescue missions, but your goal is to pick up the people and carry them to safety. My first positive response to this game came when I saw the rescued people leave the helicopter – and one of them stopped to wave goodbye.

I then noticed something even more impressive. The player *doesn't* get points for shooting planes or tanks. The player gets points only for rescuing people. What a pleasant idea!

Another Atari home computer game with nice goals is *Astro Chase* by Fernando Herrera (the author of the popular *My First Alphabet*). In this game, an astronaut has to protect Earth from migrating mine fields. Time wasted shooting other spaceships tends to spell an early death to Earth, so one learns quickly to focus on the task at hand. In addition to spectacular graphics, this game has some cute features. The first time the astronaut returns to Earth, he looks around and scratches his head because there is no welcoming committee. He then takes off to save Earth again. *This* time when he returns – wait – I don't want to spoil it for you. This is a very nice game.

You may recall that last year I spoke highly of software developed by CTW. At last, through their new division, Children's Computer Workshop (CCW), many fine educational games are appearing for machines as diverse as the Atari VCS and the Apple II. Atari was displaying an

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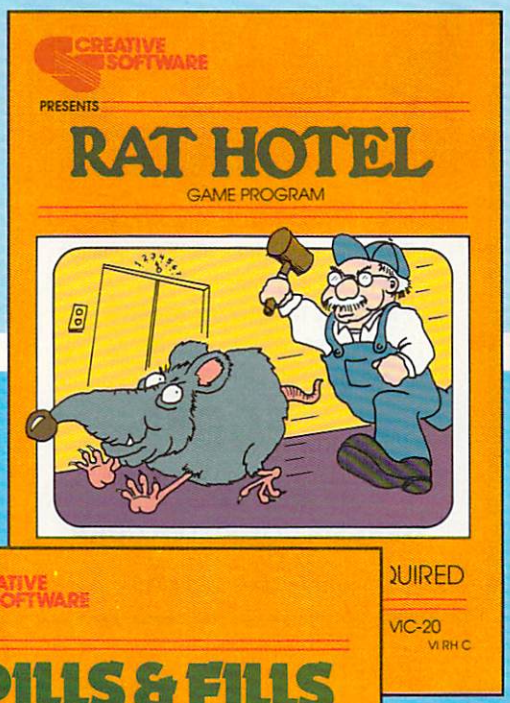

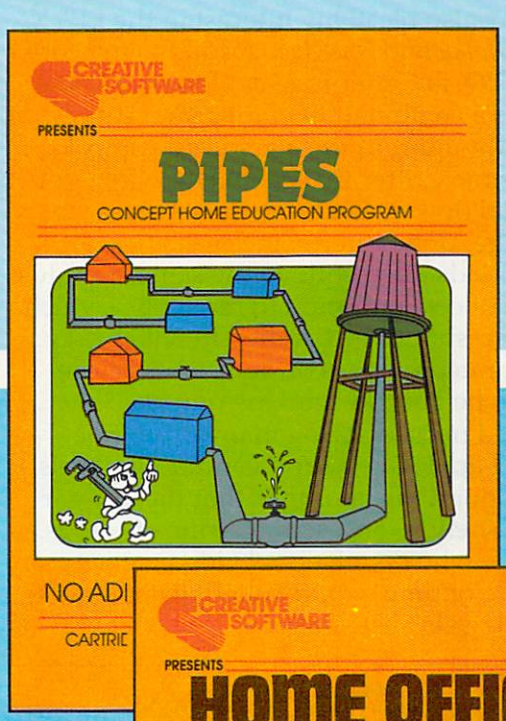

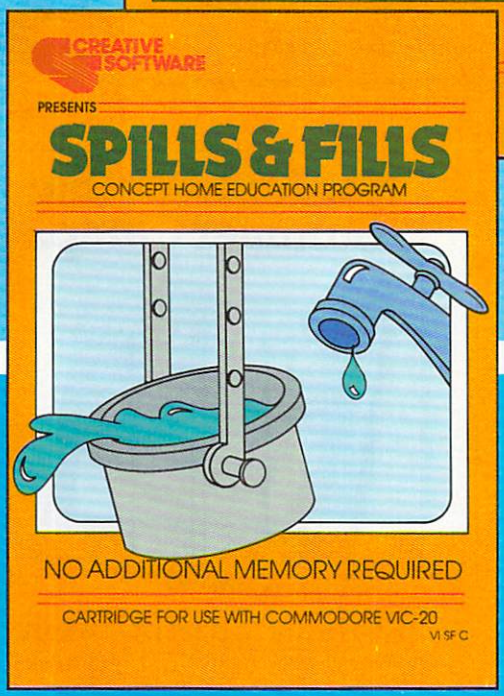

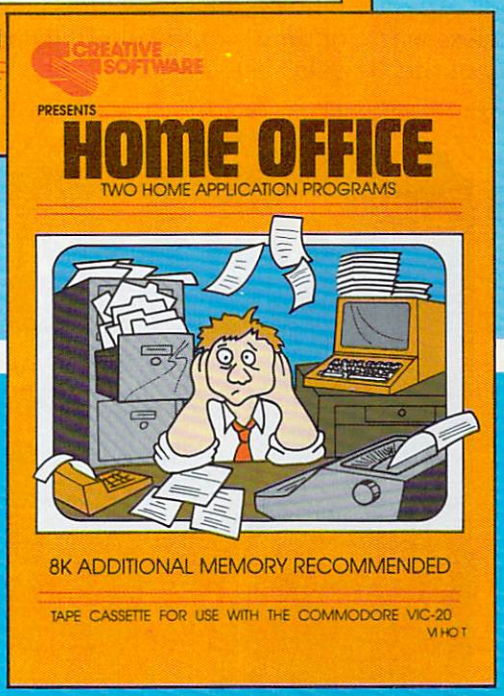

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excellent maze game in which you pick up cookies along the maze and put them in a cookie jar before the Cookie Monster gets to them. This entertaining game not only has high play value, but it also reinforces certain direction identification skills that help children learn to read. Tremendous effort has gone into these CCW designs, and the result is a line of software of great entertainment and educational value for young children.

You may also recall my interest in the EPYX games *Jabbertalky* and *Ricochet*. Added to my collection of EPYX favorites is *Alien Garden*, a game that requires a combination of mechanical skill and careful thought. In this game you control a bee-like Cosmic Critter that can bite, "wing," or sting a crystal flower. Each flower can grow, explode, change, or be eaten. Since each flower species responds differently to the same stimulus, it takes a lot of concentration to remember which type of flower should be handled in which way. Since this game provides constant motion, the player has to be good at thinking quickly.

I'm sure I missed seeing many other fine games, and I apologize to any vendor who feels left out. My point this month is that there is garbage on the shelves, and some terrific offerings as well. Anyone who dismisses *all* video games as a useless waste of time would benefit from playing any of the "jewels" listed above. ©

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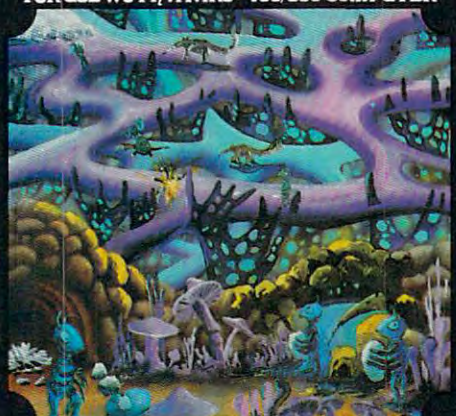

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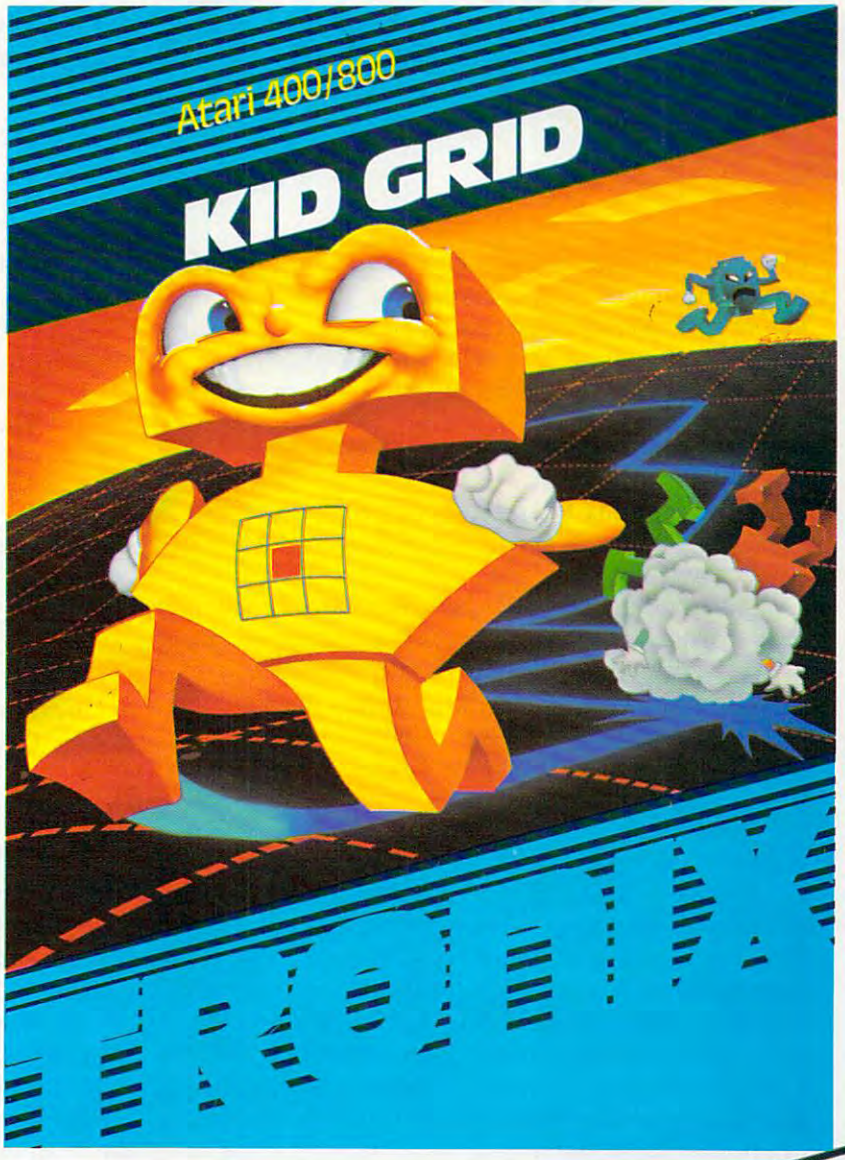

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Selecting The Right Word Processor

Tom R. Halfhill, Features Editor

One of the most useful and powerful applications for a personal computer is word processing. But the bewildering variety of word processing programs sometimes makes selecting the right one a difficult task. Here are some things to consider when making your choice.

Until the first day I used a word processor, my idea of the ultimate writing tool was an IBM Selectric typewriter.

As good as electric typewriters are, I realized that word processors are as far beyond typewriters as typewriters were beyond red crayons.

And as much as I like computers, as a writer I have to confess that if computers could do nothing else but word processing, it would justify their existence to me.

Obviously, this is one writer who is sold on word processing. Why?

Creative freedom, for one thing. With a word processor, you don't have to picture in your mind how the words will "read" on paper. You can just type them on the screen, and if they're awkward, zap them into oblivion with the delete key. No more piles of crumpled-up paper shuffling around your ankles. Less creative constraint while staring glumly at a blank page, reluctant to type for fear of another false start.

More flexibility, for another thing. With a word processor you can start at the end, or begin in the middle, and when you're done merge all the parts together into a uniform document.

With a word processor, you can tinker with text. Shape it. Mold it. It's like the difference between sculpting in clay or sculpting in marble.

Sure, you might be thinking, that's a writer's point of view. But what can word processing offer to the average person?

Plenty: you don't have to be a novelist or a journalist. Letters to Aunt Maude are enough. People are always asking what home computers are good for besides playing games, and word processing is one of the answers. If you can type, you can type better with a word processor. And if you can't type, you need a word processor even more.

For a minimum extra investment, that home computer beneath your fingertips can be turned into a word processor that only a few years ago would have cost $5000, $10,000, or even $20,000. The first word processor I used cost my newspaper several thousand dollars, lacked any disk or tape storage of its own, had rather crude editing functions, and contained only 2K of memory for text. The home computer I now use for word processing cost less, does more, and holds almost 16 times as much text.

Word processing is one of the most powerful applications you can implement on a microcomputer. That's one reason why there are scores of programs to choose from. Which is best for you? Here are some things to think about.

Fundamental Features

Word processors are descended from *text editors*. Sometimes the terms are used interchangeably, but the phrase "text editor," when applied to a writing tool, is becoming less common.

Basically, text editors started out as utilities for editing programs. Programmers created text editors to help them modify their code before cursor keys and full screen editing became standard. Eventually, someone got the idea that writers could use the text-manipulation features to edit their prose. Since English has little in common with FORTRAN, more features were added to text editors to make them easier to use, especially since most writers at the time knew nothing (and probably cared less) about computers.

At first, writers did not have much say about what features a word processor should have. That's why some writers and typists were turned off by their contact with the early word processors. The short history of word processing has often been a struggle between what writers would like to have and what programmers think writers would like to have (few people are accomplished in both fields).

Since today's word processors owe their

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parentage to text editors, there is still some family resemblance. For example, some word processors are *line-oriented*. Generally, the editing is done on lines of text, rather than on words. Often the editing in a line-oriented word processor is done in a different mode, apart from the writing. This is a holdover from the days of text editors, since programs are written in distinct lines of code. Many writers find word-oriented word processors more natural, because individual words – not lines – are the building blocks of English.

The ability to translate thoughts into words without irretrievably committing them to paper is a great psychological advantage for a writer.

The most basic feature of all word processors is that they let you type on a TV screen or monitor rather than on paper. If you make a mistake, you don't have to back up and strike it out with xxxxx's, or try to hide it with messy chalk correction sheets or white fluid. Usually you just backspace the cursor, erasing what you mistyped, and then type it again.

But this is more than merely a way to banish errors. The ability to translate thoughts into words without irretrievably committing them to paper is a great psychological advantage for a writer. A sentence can be experimentally worded several different ways, and the awkward versions discarded.

There is a minus side to this feature. Since the words on the screen are not permanent, a sudden power failure (or even a split-second "wink") can wipe out everything you've written. The solution is to occasionally save your text to disk or tape, especially if it's important or hard to reconstruct.

Another universal feature of word processors is the ability to go back in your text and insert words, and even whole sentences or paragraphs, if you have second thoughts. Transitions can be smoothed, ambiguities clarified, rough edges polished. You can also go back and delete words, sentences, and paragraphs. To do these things on a typewriter, or when composing text longhand, you'd have to resort to striking over, crossing out, jotting in margins, and recopying the whole page to get a neat finished product. With a word processor, you do all your tinkering on the screen, and simply print out a neat copy when you're done.

Advanced Features

You can, of course, do very crude word processing without buying a word processing program at all. Using the built-in screen-editing functions found on nearly all home computers, you can write your text in a series of PRINT statements in BASIC, get everything just right, and then print it out.

You could also try programming a simple word processor in BASIC, perhaps storing the input in strings which are then PRINTed out. Program listings for BASIC word processors also have appeared in magazines, including **COMPUTE!**.

But for lots of writing, there are definite advantages to commercial word processors (when we say "word processors," we're speaking here of word processing programs for home/personal computers, not the *dedicated*, or single-purpose, word processing machines found in many offices). The best commercial software is in fast, efficient machine language and offers many advanced features. Some features to look for:

- *Block Move*. What if a sentence, paragraph, or even group of paragraphs somewhere in your document would work better somewhere else? Such as at the top, or maybe the end? A block move function replaces old-fashioned cutting and pasting. You can define a "block" of text and move it anywhere you want. Usually there is a limit on how much you can move, but you can move large sections in smaller chunks. Journalists like this feature because it lets them juggle the elements of their articles.

- *Headers/Footers*. A header is a short line of text which is automatically printed at the top of each page, and a footer is automatically printed at the bottom. For example, articles submitted to **COMPUTE!** for publication require a header atop each page that includes the author's last name, a one- or two-word article title, and the page number, such as "Smith/Memory Map/4." Most word processors allow you to define such a header (or a footer) once at the beginning of the document, and then automatically print it on each page.

- *Page-Numbering*. Sometimes this is called *pagination*, a term which more properly means something else (see below). Page-numbering means simply that pages will be automatically numbered if you wish. Often you can place the page number in a header or footer, or start from a number other than one (handy when adding something to an existing document).

- *Pagination*. Some people need to know exactly how the text will appear on paper. Perhaps

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the document contains columnar charts, or subheadings, or footnotes, or figures, which cannot be broken across two pages. Usually only expensive, dedicated word processing machines have screens which exactly simulate a sheet of typing paper. On other systems, especially home computers with less than 80-column wide screens, some advanced word processors allow the document to be "printed" to the screen, just as if the TV were a printer. This gives a preview of how the paper will appear. A word processor with pagination shows exactly where each page "breaks." If the break is undesirable, you can reformat the document, perhaps by changing the margins, and try again. If the format of documents is important to you, these features will save lots of paper.

- *Text Buffer.* This is a section of memory in which you can temporarily store a block of text. When you need it, you can recall the block and insert it anywhere in the document. Often this is separate from the buffer which handles block moves, but some word processors use one buffer for both functions. Sometimes buffers are used to rapidly delete large sections of text; the text is stored in the buffer and erased with a "block delete" or "erase buffer" command.

- *Chained Files.* Sometimes a document will be too large to fit into the computer at once. The solution is to write the document in several parts, saving each one to disk or tape separately. A word processor with file-chaining allows you to print the entire document as if it were one piece. Some programs do this automatically; when the end of one part is reached, they load the next part and continue printing. Others require you to supervise the operation and issue commands yourself.

- *Merged Files.* This powerful feature lets you assemble a document on the screen from several parts stored separately on disks or tapes. You could write something in bits and pieces, as the mood strikes you, and fit it together later. Or you could create form letters, storing frequently used paragraphs and merging them as needed with whatever's on the screen. This is a real labor-saver for lawyers and businesses. On some word processors, it's as easy as positioning the cursor at the bottom of the screen text and loading the next file as usual.

- *Justification.* Although your printer automatically lines up the left margin, the right margin is generally left "ragged," or staggered. Most word processors allow you to automatically "justify," or line up, the right margin also. This can present a neater appearance. However, some people find unjustified text easier to read (the typesetting in **COMPUTE!** is unjustified, or "ragged right").

- *Global Search.* With this powerful feature, you can give the word processor a word or phrase, and it will search through all the text and find every occurrence. What is this good for? Authors love it for indexing their books. Or, if you want to locate a particular sentence or section in a very long document, you can use the search function to find a word which you know appears there. In combination with the *Replace* function described below, you can make quick, repetitive changes to long documents.

- *Search And Replace.* Let's say you've written a long document in which you refer dozens of times to someone named "Smith." Then you discover that Smith spells his name "Smythe." You could spend an hour trying to track down every Smith yourself, and you'd probably miss a few. But with Search And Replace, the word processor does it for you, in seconds. It automatically changes every "Smith" to "Smythe." Some word processors pause each time they find the target word and ask if you're sure you want it replaced. That way, somebody else referred to in your document who really does spell his name "Smith" won't have his name misspelled, either.

- *Horizontal Scrolling.* Because the typical TV cannot clearly display more than 40 characters across a screen, virtually all home computers designed to work with TVs are limited to 40 columns or less. (There are 80-column adapters available for some computers, but they require a special computer monitor.) Since a standard sheet of typing paper accommodates up to 80 characters per line, what you see on the screen is not what you get on paper. To get around this, some word processors offer *horizontal scrolling.* The entire screen moves horizontally, right to left, as the cursor bumps against the right screen margin. In effect, the screen is a moving "window" looking onto a wider document. Some word processors scroll up to 140 columns horizontally, which is useful for business charts. The *Atari Word Processor* uses horizontal scrolling, and Commodore plans to market something similar for the Commodore 64.

- *Parsing.* Also known as *word wrapping.* On word processors, unlike typewriters, you can't hit a carriage return key at the end of each line. Instead, you just type continuously, pressing RETURN only at the end of paragraphs. When you reach the end of a screen line, some word processors break the last word wherever it happens to bump against the right screen margin. This leaves random word fragments at the beginning and end of each screen line. (The printer, of course, ignores this and prints the word whole.)

However, they instantly "jump" the word down to the next line as you type. The text appears on the screen "ragged-right." This is a highly personal feature. Some people say that parsing is distracting and wastes screen space; others believe that parsed, unbroken words are easier to proof-

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read on the screen. Try both methods before deciding which you prefer.

● *Superscripts, Subscripts.* These are the tiny numbers printed slightly above or below the normal line of copy. For instance, the exponent in 10^2 is a superscript; H_2O has a subscript. Not all word processors can handle these.

Superscripts and subscripts are examples of special printing functions. Others may include *boldfacing* (printing in darker type), *elongating* (printing in larger, stretched-out type), *condensing* (printing in smaller type), underlining, *proportional spacing* (the printer uses less space to print an I than a W), and *italics*. Word processors vary in the number of special printing functions they support.

The important thing to remember is that the word processor must be matched to the printer you're using. Special printing functions are activated by sending *control codes* to the printer – usually by embedding special characters in your text – and not all printers use the same control codes. So it's quite possible that your word processor allows underlining, but your printer does not. Likewise, your printer might allow italics, but your word processor might not.

This means you should carefully consider not only the word processor's features, but also how it works with your particular printer. If you're planning to buy a printer and a word processor at about the same time, decide which purchase will influence the other. Buying a certain printer will limit you to certain word processors; buying a certain word processor will limit you to certain printers. Some word processors get around this problem by being extremely flexible. They can be *configured* (modified) to match almost any printer on the market.

Enhancements

Since word processors are becoming extremely popular in business, a number of enhancements, or add-on programs, are being designed to work with them. Word processing is only one part of today's "automated office." Microcomputers also are used to maintain data bases, files, and mailing lists. Some word processors for home/personal computers also are made to work with companion programs.

For instance, if you must regularly send out form letters to addresses on a mailing list, why bother to retype the addresses each time? Some mailing list programs are designed to work with compatible word processors. With only a few keystrokes, you can recall addresses from the mailing list and merge them with your form letters.

The same thing is possible with some data base managers. The files can be transferred to a word processor and merged with letters or other documents.

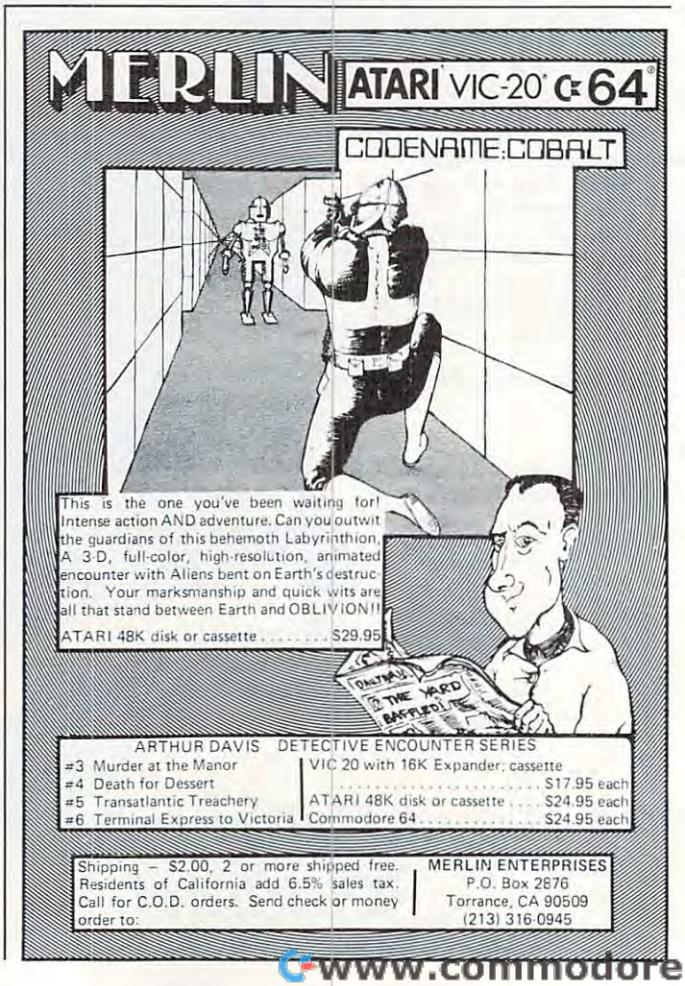
If you think you might need these features, consider them carefully when choosing a word processor. Almost always, the various programs must be specially designed to work together.

Another interesting enhancement is a spelling-checker program. This program links up with your word processor, compares your spelling to its own dictionary, and corrects any errors. Some programs even allow you to add your own words to the dictionary – those that you find especially troublesome, or technical words unique to your field. Only a few spelling checkers are available for home/personal computers, but more are becoming available.

And as if that weren't enough, Bell Laboratories – the research arm of American Telephone & Telegraph – is perfecting a program called *Writer's Workbench*. This program detects and corrects all kinds of writing errors – grammatical as well as spelling. A companion program, diplomatically dubbed *Suggest*, recommends changes.

Even more amazing, *Writer's Workbench* can actually rewrite text to remove gobbledygook. Conceivably, it could be applied to everything from business letters to legal documents to federal regulations.

Will this super-sophisticated copy editor-on-



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a-disk forever solve everybody's writing problems? Probably not. As an experiment, Bell scientists fed Abraham Lincoln's Gettysburg Address through *Writer's Workbench*. First, here's part of the familiar original:

> *Fourscore and seven years ago our fathers brought forth on this continent, a new nation, conceived in liberty, and dedicated to the proposition that all men are created equal. Now we are engaged in a great civil war, testing whether that nation or any nation so conceived and so dedicated can long endure. We are met on a great battlefield of that war. We have come to dedicate a portion of that field, as a final resting place for those who here gave their lives that that nation might live. It is altogether fitting and proper that we should do this.*

And now the computer's version:

> *Eighty-seven years ago, our grandfathers created a free nation here. They based it on the idea that everybody is created equal. We are now fighting a civil war to see if this or any similar nation can survive. On this battlefield we are dedicating a cemetery to those who died for their country. It is only right.*

That's pretty fancy work for a computer program. But most would agree that something was lost in the translation. It will probably be a long while before writers are laid off by their word processors. ©

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Air Defense

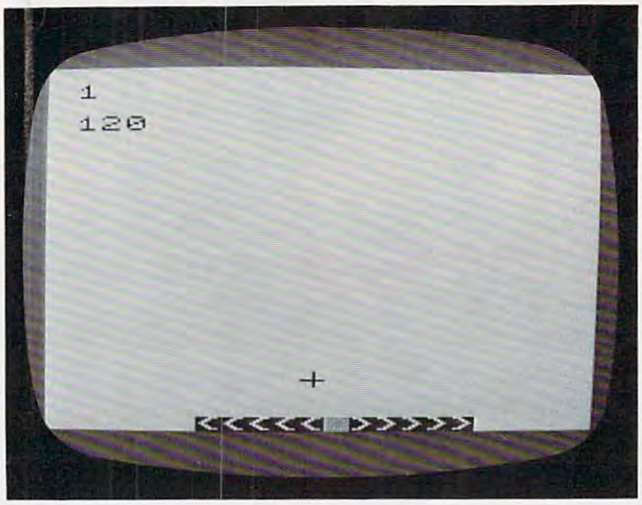
T. L. Wahl

"Air Defense" is a challenging game for the 5K VIC-20, 16K Atari 400/800, unexpanded TRS-80 Color Computer, Apple II, TI-99/4A, and PET/CBM. Look in the article for special notes on your particular machine.

The object of the game of "Air Defense" is to defend your land (at the bottom of the screen) from falling bombs. The bombs appear at various places at the top of the screen. As they fall, the player must line up the crosshair of his gunsight and fire when the bomb and crosshair are aligned. On the VIC version press S to move up, X to move down, ‹cursor down› to move left, and ‹cursor up› to move right. Press SPACE to fire.

The player gets only one shot, and timing is critical. After 20 bombs have appeared, the game ends, and the player is given a score showing hits and misses and a point score.

One of the unique features of the game is the increasing difficulty factor: as the player improves his skill, the crosshair is gradually moved toward the top of the screen, and quicker reflexes and improved technique are required to destroy the falling bombs. As a reward for increasing skill, the player earns higher point values for successive hits. In addition, the player receives a higher score the sooner the falling bomb is destroyed.



A bomb explodes in the VIC-20 version of "Air Defense" (PET/CBM and Apple versions are similar).

Program 1: VIC Version

```
100 X=RND(0)
110 A=8152:B=38872:P=0:M=0:T=0:Q=0
120 PRINT"{CLEAR}{07 DOWN}      AIR DEFENSE
    "
130 PRINT"{02 DOWN}      DO YOU NEED"
140 PRINT"{DOWN}     INSTRUCTIONS?"
150 PRINT"{DOWN}    TYPE 'Y' OR 'N'"
160 FOR H=1TO1000:GETD$
170 IF D$="N" THEN 380
180 IF D$="Y" THEN 220
190 NEXT
200 PRINT"{CLEAR}{DOWN}YOU DID NOT PRESS '
    Y' OR 'N'."
210 FOR K=1TO5000:NEXT:GOTO120
220 PRINT"{CLEAR}  YOU MUST STOP THE"
230 PRINT"  FALLING BOMB BY"
240 PRINT"   EXPLODING IT IN"
250 PRINT"     MID-AIR."
260 PRINT"{DOWN} MOVE THE CROSSHAIR"
270 PRINT"{DOWN}*{REV}LEFT{OFF}:CURSOR U/D
     KEY"
280 PRINT"{DOWN}*{REV}RIGHT{OFF}:CURSOR L/
    R KEY"
290 PRINT"{DOWN}*{REV}UP{OFF}:WITH THE 'S'
     KEY"
300 PRINT"{DOWN}*{REV}DOWN{OFF}:WITH THE '
    X' KEY"
310 PRINT"WHEN THE BOMB AND THE"
320 PRINT"CROSSHAIR ARE LINED UP, FIRE BY ~
    PRESSING THESPACE";
330 PRINT" BAR."
340 PRINT"{DOWN}PRESS ANY KEY TO START"
350 GET D$:IF D$="" THEN 350
360 PRINT"{CLEAR}{10 DOWN}      GOOD LUCK!
    "
370 FOR I=1TO2500 :NEXT
380 IFT=20 THEN 860
390 PRINT"{CLEAR}":D=INT(RND(1)*10)
400 T=T+1
410 E=D+7685
420 F=D+38405
430 PRINTP*Q*10
440 FOR I=1 TO 200:NEXTI
450 POKE A,91:POKE B,0
460 GET A$
470 IFA$="S"THENA=A-22:B=B-22
480 IF A$="X"THEN B=B+22:A=A+22
```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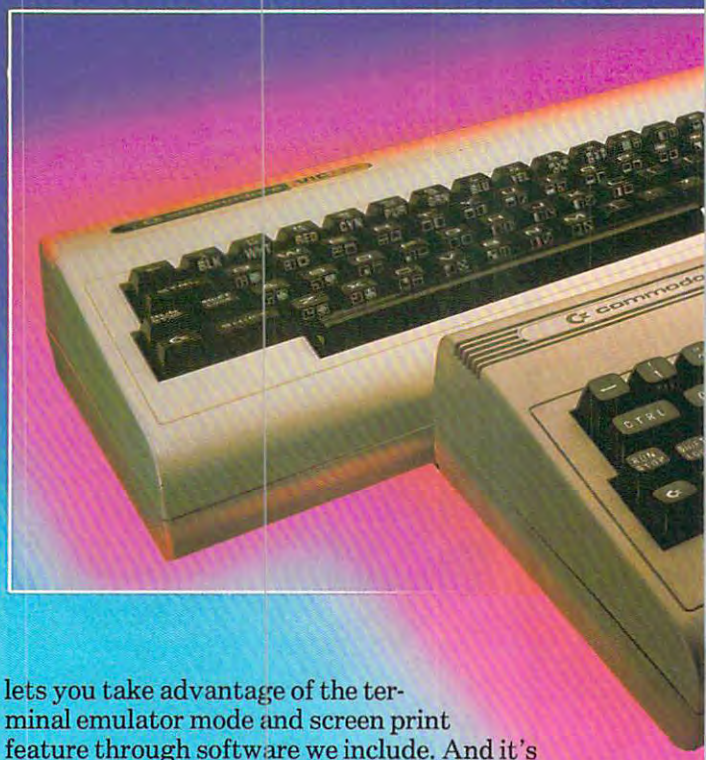

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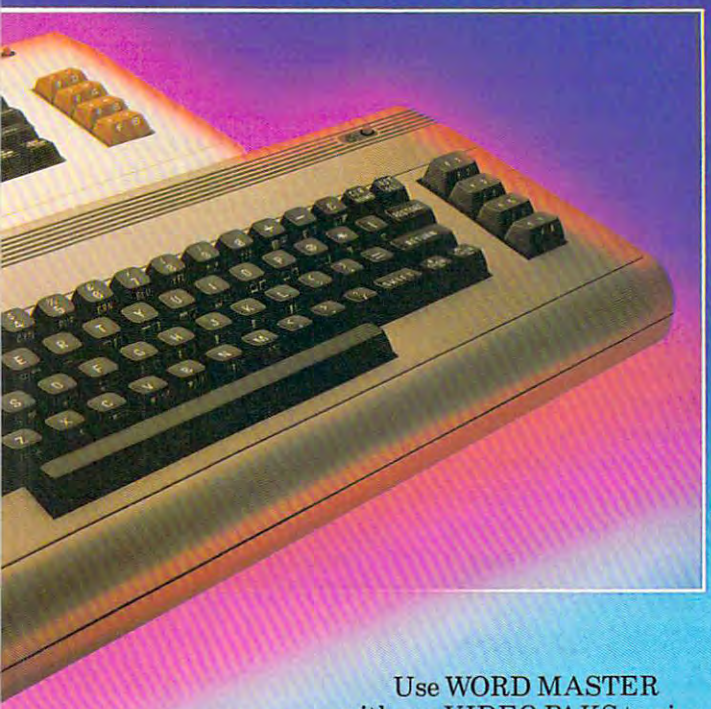

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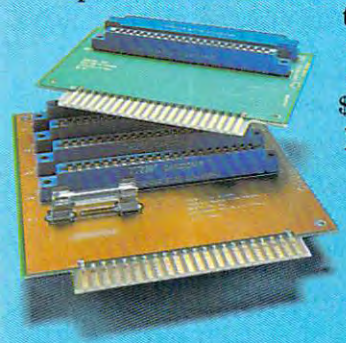

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```
490 IF A$="{RIGHT}"THEN A=A+1:B=B+1
500 IF A$="{DOWN}"THEN A=A-1:B=B-1
510 IF A<7680 THEN A=A+22:B=B+22
520 IF A>8163 THEN A=A-22:B=B-22
530 POKE E,42:POKE F,0
540 FOR I=1 TO 50:NEXT
550 IF E>8163 THEN GOTO 760
560 IF A=ETHEN 580
570 E=E+22:F=F+22:PRINT"{CLEAR}":GOTO450
580 GET B$
590 IFB$=" "THEN 620
600 GOTO 570
610 REM BOMB IS DESTROYED
620 X=100:FORI=1TO10:POKEE,X
630 POKE F,0
640 POKEE+21,X
650 POKEF+21,0
660 POKEE+24,X
670 POKEF+24,0
680 X=X+1
690 NEXT
700 NO=210:S1=-3:DU=60:GOSUB 960
710 P=P+1
720 Q=Q+22-INT((A-7680)/22)
730 A=A-22:B=B-22
740 GOTO380
750 REM BOMB GETS YOU!
760 POKE E,32:FOR I=1TO5
770 POKEE-I,188
780 POKEF-I,0
790 POKEE+I,190
800 POKEF+I,0
810 FOR S=1 TO 50:NEXT
820 NEXT
830 M=M+1
840 NO=135:S1=-2:DU=100:GOSUB 960
850 GOTO380
860 PRINT"{CLEAR}{DOWN}       GAME OVER"
870 PRINT"{03 DOWN}DESTROYED"P
880 PRINT"{02 DOWN}MISSED"M
890 PRINT"{02 DOWN}TOTAL POINTS"P*Q*10
900 FOR I=1 TO 30:GET D$:NEXT I
910 PRINT"{04 DOWN}PRESS {REV}P{OFF} TO PL
    AY AGAIN"
920 GET D$:IF D$="" THEN 920
930 IF D$="P" THEN 110
940 END
950 REM EXPLOSIONS
960 POKE 36877,NO
970 FOR I=15 TO 1 STEP S1
980 POKE 36878,I
990 FOR DELAY=1TODU:NEXTDELAY:NEXTI
1000 POKE 36877,0:POKE 36878,0
1010 RETURN
```

Atari Notes

Program 2 will run on any 16K Atari 400/800. Protect your multicolored city (designed by Harry Blair, **COMPUTE!**'s illustrator) from falling bombs. Move the crosshair with your joystick to intercept the bomb before it lands. You receive more points the higher up on the screen you intercept the bomb. The game ends when the city is finally pulverized.

A Velocity Stick

You'll probably notice that joystick response is a little odd. When you move it just a bit, your crosshair moves finely. But when you continue pressing it in a certain direction, the crosshair really takes off. This type of joystick response is called a *velocity stick*, or more accurately, an *acceleration stick*.

A velocity stick lets the player have fine control over his marker, but automatically speeds up response when the stick is pushed long enough. It's like the gas pedal in a car. A true acceleration stick would also coast a while when you let go, but not in Air Defense.

This game was an experiment of sorts. Among the novelties are realistic multicolored characters in IRG mode 5 (see the Atari Notes for "Thunderbird," **COMPUTE!**, January 1983, #32), and a multicolor player (the airplane) formed by overlaying two players to get three colors.

Of course, some machine language is necessary to move player/missile graphics (unless you use strings). A small routine moves players zero and one (the airplane) in tandem. BASIC is too slow to use two POKEs without some flicker. The other routines are more interesting. QUIKMOVE moves a series of bytes from one position to another. It is used here to move the shapes for the explosion (stored in the character set) into player four. It can only move up to 255 bytes.

PMG ML Routine

PMOVE is responsible for moving a player any number of spaces up or down. It does this by "scrolling" the player memory strip the number of specified times. It can move the player down the screen as many as 127 times, and move it up by adding 128 to the number of moves you want to go up (it makes more sense in machine language). It will only move the player vertically; and, if you move too much, the player will disappear (a good way to clear out a player is to move it 0 bytes, which is really 128 bytes). It's used in Air Defense to move the crosshair.

The syntax for SPOKE (Simultaneous POKE) is:

XX = USR(1719,N)

N is the new horizontal position of players zero and one.

The syntax for QUIKMOVE is:

XX = USR(1729,FROM,TO,LENGTH)
FROM = source address,
TO = destination address, and
LENGTH = number of bytes to move.

The syntax for PMOVE is:

XX = USR(1664,ADR,N)

N is either 1-127 to move the player down, or 129-255 ((1 - 127) + 128) to move the player up. ADR is the address of the player's first byte (player zero would be PMBASE + 512 in double-resolution).

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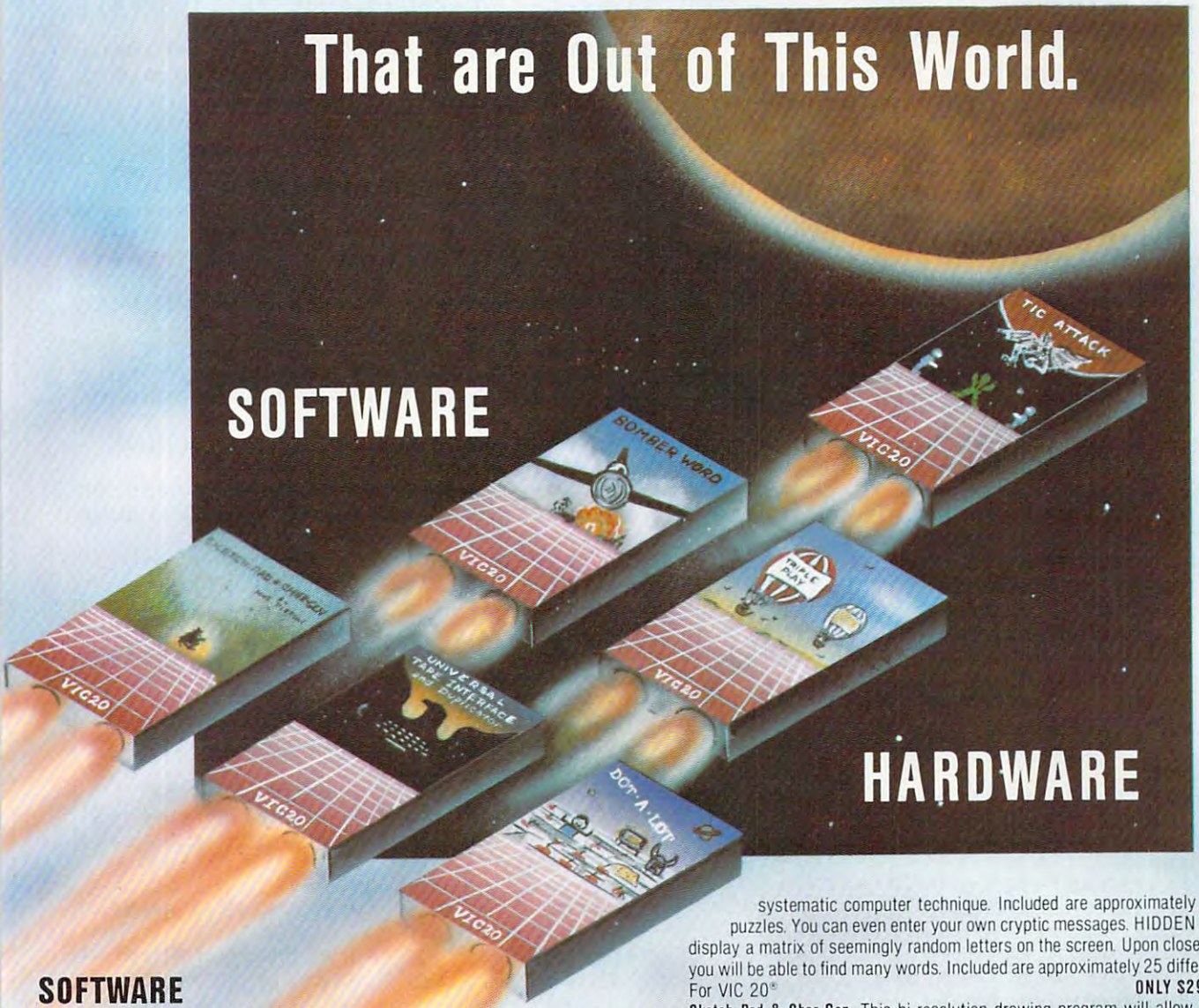

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Program 2: Atari Version

```
100 REM ■ AIR DEFENSE - ATARI VERSION
110 REM Charles Brannon 1983
120 REM
130 GOSUB 590:REM Initialize game
140 PLANEPOS=30:BOMBFALLING=0
150 POSITION 28,0:IF DIFF=1 THEN ? "
    EASY":GOTO 170
160 ? "hard"
170 K=PEEK(53279):IF K=5 THEN DIFF=3
    -DIFF
180 IF K=PEEK(53279) THEN 180
190 IF K<>6 THEN 150
200 POSITION 28,0:? "{4 SPACES}":POK
    E 53278,0
210 IF PEEK(53279)=6 THEN RUN
220 IF SELECTED>=0 THEN 240
230 SELECTED=INT(39*RND(0)):IF CITY$
    (SELECTED+1,SELECTED+1)=CHR$(0)
    THEN 230
240 IF PLANEPOS>210 THEN PLANEPOS=30
250 A=USR(SPOKE,PLANEPOS):PLANEPOS=P
    LANEPOS+3
260 IF INT((PLANEPOS-48)/4)=SELECTED
     THEN YPOS=3:BOMBFALLING=1
270 IF  NOT BOMBFALLING THEN 300
280 COLOR 32:PLOT SELECTED,YPOS-DIFF
    :COLOR 64:PLOT SELECTED,YPOS
290 YPOS=YPOS+DIFF:SOUND 0,YPOS,2,4:
    SOUND 1,YPOS,10,YPOS/1.4:IF YPOS
    >21 THEN 450
300 ST=STICK(0):GOSUB 400:IF ST=15 T
    HEN VEL=0
310 VEL=VEL+1:XD=(PTRIG(0)-PTRIG(1))
    *VEL
320 PX=PX+XD:IF PX<46 OR PX>200 THEN
     PX=PX-XD
330 POKE 53250,PX
340 YD=VEL*(-((ST=14)+(ST=10)+(ST=6)
    )+((ST=9)+(ST=5)+(ST=13)))
350 IF YD=0 THEN 210
360 POKE 77,0:PY=PY+YD:IF PY<32 OR P
    Y>96 THEN PY=PY-YD:GOTO 210
370 D=YD:IF D<0 THEN D=128-D
380 A=USR(PMOVE,P2,D)
390 GOTO 210
400 IF PEEK(53254)=0 THEN RETURN
410 EX=PX:EY=PY:GOSUB 490:COLOR 32:P
    LOT SELECTED,YPOS-DIFF:BOMBFALLI
    NG=0:SELECTED=-1
420 SCORE=SCORE+(22-YPOS)*10:POSITIO
    N 28,0:? SCORE;
430 PX=140*RND(0)+48:POKE 53250,PX
440 POKE 53278,0:POP :GOTO 210
450 EY=104:EX=SELECTED*4+44:POKE 532
    59,1:COLOR 32:PLOT SELECTED,YPOS
    -DIFF:GOSUB 490:POKE 53259,0:POK
    E 53278,0
460 BOMBFALLING=0:CITY$(SELECTED+1,S
    ELECTED+1)=CHR$(0):SELECTED=-1
470 HIT=HIT+1:IF HIT=39 THEN 1020:RE
    M TOTAL DESTRUCTION
480 PX=140*RND(0)+48:POKE 53250,PX:G
    OTO 210
490 REM DO EXPLOSION IN PLAYER 4
500 REM AT POSITION EX,EY
510 POKE 53251,EX:EP=P3+EY:POKE 5325
    0,0
520 FOR I=1 TO LEN(EXPL$)
530 POKE 707,PEEK(53770):IF FINAL TH
    EN POKE 53251,EX:EX=EX+4*(EX<250
    )
540 A=USR(QUIKMOVE,CHSET+ASC(EXPL$(I
    ))*8,EP,7)
550 SOUND 0,I*5+YPOS*2,0,13-I+FINAL*
    2:SOUND 1,I*10+FINAL*100,0,6.5-I
    /2
560 NEXT I:POKE 53250,PX
570 RETURN
580 END
590 REM ■ INITIALIZATION
600 DIM EXPL$(20):EXPL$(1)=CHR$(15):
    FOR I=2 TO 6:EXPL$(I)=CHR$(24+I)
    :NEXT I:EXPL$(7)=";<=>?":EXPL$(1
    2)=CHR$(0)
610 CHSET=(PEEK(106)-16)*256:IF PEEK
    (CHSET+8)=21 THEN 630
620 GRAPHICS 2+16:SETCOLOR 4,9,4:SET
    COLOR 0,1,10:POSITION 5,5:? #6;"
    PLEASE WAIT":GOSUB 1120:GOSUB 86
    0
630 SPOKE=1719:QUIKMOVE=1729:PMOVE=1
    664:DIFF=1
640 GRAPHICS 0:POKE 756,CHSET/256:SC
    R=PEEK(88)+256*PEEK(89):SETCOLOR
     4,1,10:POKE 559,0
650 DL=PEEK(560)+256*PEEK(561)+4
660 POKE DL-1,6+64:POKE DL+2,6
670 FOR I=3 TO 22:POKE DL+I,4:NEXT I
    :POKE DL+I,5:POKE DL+I+1,65:POKE
     DL+I+2,PEEK(560):POKE DL+I+3,PE
    EK(561)
680 DIM CITY$(39)
690 CITY$="!■#$%&'()*+,.-$#&$')$+'!(
    ).-#!(%$'■$',.":POSITION 0,21:?
    CITY$;
700 POSITION 5,0:? "■AIR DEFENSE■"
710 PMB=PEEK(106)-16:PMBASE=PMB*256:
    P0=PMBASE+512:P1=P0+128:P2=P1+12
    8:P3=P2+128
720 PY=60:PX=127:OY=PY
730 FOR I=0 TO 3:POKE 53248+I,0:NEXT
     I
740 POKE 53277,3:POKE 54279,PMB:POKE
     53256,1:POKE 53257,1:POKE 53258
    ,0
750 FOR I=0 TO 3:A=USR(PMOVE,P0+I*12
    8,0):NEXT I
760 RESTORE 780:FOR I=0 TO 7:READ A:
    POKE P0+I+22,A:NEXT I:FOR I=0 TO
     7:READ A:POKE P1+I+22,A:NEXT I
770 FOR I=0 TO 7:READ A:POKE P2+PY+I
    ,A:NEXT I
780 DATA 0,0,126,127,63,0,0,0
790 DATA 176,216,0,42,0,24,48,0
800 DATA 0,8,8,54,8,8,0,0
810 POKE 53250,PX:POKE 623,33:POKE 7
    04,20:POKE 705,3*16+2:POKE 706,3
    0
820 SETCOLOR 0,7,6:SETCOLOR 1,15,4:S
    ETCOLOR 2,0,10:SETCOLOR 4,0,0:PO
    KE 559,46
830 RETURN
840 GOTO 830
850 GOTO 850
860 RESTORE 870:FOR I=1664 TO 1752:R
    EAD A:POKE I,A:NEXT I:RETURN
870 DATA 104,104,133,204,104,133
880 DATA 203,104,104,170,48,20
890 DATA 160,126,177,203,200,145
900 DATA 203,136,136,16,247,169
```


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Exterminator **By Ken Grant** Just about as action-packed and complex as is nufisically possible in your standard 5K VIC 20. This extremely well-written, machine code game is invariably praised by customers and has been called the second best tape game made for the VIC of 1982 (oh, no, not by us, we don't agree with that opinion). Rapidfire from the bottom of the screen at moving insects and creatures . . . anything that moves, and even anything that doesn't. Just don't be overrun by any or all. It's as much fun the hundredth time you play it as it was the first. This game plays stick or key and runs in standard 5K VIC 20.

3-D Man Not just another eat-the-dots-in-a-maze game, this! Though you find yourself in an edible dot-littered floor plan that may seem vaguely familiar, we guarantee you have never looked at it from this perspective (eye level) before. The dots diminish into the distance as you race down a hallway eating them one after the other. The dot-remaining counter on the right clicks downward. Race through a 4-way intersection and whoops! Head to head with one of the ghosts that haunt these halls! Back quickly on the stick puts you facing the dotless hall you just cleaned out when . . . another ghost! A quick left turn into that junction saves you, but in the confusion you've lost direction momentarily and must check the miniature radar plotting screen to set things straight. . . . Definitely, an ordinary maze game this one is *not*. 3-D Man requires a joystick and at least 3K extra memory.

Racefun Extensive use of multi-color character graphic capabilities of the VIC make this game very appealing to the eye. Fast all-machine language action, quick response to the stick or keyboard-controlled throttle, combine with the challenge of driving in ever-faster traffic to make it appeal to the rest of the body. Plays joystick or keyboard.

Antimatter Splatter! A more dastardly alien could scarcely be found than one who would wipe out an entire civilization by dropping anti-matter anti-canisters, right? If your opinion of this alien troublemaker is the same as ours, probably your first thought was, get some matter! We say calm down! All is not lost. A mobile rapid splatter cannon capable of both breaking through his standard alien moving force fields and laying waste to the ever-increasing number of anti-canisters is even now hovering above us. If only our cannoneer hadn't called in sick...say, what are you doing today? *Anti-Matter Splatter* is 100% machine language and runs in standard 5K VIC.

Defender on Tri As pilot of the experimental Defender-style ship "Skyes Limited," you are the only hope for an advance party of scientists trapped in ancient alien sphere which suddenly (heat from collision course with sun presumably—G.E.) came to life. Four screens worth of unique defenses, on-off shields, fuel deposits, alien treasures, running timer, energy, score and very nice graphics display make this one that does not quickly wax old. *Defender on TRI* requires at least 3K memory expander, but will run with any memory add-on (8K, 16K, 24K, etc.) we have come across.

Alien Panic Standard 5K VIC 20/combination stick & keyboard. This arcade-type game pits you against time and an alien on a six level construction sight with ladders and pitfalls, but *not to worry!* You have a shovel.

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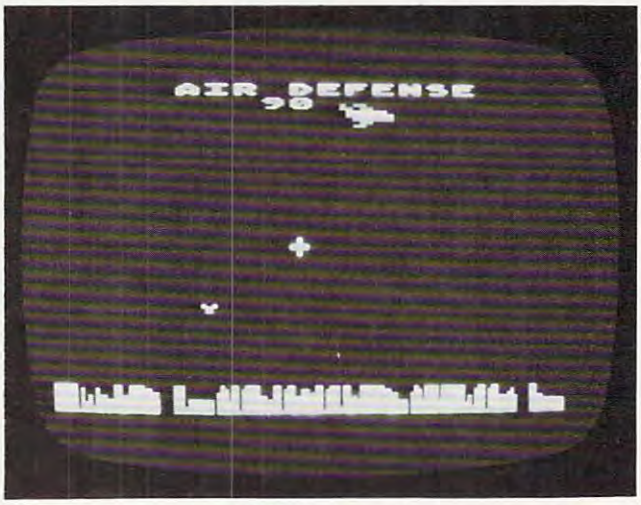
```
910 DATA 0,168,145,203,202,208
920 DATA 237,96,41,127,170,160
930 DATA 1,177,203,136,145,203
940 DATA 200,200,16,247,136,169
950 DATA 0,145,203,202,208,237
960 DATA 96,104,104,104,141,0
970 DATA 208,141,1,208,96,104
980 DATA 104,133,204,104,133,203
990 DATA 104,133,206,104,133,205
1000 DATA 104,104,168,177,203,145
1010 DATA 205,136,16,249,96
1020 REM TOTAL DESTRUCTION
1030 POKE 53259,3:PX=0:EY=104:FINAL=
     1:FOR L=1 TO 4:EX=100*RND(0)+32
     :GOSUB 490:NEXT L
1040 POKE 53277,0:FOR I=0 TO 2:POKE
     53261+I,0:NEXT I
1050 GRAPHICS 3+16:FOR I=0 TO 3:X=19
     :FOR Y=0 TO 11:X=X-1:COLOR 3*RN
     D(0):PLOT 19-X*RND(0),12-Y:COLO
     R 3*RND(0)
1060 POKE 708,PEEK(53770):POKE 709,P
     EEK(53770):POKE 710,PEEK(53770)
     :POKE 712,PEEK(53770):SOUND I,1
     00+I*10,0,15-Y/2
1070 PLOT 19+X*RND(0),12-Y:COLOR 3*R
     ND(0):PLOT 19-X*RND(0),12+Y:COL
     OR 3*RND(0):PLOT 19+X*RND(0),12
     +Y:NEXT Y:NEXT I
1080 FOR W=1 TO 100:POKE 712,PEEK(53
     770):NEXT W
1090 FOR I=0 TO 1:SOUND I,0,0,0:NEXT
      I
1100 GRAPHICS 0:POKE DL+10,7:POSITIO
     N 5,9:? "SCORE:";SCORE;
1110 SETCOLOR 2,4,0:FOR W=1 TO 100:P
     OKE 712,48+14*RND(0):NEXT W:RUN

1120 FOR I=128 TO 207:POKE CHSET+I,P
     EEK(57344+I):NEXT I:FOR I=264 T
     O 471:POKE CHSET+I,PEEK(57344+I
     ):NEXT I
1130 RESTORE 1170
1140 READ A:IF A=-1 THEN RETURN
1150 FOR J=0 TO 7:READ B:POKE CHSET+
     A*8+J,B:NEXT J
1160 GOTO 1140
1170 DATA 0,0,0,0,0,0,0,0,0
1180 DATA 1,21,21,55,21,183,149,183,
     149
1190 DATA 2,0,8,40,170,170,170,166,1
     66
1200 DATA 3,85,85,125,85,125,85,125,
     85
1210 DATA 4,80,82,242,82,242,82,242,
     90
1220 DATA 5,0,1,1,17,17,81,101,105
1230 DATA 6,0,0,0,80,234,234,234,238
1240 DATA 7,80,80,80,89,189,189,189,
     189
1250 DATA 8,170,186,238,186,238,186,
     238,170
1260 DATA 9,0,80,90,90,95,95,127,127
1270 DATA 10,10,138,139,74,75,74,75,
     73
1280 DATA 11,168,168,184,168,184,168
     ,186,170
1290 DATA 12,0,0,0,0,85,170,187,170
1300 DATA 13,16,20,92,84,94,85,93,85
1310 DATA 14,0,0,0,0,168,84,116,84
1320 DATA 15,0,0,0,24,60,24,0,0
1330 DATA 26,0,0,24,60,60,24,0,0
1340 DATA 27,0,0,60,126,126,60,0,0
1350 DATA 28,0,56,124,254,124,56,0,0
1360 DATA 29,24,60,126,255,255,126,6
     0,24
1370 DATA 30,60,126,255,255,255,255,
     126,60
1380 DATA 31,126,255,255,255,255,255
     ,255,126
1390 DATA 32,0,195,235,40,40,20,0,0
1400 DATA 59,126,255,255,231,231,255
     ,255,126
1410 DATA 60,60,126,247,199,227,239,
     126,60
1420 DATA 61,60,102,219,189,189,219,
     102,60
1430 DATA 62,66,153,36,66,66,36,153,
     66
1440 DATA 63,60,102,195,129,129,195,
     102,60
1450 DATA 64,8,8,20,99,20,8,8,0
1460 DATA 65,0,0,126,127,63,0,0,0
1470 DATA 66,176,216,0,42,0,24,48,0
1480 DATA 127,16,24,28,30,30,28,24,1
     6
1490 DATA -1
```



In the Atari version of "Air Defense," a multicolored jet drops bombs as you maneuver your defending crosshair.

TRS-80 Color Computer Notes

Program 3 will run on unexpanded Color BASIC. Instructions are displayed when you RUN the game. Try to intercept the falling bombs with your crosshair cursor, and press the red fire button when they intersect. The higher up on the screen you detonate the bomb, the more points you receive.

Program 3: TRS-80 Color Computer Version

```
100 ' COLOR COMPUTER
110 ' AIR DEFENSE
120 CLS:PRINT@10,"AIR DEFENSE":PRINT
130 PRINT"SAVE YOUR CITY FROM FALLING
    "
140 PRINT "BOMBS. USE THE RIGHT JOYS
```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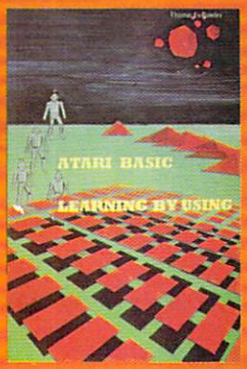

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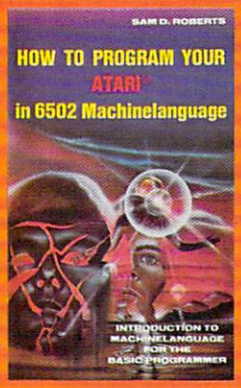

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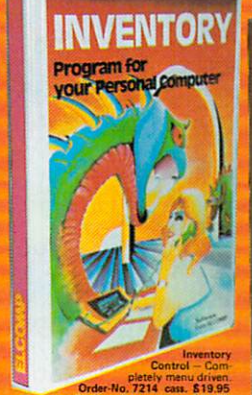

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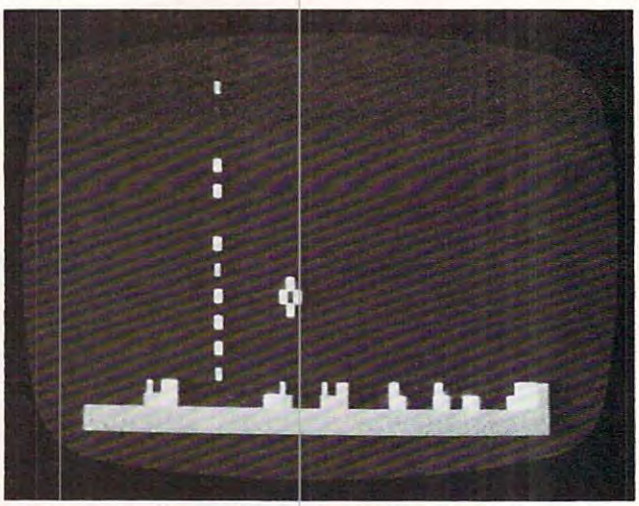
```
    TICK
150 PRINT"TO INTERCEPT BOMBS BEFORE T
    HEY
155 PRINT"LAND.  THE SOONER YOU HIT T
    HE
157 PRINT"BOMB, THE BETTER YOUR SCORE
     IS.":PRINT
160 PRINT"THE GAME CONTINUES
170 PRINT"UNTIL YOUR CITY IS GONE."
180 PRINT:PRINT"PRESS THE RED BUTTON
    TO BEGIN"
190 GOSUB 500:IF FIRE=0 THEN 190
195 CITY$="CGKO"
200 CLS0:PRINT@481,"";
210 FORI=1TO30:PRINTCHR$(ASC(MID$(CIT
    Y$,RND(4)))+64+8*RND(7));:NEXT:PR
    INT
220 DIM CITY(63):FORI=1TO63:CITY(I)=1
    :NEXT
240 CX=31:CY=15:OX=CX:OY=CY
250 BX=RND(60)+1:IFCITY(BX)=0THEN250
260 FOR B=1 TO 28STEP2
280 RESET(OX,OY):RESET(OX-1,OY+1):RES
    ET(OX+1,OY+1):RESET(OX,OY+2)
290 CX=JOYSTK(0):CY=JOYSTK(1)/2
300 IFCX<1THENCX=1
305 IFCX>62THENCX=62
310 IFCY<1THENCY=1
320 IFCY>25THENCY=25
322 SET(CX,CY,5):SET(CX+1,CY+1,5):SET
    (CX-1,CY+1,5):SET(CX,CY+2,5)
325 OX=CX:OY=CY
327 IF(PEEK(65280)=126ORPEEK(65280)=2
    54)ANDABS(CX-BX)<1ANDABS(CY-B)<1T
    HEN1500
330 SET(BX,B,RND(8))
340 NEXT B
341 CITY(BX)=0
342 CITIES=CITIES+1:IFCITIES=60THEN10
    00
350 REM EXPLOSION
351 GOSUB2000:SOUND250,1:SOUND251,1:S
    OUND253,1:SOUND255,1
355 FORI=1TO5
360 SET(BX-2,B-2,8):SET(BX,B-2,2):SET
    (BX+2,B-2,8):SET(BX-1,B-1,2):SET(
    BX+1,B-1,2):SET(BX,B,4)
370 RESET(BX-2,B-2):RESET(BX,B-2):RES
    ET(BX+2,B-2):RESET(BX-1,B-1):RESE
    T(BX+1,B-1):RESET(BX,B)
380 NEXTI
390 GOTO250
499 END
500 REM JOYSTICK FIRE BUTTON ROUTINE
510 Z=PEEK(65280):FIRE=(Z=126)OR(Z=25
    4)
520 RETURN
1000 REM GAME OVER
1010 FORI=0TO31
1020 FORI=31TOOSTEP-1
1030 FORJ=1TO5
1040 SET(RND(63),I,RND(8))
1050 NEXT:NEXT
1060 PRINT@0,"PRESS FIRE TO PLAY AGAI
     N":GOTO190
1500 GOSUB2000:SOUND240,5
1510 SCR=SCR+100-B*100/31
1520 PRINT@490,INT(SCR);
1530 GOTO250
2000 FORI=B TO 0 STEP-2:RESET(BX,I):N
     EXT:RETURN
```



Falling bombs leave trails in the TRS-80 Color Computer version of "Air Defense," which also features a joystick-controlled crosshair.

Apple II Notes

The instructions for Program 4 are given when the program is run. You will find that the REPEAT key, along with the necessary crosshair controls and fire button (the space bar), can greatly improve your scores. The bomb number and score are displayed in the upper left corner.

Program 4: Apple Version

```
100 P = 0:M = 0:T = 0:Q = 0
110  FOR I = 0 TO 21: READ C5: POKE 768
      + I,C5: NEXT I
120  DATA  169,200,133,7,173,48,192,136
     ,208,4
130  DATA  198,7,240,7,202,208,246,162,
     100,100,239,96
140  TEXT : HOME
150  VTAB 6: PRINT  SPC( 14);"AIR DEFEN
     SE"
160  VTAB 11: PRINT  TAB( 15)"DO YOU NE
     ED"
170  PRINT : PRINT  TAB( 14)"INSTRUCTIO
     NS?"
180  PRINT : PRINT  TAB( 13)"TYPE 'Y' O
     R 'N'"
190  PRINT : HTAB 20: GET D$
200  IF D$ = "N" THEN 310
210  IF D$ <  > "Y" THEN  GOTO 190
220  HOME
230  VTAB 3: PRINT  SPC( 14);"AIR DEFEN
     SE"
240  PRINT : PRINT : PRINT : PRINT : PRINT
     "     YOU MUST STOP THE FALLING BOM
     B"
250  PRINT  SPC( 5)"BY EXPLODING IT IN
     MID-AIR.": PRINT
260  PRINT : PRINT  SPC( 9)"MOVE THE CR
     OSSHAIR:"
270  PRINT : PRINT  SPC( 8)"LEFT WITH T
     HE '<-' KEY": PRINT  SPC( 8)"RIGHT
      WITH THE '->' KEY"
280  PRINT  SPC( 8)"UP WITH THE 'S' KE
     ": PRINT  SPC( 8)"DOWN WITH THE '
     ' KEY"
```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```
290  PRINT : PRINT : PRINT " WHEN THE B
     OMB AND THE CROSSHAIR ARE IN": PRINT
     " LINE, FIRE BY PRESSING THE SPACE
      BAR."
300  FOR I = 1 TO 10000: NEXT : HOME : VTAB
     10: HTAB 15: FLASH : PRINT "GOOD L
     UCK!": FOR I = 1 TO 5000: NEXT : NORMAL

310 VC = 22
320  IF T = 20 THEN 780
330  HOME : VTAB 24: INVERSE : FOR I =
     2 TO 39: HTAB I: PRINT " ";: NEXT
     I: NORMAL
340 HC = 21:T = T + 1:VB = 0: VTAB 2: HTAB
     3: PRINT T
350  VTAB 4: INVERSE : PRINT P * Q * 10
     : NORMAL
360 HB =  INT ( RND (1) * 29) + 6
370 VB = VB + 1
380  IF VB = 1 THEN 400
390  HTAB HB: VTAB VB - 1: PRINT " "
400 OVCROSS = VC:OHCROSS = HC
410 A =  PEEK ( - 16384): POKE  - 16368
    ,0
420  IF A - 128 =  ASC ("S") THEN VC =
     VC -  SGN (VC - 1)
430  IF A - 128 =  ASC ("X") THEN VC =
     VC +  SGN (22 - VC)
440  IF A = 136 THEN HC = HC -  SGN (HC
      - 2)
450  IF A = 149 THEN HC = HC +  SGN (39
      - HC)
460  IF VC = OVCROSS AND HC = OHCROSS THEN
     480
470  HTAB OHCROSS: VTAB OVCROSS: PRINT
     " "
480  HTAB HC: VTAB VC: PRINT "+"
490  HTAB HB: VTAB VB: PRINT "*"
500  FOR I = 1 TO 50: NEXT I
510  IF VB = 23 THEN 560
520  IF VB = VC AND HB = HC THEN 540
530  GOTO 370
540  IF A - 128 =  ASC (" ") THEN 650
550  GOTO 370
560  REM  MISS
570  VTAB VB: HTAB HB: PRINT " "
580  VTAB 24: INVERSE : FOR I = 1 TO 5:
      HTAB HB - I: PRINT "<";: HTAB HB +
     I: PRINT ">";: NEXT I
590  FOR K = 1 TO 100
600  CALL 768
610  NEXT K
620  FOR I = 1 TO 100: NEXT I
630 M = M + 1: GOTO 320
640  REM  HIT
650  HTAB HC - 1: VTAB VC - 1: PRINT  CHR$
     (220);" /"
660  HTAB HC - 1: VTAB VC: PRINT "- -"
670  HTAB HC - 1: VTAB VC + 1: PRINT "/
      "; CHR$ (220)
680  REM  SOUND ROUTINE
690  FOR K = 1 TO 20
700  FOR I = 1 TO K
710  CALL 768
720  NEXT I
730  NEXT K
740 Q = Q + 23 - VC
750 P = P + 1
760 VC = VC - 1
770  GOTO 320
780  REM  GAME OVER
790  HOME
800  VTAB 8: HTAB 15: FLASH : PRINT "GA
     ME OVER": NORMAL
810  VTAB 12: PRINT  TAB( 12)"DESTROYED
      "P
820  VTAB 14: PRINT  TAB( 15)"MISSED "M

830  VTAB 17: PRINT  TAB( 11)"YOUR SCOR
     E "P * Q * 10
840  VTAB 20: HTAB 10: INPUT "ANOTHER G
     AME (Y/N) ";AN$
850  IF AN$ = "N" THEN 880
860  IF AN$ <  > "Y" THEN  VTAB 20: HTAB
     29: PRINT "      ": GOTO 840
870  RUN
880  END
```

TI-99/4A Notes

The TI-99/4A version of Air Defense is similar to the VIC-20 version. In fact, scoring is calculated in the same manner: the sooner the bombs are destroyed, the higher the score. However, the TI-99/4A version's graphics are drawn with custom characters.

Most of the shapes in the game are custom characters that were designed with the aid of the character definition program in the TI-99/4A *User's Reference Guide* (pages III-26 and III-27). Custom characters created in this manner were then assigned ASCII code numbers in the range 122-136, which correspond to character sets 12, 13, and 14. Since no character set higher than 14 is referenced in the program, the Extended BASIC mode can be used for a faster, more challenging game.

Program 5: TI Version

```
100 DIM BLOCK$(2),PLACE(2),BUILDING(
    32,2)
110 RANDOMIZE
120 REM BOMB CHARACTER
130 CALL CHAR(129,"001CBEFFFFBE1C00"
    )
140 REM CROSSHAIR CHARACTER
150 CALL CHAR(130,"181818FFFF181818"
    )
160 CALL CLEAR
170 CALL SCREEN(12)
180 FOR J=5 TO 8
190 CALL COLOR(J,5,16)
200 NEXT J
210 FOR J=9 TO 12
220 CALL COLOR(J,2,14)
230 NEXT J
240 T=0
250 P=0
260 Q=0
270 M=0
280 CALL CLEAR
290 PRINT "{8 SPACES}AIR DEFENSE"
300 PRINT
310 PRINT
320 PRINT
330 PRINT " do you need instructions
    ?"
340 PRINT
```


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```
350 PRINT "{8 SPACES}type Y or N"
360 FOR I=1 TO 7
370 PRINT
380 NEXT I
390 CALL KEY(3,Y,STATUS)
400 IF STATUS=0 THEN 390
410 IF Y=ASC("N")THEN 750
420 IF Y=ASC("Y")THEN 520
430 CALL CLEAR
440 PRINT
450 PRINT "  you did not press Y or
    N."
460 FOR I=1 TO 13
470 PRINT
480 NEXT I
490 FOR DELAY=1 TO 500
500 NEXT DELAY
510 GOTO 280
520 CALL CLEAR
530 PRINT "{3 SPACES}YOU MUST STOP T
    HE FALLING"
540 PRINT "BOMB BY EXPLODING IT IN M
    ID-AIR."
550 PRINT
560 PRINT
570 PRINT "{3 SPACES}-MOVE THE CROSS
    HAIR-"
580 PRINT
590 PRINT "  left :HOLD THE s KEY"
600 PRINT "  right:HOLD THE d KEY"
610 PRINT "  up{3 SPACES}:HOLD THE e
     KEY"
620 PRINT "  down :HOLD THE x KEY"
630 PRINT
640 PRINT "{3 SPACES}WHEN THE BOMB A
    ND THE"
650 PRINT "CROSSHAIR ARE LINED UP,"
660 PRINT "FIRE BY PRESSING THE SPAC
    E"
670 PRINT "BAR. THE SOONER YOU GET T
    HE"
680 PRINT "BOMB, THE HIGHER YOUR SCO
    RE."
690 PRINT
700 PRINT
710 PRINT
720 PRINT "{3 SPACES}PRESS any key T
    O START"
730 CALL KEY(0,S,STATUS)
740 IF STATUS=0 THEN 730
750 CALL CLEAR
760 CALL COLOR(8,2,1)
770 PRINT "{7 SPACES}GOOD LUCK!!!"
780 FOR I=1 TO 10
790 PRINT
800 NEXT I
810 IF R=ASC("R")THEN 840
820 GOSUB 2090
830 GOTO 860
840 FOR I=1 TO 250
850 NEXT I
860 CALL CLEAR
870 GOSUB 2300
880 IF T=20 THEN 1860
890 T=T+1
900 CCROSS=16
910 RCROSS=21
920 RBOMB=1
930 CALL SCREEN(6)
940 CBOMB=INT(RND*29)+2
950 H$=STR$(T)
960 ROW=2
970 COL=3
980 GOSUB 2520
990 SCORE=P*Q*10
1000 H$=STR$(SCORE)
1010 ROW=5
1020 GOSUB 2520
1030 FOR I=1 TO 70
1040 NEXT I
1050 FOR I=2 TO 5 STEP 3
1060 CALL HCHAR(I,3,32,6)
1070 NEXT I
1080 OLDRCROSS=RCROSS
1090 OLDCCROSS=CCROSS
1100 CALL KEY(0,A,STATUS)
1110 IF A<>ASC("E")THEN 1130
1120 RCROSS=RCROSS-SGN(RCROSS-1)
1130 IF A<>ASC("X")THEN 1150
1140 RCROSS=RCROSS+SGN(22-RCROSS)
1150 IF A<>ASC("D")THEN 1170
1160 CCROSS=CCROSS+SGN(31-CCROSS)
1170 IF A<>ASC("S")THEN 1190
1180 CCROSS=CCROSS-SGN(CCROSS-2)
1190 IF RBOMB=1 THEN 1210
1200 CALL VCHAR(RBOMB-1,CBOMB,32)
1210 IF (RCROSS=OLDRCROSS)*(CCROSS=O
     LDCCROSS)THEN 1230
1220 CALL VCHAR(OLDRCROSS,OLDCCROSS,
     32)
1230 CALL VCHAR(RCROSS,CCROSS,130)
1240 CALL VCHAR(RBOMB,CBOMB,129)
1250 RBOMB=RBOMB+1
1260 IF RBOMB=23 THEN 1540
1270 IF (RCROSS=RBOMB-1)*(CCROSS=CBO
     MB)THEN 1290
1280 GOTO 1080
1290 CALL KEY(0,B,STATUS)
1300 IF B=32 THEN 1330
1310 GOTO 1080
1320 REM BOMB DESTROYED
1330 RBOMB=RBOMB-1
1340 CALL SCREEN(10)
1350 CALL VCHAR(RBOMB,CBOMB,32)
1360 CNT=0
1370 C1=92
1380 C2=47
1390 FOR I=-1 TO 1 STEP 2
1400 CALL VCHAR(RBOMB+I,CBOMB+I,C1)
1410 CALL VCHAR(RBOMB+I,CBOMB-I,C2)
1420 NEXT I
1430 C1=32
1440 C2=32
1450 IF CNT=1 THEN 1510
1460 CNT=1
1470 FOR VOL=10 TO 30 STEP 5
1480 CALL SOUND(100,-6,VOL)
1490 NEXT VOL
1500 GOTO 1390
1510 P=P+1
1520 Q=Q+(23-RBOMB)
1530 GOTO 880
1540 REM BOMB HITS THE CITY
1550 CALL VCHAR(22,CBOMB,32)
1560 CALL SCREEN(9)
1570 CALL COLOR(12,11,1)
1580 CALL VCHAR(23,CBOMB-1,122)
1590 CALL VCHAR(23,CBOMB,32)
1600 CALL VCHAR(23,CBOMB+1,123)
1610 CALL VCHAR(24,CBOMB-1,124)
1620 CALL VCHAR(24,CBOMB,125)
1630 CALL VCHAR(24,CBOMB+1,126)
```

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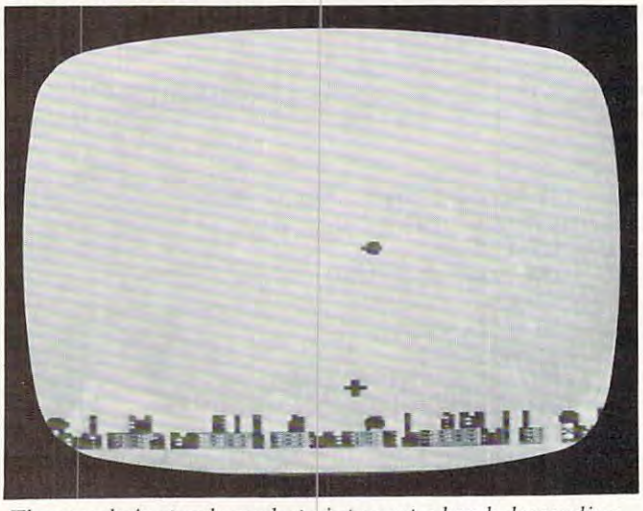
```
1640 FOR I=1 TO 20
1650 NEXT I
1660 CALL COLOR(12,7,1)
1670 CALL SCREEN(12)
1680 FOR I=1 TO 20
1690 NEXT I
1700 CALL SCREEN(7)
1710 FOR VOL=24 TO 1 STEP 4
1720 CALL SOUND(200,-7,VOL)
1730 NEXT VOL
1740 FOR DVOL=1 TO 24 STEP 4
1750 CALL SOUND(200,-7,DVOL)
1760 NEXT DVOL
1770 FOR J=23 TO 24
1780 FOR I=CBOMB-1 TO CBOMB+1
1790 CALL VCHAR(J,I,32)
1800 NEXT I
1810 NEXT J
1820 CALL VCHAR(RCROSS,CCROSS,32)
1830 CALL COLOR(12,2,14)
1840 M=M+1
1850 GOTO 880
1860 CALL CLEAR
1870 CALL SCREEN(4)
1880 CALL COLOR(8,5,16)
1890 PRINT "{9 SPACES}GAME OVER"
1900 FOR I=1 TO 4
1910 PRINT
1920 NEXT I
1930 PRINT "{3 SPACES}DESTROYED
     {3 SPACES}";P
1940 PRINT
1950 F[O{,}!1{5 ,}"{3 SPACES}MISSED
     {6 SPACES}";M
1960 PRINT
1970 PRINT "{3 SPACES}TOTAL POINTS";
     P*Q*10
1980 FOR I=1 TO 4
1990 PRINT
2000 NEXT I
2010 PRINT "{3 SPACES}PRESS r TO PLA
     Y AGAIN"
2020 PRINT
2030 PRINT
2040 CALL KEY(0,R,STATUS)
2050 IF STATUS=0 THEN 2040
2060 IF R=ASC("R")THEN 160
2070 END
2080 REM READ CITY DATA
2090 FOR ROW=2 TO 1 STEP -1
2100 FOR COL=1 TO 32
2110 READ BUILDING(COL,ROW)
2120 NEXT COL
2130 NEXT ROW
2140 REM CUSTOM CHAR & COLORS
2150 CALL CHAR(136,"FFABFFABFFABFFFF
     ")
2160 CALL CHAR(128,"003C7EFFFFFF7E42
     ")
2170 CALL CHAR(131,"42665A6642427E66
     ")
2180 CALL CHAR(132,"6060606060606060
     ")
2190 CALL CHAR(133,"607858F8D8F8D8F8
     ")
2200 CALL CHAR(134,"F8A8F8A8F8A8F8F8
     ")
2210 CALL CHAR(135,"C3C3FFABFFABFFFF
     ")
2220 CALL COLOR(14,7,12)
2230 CALL CHAR(122,"8040201008040201
     ")
2240 CALL CHAR(123,"0102040810204080
     ")
2250 CALL CHAR(124,"80E0F8FEFFFFFFFF
     ")
2260 CALL CHAR(125,"814224180081C3E7
     ")
2270 CALL CHAR(126,"01071F7FFFFFFFFF
     ")
2280 RETURN
2290 REM SET UP CITY
2300 FOR ROW=2 TO 1 STEP -1
2310 FOR COL=1 TO 32
2320 BLOCK$(ROW)=BLOCK$(ROW)&CHR$(BU
     ILDING(COL,ROW))
2330 NEXT COL
2340 NEXT ROW
2350 FOR ROW=2 TO 1 STEP -1
2360 FOR COL=1 TO 32
2370 PLACE(ROW)=ASC(SEG$(BLOCK$(ROW)
     ,COL,1))
2380 CALL HCHAR(ROW+22,COL,PLACE(ROW
     ))
2390 NEXT COL
2400 NEXT ROW
2410 RETURN
2420 REM CITY DATA
2430 DATA 136,134,131,135,133,136,13
     6,133
2440 DATA 135,136,136,136,133,136,13
     6,135
2450 DATA 135,136,136,134,133,136,13
     6,136
2460 DATA 135,132,136,32,131,135,132
     ,135
2470 DATA 134,133,128,32,132,32,135,
     32
2480 DATA 32,32,134,132,132,32,133,3
     2
2490 DATA 32,32,128,32,132,32,133,13
     5
2500 DATA 32,132,132,32,128,32,132,3
     2
2510 REM HORIZONTAL # PRINTER
2520 FOR I=1 TO LEN(H$)
2530 DIGIT=ASC(SEG$(H$,I,1))
2540 CALL HCHAR(ROW,COL+I,DIGIT)
2550 NEXT I
2560 RETURN
```



The crosshair stands ready to intercept a bomb descending toward multicolored buildings in the TI version of "Air Defense."

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PET/CBM Notes

The PET/CBM version of Air Defense was written for machines with either 40- or 80-column screens. The program, as given, will run successfully on the 40-column PET. If you have an 80-column screen, simply remove the word "REM" at the beginning of line 120 and delete line 130. The 80-column screen requires you to cover a greater range of positions than does the 40-column screen, however, and you may find the wider screen somewhat difficult to maneuver on initially.

Instructions for the game are displayed when the program is run. The main principle to bear in mind while playing is that the more bombs which are picked off (and the quicker they are destroyed) the higher the score. Press the REPEAT key along with the crosshair controls or the fire button (the SPACE bar) to achieve much higher scores.

If either the 40- or 80-column version becomes too easy, the level of difficulty can be increased by modifying line 600. In line 600, the variable "A" refers to the screen memory location of the crosshair, "E" defines the position of the bomb, and "LL" is the screen width (line length). As written, this statement allows the bomb to be destroyed when the gun is fired within one space above or below or to the left or right of the positioned gunsight. By removing one or more of the conditional expressions in line 600 (starting with the second expression), you can significantly increase the challenge of the game.

Program 6: PET/CBM Version

```
100 POKE 59468,12:PRINT CHR$(142)
110 X=RND(-TI)
120 REM LL=80:R1=40:A=34632:A1=34767:REM F
    OR A 80-COLUMN SCREEN
130 LL=40:R1=20:A=33702:A1=33767:REM FOR A
     40-COLUMN SCREEN
140 P=0:M=0:T=0:Q=0
150 PRINT"{CLEAR}{07 DOWN}{09 RIGHT}     {R
    EV}AIR{OFF} {REV}DEFENSE{OFF}"
160 PRINT"{04 DOWN}{RIGHT}      DO YOU NEED
     INSTRUCTIONS?"
170 PRINT"{DOWN}{08 RIGHT}TYPE 'Y' OR 'N'"
180 FOR H=1TO1000:GETD$
190 IF D$="N" THEN 380
200 IF D$="Y" THEN 240
210 NEXT
220 PRINT"{CLEAR}{07 DOWN}{06 RIGHT}YOU DI
    D NOT PRESS 'Y' OR 'N'."
230 FOR K=1TO5000:NEXT:GOTO150
240 PRINT"{CLEAR}{02 DOWN}  YOU MUST STOP ~
    THE FALLING BOMB BY"
250 PRINT"  EXPLODING IT IN MID-AIR."
260 PRINT"{02 DOWN}       -MOVE THE CROSSHA
    IR-"
270 PRINT"{DOWN}     *{REV}LEFT{OFF}: TAP T
    HE '<' KEY"
280 PRINT"{DOWN}     *{REV}RIGHT{OFF}: TAP ~
    THE '>' KEY"
290 PRINT"{DOWN}     *{REV}UP{OFF}: TAP THE
     'S' KEY"
300 PRINT"{DOWN}     *{REV}DOWN{OFF}: TAP T
    HE 'X' KEY"
310 PRINT"{02 DOWN}{02 RIGHT}WHEN THE BOMB
     AND THE CROSSHAIR ARE"
320 PRINT"{02 RIGHT}LINED UP, FIRE BY PRES
    SING THE"
330 PRINT"{02 RIGHT}SPACE BAR."
340 PRINT"{02 DOWN}{07 RIGHT}{REV}PRESS AN
    Y KEY TO START{OFF}"
350 GET D$:IF D$="" THEN 350
360 PRINT"{CLEAR}{10 DOWN}                GOO
    D LUCK!"
370 FOR I=1TO2500 :NEXT
380 A=(A1-LL*1.5)-P*LL:IF T=20 GOTO 820
390 T=T+1
400 PRINT"{CLEAR}":D=INT(RND(1)*R1)+LL/4
410 E=D+32768
420 PRINT" ";T
430 FOR I=1 TO 100:NEXT I
440 PRINT"{02 DOWN}{RIGHT}";P*Q*10
450 FOR I=1 TO 200:NEXTI
460 POKE A,91
470 GET A$
480 IFA$="S"THENA=A-LL
490 IF A$="X"THEN A=A+LL
500 IF A$="."THEN A=A+1
510 IF A$=","THEN A=A-1
520 IF A>A1 THEN A=A-LL
530 IF A<32768 THEN A=A+LL
540 POKE E,42
550 FOR I=1 TO 50:NEXT
560 IF E>A1-LL THEN GOTO 750
570 REM ADJUST DIFFICULTY LEVEL BY ELIMINA
    TING
580 REM CONDITIONS IN LINE 600
590 REM LINE 600 ALLOWS A HIT WITHIN ONE S
    PACE OF MISSILE
600 IF A=E OR A=E-1 OR A=E+1 OR A=E-LL OR ~
    A=E+LL THEN 620
610 E=E+LL:PRINT"{CLEAR}":GOTO460
620 GET B$
630 IFB$=" "THEN 660
640 GOTO 610
650 REM BOMB IS DESTROYED
660 X=100:FORI=1TO10:POKEE,X
670 POKE E+LL-1,X
680 POKE E+LL+2,X
690 X=X+1
700 NEXT
710 P=P+1
720 Q=Q+24-INT((A-32768)/LL)
730 GOTO380
740 REM BOMB GETS YOU!
750 POKE E,32:FOR I=1 TO 5
760 POKEE-I,188
770 POKEE+I,190
780 FOR S=1 TO 20:NEXT
790 NEXT
800 M=M+1
810 GOTO380
820 PRINT"{CLEAR}{02 DOWN}{10 RIGHT}     {
    REV}GAME{OFF} {REV}OVER{OFF}"
830 PRINT"{03 DOWN}{03 RIGHT}DESTROYED"P
840 PRINT"{02 DOWN}{03 RIGHT}MISSED"M
850 PRINT"{02 DOWN}{03 RIGHT}TOTAL POINTS"
    P*Q*10
860 FOR I=1 TO 30:GET D$:NEXT I
870 PRINT"{04 DOWN}{08 RIGHT}PRESS '{REV}P
    {OFF}' TO PLAY AGAIN"
880 GET D$:IF D$="" THEN 880
890 IF D$="P" THEN 120
900 END
```

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VIC EDITYPE

A Text Editing And Storage Program

Paul Bishop

This mini word processor for the VIC lets you enter, edit, and save text to tape. It works with the VIC 1515 printer and 3K memory expansion.

If you are at all like me, the minute you saw the VIC-20 sitting there on the showroom table flashing its upper-lowercase mode, you smiled to yourself and said what a wonderful text storage and manipulation device it would make. *Wonderful* in this context means inexpensive, and Commodore promised us no less in its literature.

This program is a miniature word processor. It will allow the user to input text, edit it (with certain limitations), and save it to tape. The text may be printed on any line length specified, though it will not right justify. The program uses a word wrapping scheme to minimize the VIC's limited display size and is meant to be used with the VIC 1515 printer and a 3K memory expansion.

Entering Text

The program is menu driven, and we will discuss the options in detail. New mode is used for entering text. It is also the mode in which the formatting features are selected. Centering is done by pressing the up-arrow (next to the restore key) at the beginning of the line that is to be centered. Remember to use the carriage return at the end of the line, and note that the line may not exceed the line length you intend to print.

The second function is an inset line length. This is selected by pressing the first bracket (shifted colon) at the start of the text to be inset. All text before the next return character will be printed on the alternate line length, which will be specified during printing. Line numbering is something that I use frequently. It is selected with the second bracket, and the line will be printed with a number (numbered sequentially by the computer) before and after the line. Examples of all the formatting options are represented in the demo text.

Backspacing in the New mode may only be done with the DEL key, and may only continue to the first character of the line on which the cursor rests. Any further DELeting will result in an Illegal Quantity error. If a boo-boo is in an earlier line, it must be corrected in the edit mode. All keys repeat, and the pound symbol (next to CLR HOME) is used to return to the menu. Once the menu is chosen, no further text may be entered in the New mode. (This is something the user could change.)

A final note: text entry becomes progressively slower as memory fills, and subsequent printing is also adversely affected by large quantities (relatively speaking) of text. So, although the low memory warning should keep you from overtyping the machine's capacity, it is best to save the text and then continue when the word-wrap starts to slow down.

Text entered in the New mode can be reviewed and modified in the Edit mode. The mode has three options: Forward, Correct, and Return to Main Menu. The Forward option scrolls through the text one VIC screen line at a time. To make changes in entered text, use the Correct option. You will be given the prompt "error:", at which point you enter the characters you wish to change *as they appear in the text*. End your entry with the up-arrow (↑) key, *not* the RETURN key. The next prompt is "correction:". Enter the text as you wish it to appear in the corrected version. Again follow your input with the up-arrow key rather than RETURN. The computer will then search the text for the "error" and replace it with the "correction." If the search characters are not found in the text, the program will provide an error message.

Saving And Printing

The save mode is straightforward in operation: simply press the S key and RETURN and the text will be stored under the title you entered in the New mode. Load is just like it. If you include a file name, the cassette drive will search for that file; otherwise it will load the first file it comes to. The Load and Print mode is for files too long to be contained in memory and is fairly automatic. You

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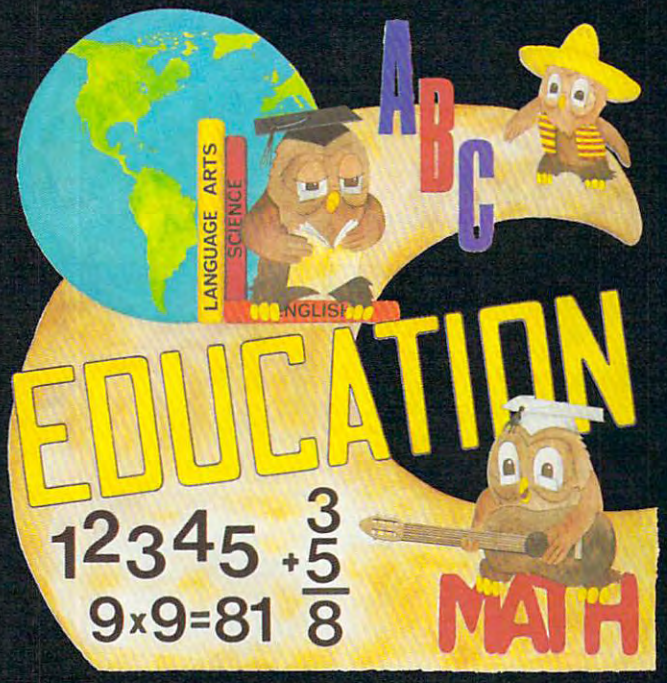

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simply set the formatting in the print mode, and let the computer do the rest.

The Print mode is also straightforward. First it asks for the normal line length. This may be any value up to 80, but between 40 and 70 are recommended. Next you are asked for the inset line length. Again, this should be between 40 and 70. Next you are asked for s for single or d for double spacing. Finally, the computer asks for the number at which it will begin the sequential line numbering. This may be set at any value, but usually will be one.

Obviously, this program will not meet everyone's writing needs. I am looking forward to further memory expansion which will allow me to implement further editing functions, as well as longer text entry. And you may wish to delete functions which you will not use and add others. That is the beauty of a word processor written in BASIC.

Before we consider the program in detail, a few comments about operation will be in order here. First, the cursor does not function as well as it should. I am searching for a cure. In the meantime, if you find it more distracting than helpful, you may get rid of it by deleting POKE 204,0 from line 120. Also, from time to time, errors will happen which will cause the machine to default to BASIC. This is no cause for alarm. A few moments studying the program listing and a GOTO in the immediate mode will get you out of all but the worst spots. If in doubt, GOTO 51 (the menu).

Program Structure

Since I have included no documentation in the body of the program, I will list the various parts of it here. You will want to keep this handy for reference, since every REM you add will cost you valuable memory space.

Line 42 is initial housekeeping, setting variables and DIMing the text string array.

Lines 51-67 are the menu.

Lines 100-280 are the text entry and word wrapping routine, including the delete routine in line 200.

Lines 3000-3350 are the string search and replace, the "Edit Mode."

Lines 3800-4710 are the print routine. Lines 4060-4095 are for getting a string of printing length. Lines 4200-4240 are used in the centering function. 4300-4710 are for tidying up the print strings and sending them to the printer.

Lines 5000-5080 are the load routine.

Lines 6000-6080 are for saving text.

Lines 7000-7009 are for the page numbering function.

Variable List

- **A$** is the actual text string (1 to 200).
- **C$** is the get character string in the new mode.
- **C4$** is the error string in the edit mode.
- **C5$** is the correction string in the edit mode.
- **C6$** is the right remainder of the string being searched for the error in the edit mode.
- **DE$** is the string of the variable SL.
- **J$** is the get character string for the correction string in edit mode.
- **M$** is the string for the mode selection in the menu.
- **P$** is the print string.
- **T1$** is the leftover from P$ after searching for a space at the end of the line.
- **T2$** is the working string of A$ in the print mode.
- **W$** is the get string in the edit mode.
- **X$** is the working character in getting an 80-character line for P$.
- **Z$** is the get string for the load mode.

- **LA** is the normal line length.
- **LB** is the inset line length.
- **LC** is the line count.
- **PC** is the page count.
- **SL** is the line numbering counter.

```
                        Sample Text

     This is a page of demo text for "Editype."  This is the normal
     line length.  Note that there is no hyphenation of words in the
     print routine, so the edges may be somewhat ragged.  Resetting
     the line length may help.

           This is an inset line.  Insets may be set to
           any length and may be longer than the normal
           line length if necessary.

                     This line is autocentered.

1.   This is an example of a numbered line.                        1.

     Note that the computer keeps track of line numbers.  The line
     above could have been given any number as a starting point and
     subsequent numbered lines would be renumbered from there.
```


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42 PC=1:LC=1:F=0:PRINTCHR$(14):DIMA$(200)
   :PRINT"{CLEAR}":POKE650,128
51 M$=""
53 PRINT"{CLEAR}    MODE SELECTION":PRINT:
   PRINT:PRINT"LP=LOAD AND PRINT":PR
   INT
55 PRINT"N=NEW":PRINT:PRINT"E=EDIT":PRINT
   :PRINT"P=PRINT
58 PRINT:PRINT"S=SAVE":PRINT:PRINT"L=LOAD
   ":PRINT:PRINT"C=CONTINUE"
60 PRINT:INPUT"SELECT MODE:  ";M$
61 IFM$="E"THEN3010
62 IFM$="P"THEN3800
63 IFM$="N"THEN100
64 IFM$="L"THEN5000
65 IFM$="S"THEN6000
66 IFM$="LP"THEN3800
67 IFM$="C"THENFORB=1TOK-1:PRINTA$(B):NEX
   TB:PRINTA$(K);:GOTO120
68 GOTO51
100 FORA=1TO200:A$(A)="":NEXTA
103 INPUT"TYPE FILE NAME";V$
105 PRINT"{CLEAR}          NEW MODE":K=1
120 POKE204,0:POKE207,0:GETC$:IFC$=""THEN1
   20:POKE204:2
130 IFC$="{DOWN}"THEN120
140 IFC$="{UP}"THEN120
150 IFC$="{RIGHT}"THEN120
160 IFC$="{LEFT}"THEN120
170 IFC$="£"THEN51
171 IFC$="{HOME}"THEN120
172 IFC$="{CLEAR}"THEN120
175 IFC$=CHR$(20)AND LEN(A$(K))=0THEN120
180 PRINTC$;
190 IFC$=CHR$(13)THENK=K+1:A$(K)=A$(K)+C$:
   GOTO120
200 IFC$=CHR$(20)THENA$(K)=LEFT$(A$(K),LEN
   (A$(K))-1):GOTO120
210 A$(K)=A$(K)+C$:C$="":IFLEN(A$(K))<22TH
   EN120
220 IFRIGHT$(A$(K),1)=CHR$(32)THEN240
221 IFRIGHT$(A$(K),1)=CHR$(160)THEN240
230 A$(K+1)=RIGHT$(A$(K),1)+A$(K+1):A$(K)=
   LEFT$(A$(K),LEN(A$(K))-1):GOTO220

240 FORU=1TO22-LEN(A$(K)):PRINTCHR$(20);:N
   EXTU
250 IFLEN(A$(K))<11THENPRINT,,
260 IFLEN(A$(K))>10THENPRINT,
264 IFA$(K)=""THENA$(K)=" "
265 IFFRE(0)<600THENPRINT"{REV}MEMORY LOW{
   OFF}":PRINT
266 IFFRE(0)<500THEN51
270 K=K+1:PRINTA$(K);:GOTO120
280 GOTO51
3010 C4$="":C5$=""
3015 PRINT"{CLEAR}      EDIT MODE":Q=1
3025 PRINT:PRINT"F=FORWARD":PRINT"£=RETURN
      TO MENU":PRINT"C=CORRECT"
3026 PRINT"SELECTION? "
3030 GETW$:IFW$=""THEN3030
3040 IFW$="F"THENPRINTA$(Q):Q=Q+1:IFQ>199TH
   EN51:GOTO3030
3055 IFW$="£"THEN51
3060 IFW$="C"THEN3200
3061 GOTO3030
3200 PRINT"ERROR:"
3210 FORA=1TO80
3220 GETJ$:IFJ$=""THEN3220
3225 IFJ$="↑"THEN3250
3226 IFJ$=CHR$(20)THENC4$=LEFT$(C4$,LEN(C4$
   )-1):GOTO3235
3230 C4$=C4$+J$
3235 PRINTJ$;
3240 NEXTA
3250 PRINT:PRINT"CORRECTION: "
3260 FORA=1TO80
3270 GETJ$:IFJ$=""THEN3270
3280 IFJ$="↑"THEN3310
3281 IFJ$=CHR$(20)THENC5$=LEFT$(C5$,LEN(C5$
   )-1):GOTO3290
3285 C5$=C5$+J$
3290 PRINTJ$;
3300 NEXTA
3310 PRINT"{CLEAR}    {REV}CORRECTING{OFF}"
3320 FORA=1TO200
3325 FORB=1TOLEN(A$(A))
3327 O=LEN(C4$)
3329 IFMID$(A$(A),B,O)=C4$THENOO=LEN(A$(A))
   -B+1-LEN(C4$)
3330 IFMID$(A$(A),B,O)=C4$THENC6$=RIGHT$(A$
   (A),OO)
3340 IFMID$(A$(A),B,O)=C4$THENA$(A)=LEFT$(A
   $(A),B-1):GOTO3344
3341 GOTO3346
3344 A$(A)=A$(A)+C5$+C6$:C4$="":C5$=""
3345 PRINT"{CLEAR}":FORH=1TOA:PRINTA$(H):NE
   XTH:Q=H::GOTO3025
3346 NEXTB
3347 NEXTA
3348 PRINT"{CLEAR}{RED}{REV}ERROR NOT FOUND
   {BLU}{OFF}":PRINT:GOTO3025
3350 GOTO3010
3800 PRINT:INPUT"NORMAL LINE LENGTH";LA
3810 PRINT:INPUT "INSET LINE LENGTH";LB
3903 PRINT"SINGLE OR DOUBLE      SPACE? S/D

3904 INPUTSD$
3905 INPUT"LINE NUMBERING #";SL
4000 T1$="":N=1:LL=LA
4002 OPEN4,4
4003 T$="":T2$="":P$="":LC=1
4010 PRINT#4:PRINT#4:PRINT#4
4016 LC=3
4040 CLOSE4,4
4050 IFA$(N)=""ANDM$="LP"THEN5002
4051 IFA$(N)=""THEN4660
4059 T2$=A$(N)
4060 FORA=1TOLL-LEN(P$)
4061 IFT2$=""THEN4094
4065 X$=LEFT$(T2$,1):T2$=RIGHT$(T2$,LEN(T2$
   )-1)
4075 IFX$="["THENLL=LB:GOTO4060
4076 IFX$="]"THENFL=1:GOTO4060
4080 IFX$="↑"THEN4200
4085 IFX$=CHR$(13)THEN4660
4090 P$=P$+X$
4094 IFLEN(T2$)=0THENN=N+1:GOTO4050
4095 NEXTA
4100 GOTO4610
4200 FORA=1TOLA
4210 X$=LEFT$(T2$,1):T2$=RIGHT$(T2$,LEN(T2$
   )-1)
4211 IFLEN(T2$)=0THENN=N+1:T2$=A$(N)
4214 IFA$(N)=""ANDLEN(T2$)=0THENP$=P$+X$:GO
   TO4660
4220 IFX$=CHR$(13)THEN4300
4230 P$=P$+X$
4240 NEXTA
4300 IN=(80-LEN(P$))/2:GOTO4670
4610 FORA=1TOLEN(P$)
4620 IFRIGHT$(P$,1)=CHR$(32)THEN4660
```


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```
4622 IFRIGHT$(P$,1)=CHR$(160)THEN4660
4630 T1$=RIGHT$(P$,1)+T1$:P$=LEFT$(P$,LEN(P
    $)-1)
4640 NEXTA
4660 IFLEFT$(P$,1)=CHR$(32)THENP$=RIGHT$(P$
    ,LEN(P$)-1)
4661 IFLEFT$(P$,1)=CHR$(160)THENP$=RIGHT$(P
    $,LEN(P$)-1)
4662 PRINTP$
4665 IN=(80-LL)/2
4666 DE$=STR$(SL):IFFL=1THENOPEN4,4
4667 IFFL=1THENPRINT#4,CHR$(17)DE$."SPC(IN
    -LEN(DE$)-1)P$SPC(76-LEN(P$)-IN)D
    E$"."
4668 IFFL=1THENCLOSE4:LC=LC+1:SL=SL+1:P$=""
    :FL=0:P$=T1$:T1$="":GOTO4680
4670 OPEN4,4:PRINT#4,CHR$(17)SPC(IN)P$:CLOS
    E4,4:P$="":P$=T1$:T1$="":LC=LC+1
4680 IFSD$="D"THENOPEN4,4:PRINT#4:CLOSE4:LC
    =LC+1
4690 IFLC>60THEN7000
4700 IFX$=CHR$(13)THENLL=LA
4701 IFA$(N)=""ANDM$="LP"THENP$=P$+X$:GOTO5
    002
4705 IFA$(N)=""THEN51
4710 GOTO4060
5000 INPUT"TYPE FILE NAME";V$
5002 FORA=1TO200:A$(A)="":NEXTA
5005 PRINT"{CLEAR}       LOAD MODE"
5010 OPEN1,1,0,V$
5015 PRINT"FILE OPEN, LOADING."
5020 FORA=1TO200
5025 FORB=1TO22
5030 GET#1,Z$
5031 A$(A)=A$(A)+Z$
5040 IFZ$=""THEN5065
5042 NEXTB
5050 NEXTA
5065 CLOSE1:N=1
5077 IFM$="LP"THENN=1:GOTO4050
5080 GOTO51
6000 PRINT"{CLEAR}SAVE MODE"
6010 OPEN1,1,1,V$
6030 FORA=1TO200
6040 PRINT#1,A$(A);
6050 IFA$(A)=""THEN6075
6060 NEXTA
6075 CLOSE1
6080 GOTO51
7000 OPEN4,4
7001 FORM=1TO66-LC
7002 PRINT#4
7003 NEXTM
7004 PRINT#4:PC=PC+1
7005 PRINT#4,CHR$(17)SPC(70)"PAGE "PC
7006 PRINT#4
7007 CLOSE4
7008 LC=3
7009 GOTO4060
```

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Scriptor:
An Atari Word Processor

Charles Brannon, Editorial Assistant

Scriptor is an easy-to-use, full-scrolling, character-oriented, multifunction word processor, requiring an Atari 400/800 with a minimum of 32K of memory (40K recommended), an Epson MX-80 or Atari 825 printer, and an Atari 810 disk drive. It is programmed in both BASIC and machine language. For instructions on typing in the program, see the section under: Typing It In.

Through The Ruby

Computers don't just calculate with numbers – they can also work with text. Five inch disks can replace stacks of files. Computers can sort, search, select, and update any kind of information. They can *focus* information. In this sense, the computer is like the ruby crystal in a laser. Ordinary random light waves are transformed and concentrated through the ruby into a tight, powerful beam. Computers can do the same for information.

Word Processing

Electronic text is more "liquid," easier to work with, than words solidified on paper (*hardcopy*). This is what makes word processing special: the extraordinary editing power it gives you. Distinctions between a rough draft and a final draft are meaningless; the work is typed, changed dynamically, and stored to disk. It can then later be recalled, revised, and printed out. Very little retyping is necessary. What a boon for anyone who writes.

Converts to word processing immediately notice an improvement in their writing. The entire manuscript becomes "alive," not committed to paper. Changing a word or a sentence, inserting a line or a paragraph are all accomplished with ease. For example, take just one key, the backspace key (called RUBOUT on some computers or terminals). When this key is struck, the last character typed is erased from the screen. Compare this to the frequently elaborate typewriter correction schemes.

Besides the disk file, which has already been mentioned and which will be explained in greater detail later, an important concept in word processing is the *cursor*. Named after the clear plastic slide on a slide rule, the cursor shows you where the next character you type is going to appear. It usually looks like an underline, "_", or a solid square. Users familiar with any computer have already encountered the cursor. The computer itself doesn't need a cursor; but since you can type anywhere on the screen, the cursor is vital so that you can know where you "are."

The cursor can be moved up, down, left, and right with special keys, usually with arrows on them. To correct the following line:

```
The quick brown dox jumped
```

you would either press backspace ten times, erasing the text as you go, or press cursor-left ten times. The cursor moves "over" the characters without erasing them. It is then resting on the "d":

```
The quick brown dox jumped
```

You can correct the error by typing "f," which overstrikes (replaces) the "d."

```
The quick brown fox jumped
```

The cursor can then be moved to the end of the line (ten cursor-rights), and typing resumed.

This sounds harder than it really is. Cursor editing becomes second nature after only hours of use. The cursor UP/DOWN keys can reach lines of text above and below the current line. It is like rolling a typewriter's platen up or down, but with one important difference – the "paper" is one continuous, long sheet.

Getting Specific

Two very special functions are *insert* and *delete*. Insert lets you add text in the middle of a line, by pressing INSERT to insert spaces in the text, and then typing in the word. For example:

```
To be or to be,that is the
   question.
```

The cursor is placed on the second "to," and INSERT is pressed four times (three for "n-o-t,"

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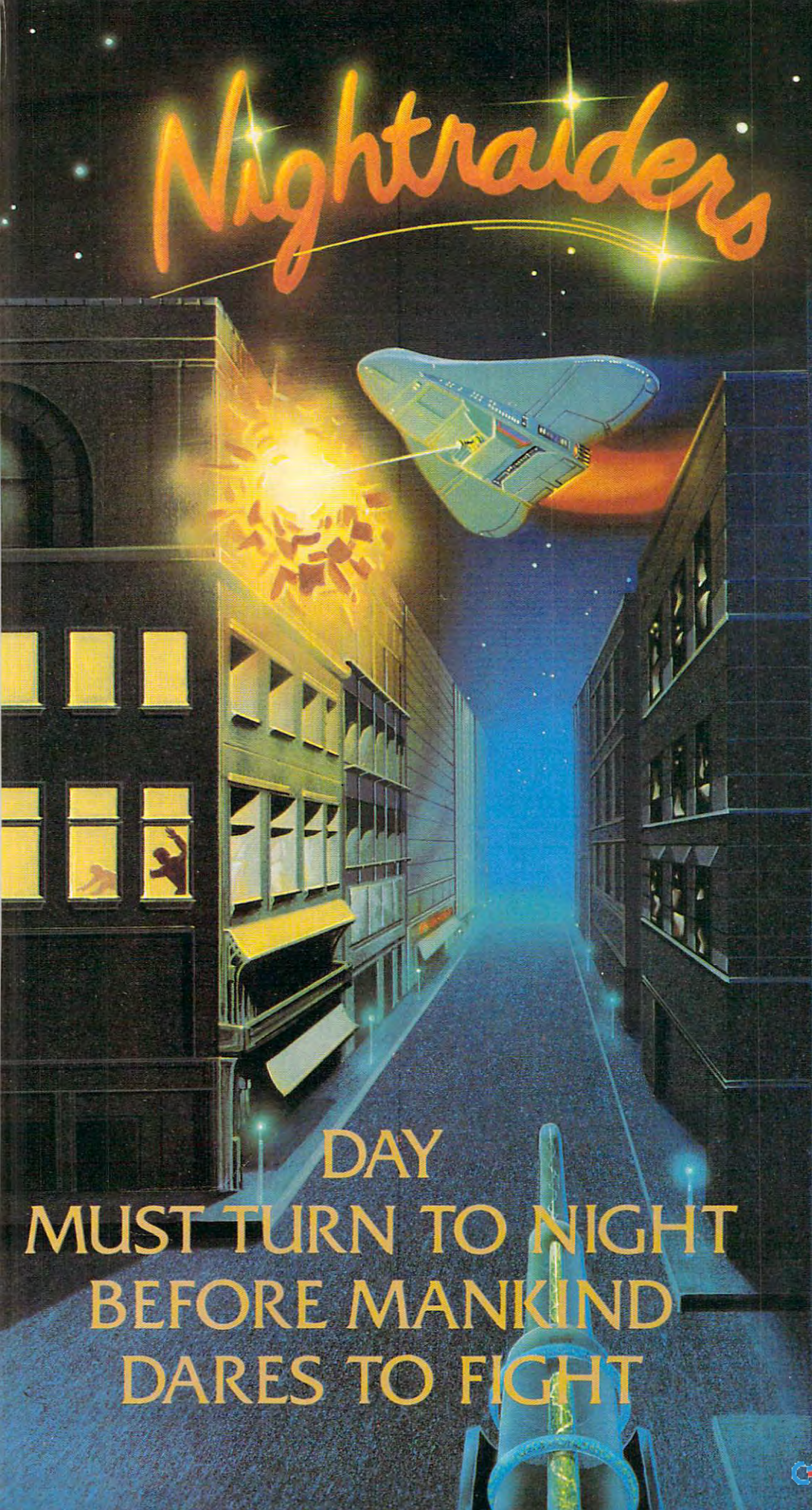

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and one for a space):

```
To be or ■   to be,that is
    the question.
```

The word "not" is then typed:

```
To be or not■to be,that is
    the question.
```

Delete is used to erase text. As distinguished from mere backspacing or spacing over a word, delete closes up the space after the deleted word:

```
Take out a word■
```

1. `Take ▯ut a word`
   (cursor is moved to "o")
2. `Take ▯t a word`
   (DELETE typed; "o" disappears, "ut a word" moves left.)

   `Take ▯ word`
   (DELETE is typed four times.)

Insert and delete can also act on words, sentences, lines, or entire paragraphs in a similar way.

Disk Files

A "file" is simply a permanent record of your text. When the computer's power is turned off, it forgets everything except what is "burned" (in ROM memory) into it permanently. Your text is obviously not "burned in," or you couldn't ever change it. If you have a blackout, or a fuse blows, say good-bye to your text.

Catastrophes aside, you certainly don't want to leave your computer on all the time, or keep the computer tied up with your text forever. Fortunately, you can save your text on disk, ready for any later revisions. You can type it one time, save your text, and print it out when convenient.

Since a disk can store more than one document (unless it's very long), you and the computer must have some way to distinguish and separate one file from another. This is usually done via a *directory*, a list of file names. You access a file by giving the computer the file's name.

"Scriptor," the word processor program at the end of this article, has many features usually found only in professional word processors, but it lacks a few features such as search and replace, justification, data base merge, etc. Also, it is written in BASIC, so it can be rather slow at times. It is, however, aided by several machine language subroutines for time-critical situations such as disk input/output and some editing features.

Typing It In

Program 1 is the Scriptor program itself. Type it carefully, since it contains many critical machine language DATA statements. Extra time spent in typing it in will reward you with a smoother, bug-free word processor. Remember to use the **COMPUTE!** Listing Conventions (see Typing In **COMPUTE!**'s Programs, published every issue). Use the Atari logo key to enter inverse video.

To give you more memory for text, Scriptor deletes a substantial portion of itself after it initializes (sets up). Don't worry – the program is busy running while the screen flashes; it just takes awhile. The set-up lines from 5000-6999 are automatically erased.

If you quit the program and try to run it again, the program will automatically try to re-RUN itself anew from disk. If you've changed disks, you'll need to reload it yourself. You should SAVE the program with the filename "D:SCRIPTOR" or change line 110 appropriately. Be sure to SAVE Scriptor after you've typed it, before you run it, or you will find a sizeable chunk of your typing erased when you exit. You can free up more memory for text by deleting the "help" function. Take out all lines from 1570 to 1700 and remove line 775. If you'd rather keep this handy aid, leave these lines alone.

If you get the message "Error in DATA statements" when you run the program, you need to check your typing on the bank of machine language DATA statements at the end of the program. Also make sure you haven't typed a letter "O" for a zero (the zero is thinner than the "O").

If you have an Atari 825 printer, you will need to type in the lines in Program 2. This will replace the lines used for the MX-80 with lines applicable to the 825 80 Column Printer. If you have another printer, refrain from using special characters such as underlining, and you will probably be able to get one of the sets of lines to work.

Getting Started

The Scriptor is a full-scrolling, character-oriented word processor. Usage of cursor control keys is similar to normal Atari editor functions, with these exceptions:

1. ‹RETURN› is used only to force a carriage return, as at the end of a paragraph, or to print a blank line. The computer will format your line when you print it out, so just type continuously. Do not press ‹RETURN› at the end of each line. Pressing ‹RETURN› prints a back-arrow at the end of the line, and erases all text to the end of that line.

2. Insert and Delete character (CTRL-INSERT/CTRL-DELETE) work on whole "paragraphs." A paragraph is a block of lines from the cursor to a "back-arrow." If there is no back-arrow, one is assumed at the end of text. Therefore, insert and delete can be quite slow if you don't have a back-arrow somewhere.

3. Insert and Delete line work on the entire document. The screen will blank during this op-

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eration. This is normal and speeds up the process, as it can be slow on long documents.

4. All TAB controls work normally, just a little slower. ‹CTRL-K› will clear all tab settings.

5. ‹CLEAR› will not clear the screen. It is used to erase all or part of the text. Press ‹CLEAR› ‹A› to erase all text. Press the Atari logo key to abort the erase function.

6. The break key is disabled. Use ‹CTRL-Q› to exit the program.

7. The ESC key enters the "mini-DOS." (See below.)

8. The console keys are "live"; see a description of their functions later.

9. The Atari logo key is disabled for normal typing. Within prompts, it acts as an "abort" key.

Getting Control

Since the Atari is not a dedicated word processor (that means it's just not a "word processing machine" like a Lanier, but is, rather, a general-purpose computer), it does not have special keys to activate word processing functions. Instead, the ‹CTRL-key› combination is used. For example, to quit the program, you would hold down ‹CTRL› and press ‹Q›. The CTRL key stands for "Control" – it is like a special shift key. The keys are linked *mnemonically* (easy to remember) to the commands they stand for, such as ‹P› for Print Text. To get a list of the commands and what they stand for at any time, just press ‹CTRL-?› (hold down CTRL and press the question mark) for a HELP menu. See Table 1 for a quick-reference chart of the commands.

Going Around The Block

An important feature in a word processor is block move and delete. Scriptor lets you "define" a series of up to 23 lines. You can then move these lines to another place in the text with Line Duplicate, or delete the defined lines with ‹CLEAR/D› (Erase: Defined lines). To define a block of lines, just place the cursor on the first line and press ‹CTRL-D›. A flashing arrow will appear to the left of the line. Press cursor-down, and another symbol will appear underneath. Press cursor-down until all the desired lines have an arrow to their left. Then press ‹RETURN›. If you make a mistake, just try again, or press cursor-up while defining.

To copy these lines to another place, position the cursor at the place you want the lines to appear, and press ‹CTRL-L›. If you haven't defined any lines, this command will be ignored. Note that you can press this key more than once to make many copies of the lines. You may want to delete the defined lines after you move them. Press ‹CLEAR›. You will see the prompt "ERASE:". Press ‹D›. The lines will be deleted, just as if you used Delete line multiple times.

A Mini-DOS

The ESC key activates the "mini-DOS." It lets you look at the directory and scratch, rename, lock, or unlock files. When you press ‹ESC›, you will see:

```
Directory,Lock,Unlock,Rename,
    Scratch?
```

Press the appropriate key. For all except the directory, you will need to enter a file name. The cursor, a half box, will be at the top of the screen. The only editing key you can use here is backspace.

Remember that you can abort any time before pressing ‹RETURN› by pressing the logo key. While the directory is listed, you can press ‹ESC› again to keep the directory on the screen while you use one of the other functions. You can also press [SELECT] (see later) to save or recall a file while looking at the directory. If you get an error message at the top of the screen, check the disk and your entry and try again.

For The Record...

To save or recall a document, press [SELECT]. The screen will display:

```
Save or Recall
```

Press the appropriate key, enter the file name, and the document will either be stored or retrieved. If you Recall a document, it loads starting at the line the cursor is on. This lets you add text to a document. Press START twice to home the cursor to the start of the text. If you get an error message, check to see you have the right disk, consult the *DOS Manual*, and try again. Remember that your file name must start with a capital letter and be followed by up to seven capital letters or numbers. You can optionally put a three-character "extension" on the file if you separate it with a period, e.g., EDITOR.DOC, DRAFT3.CGB, DUNGEON.MAP, etc. *You should not enter the "D:" prefix.*

Printer À La Mode

Different printers offer special print densities and formats such as boldface, underlining, super- and subscripts, double-width, condensed, proportional spacing, etc. To underline a word or phrase, enclose it in ‹CTRL-brackets›. In other words, ‹CTRL-,› is underlining on, and ‹CTRL-.› is underlining off. Underlining works only on the 825 printer. If you have GRAFTRAX installed in your MX-80, underlining produces italics.

The following is an advanced technique. You can "define" up to ten special characters and print them at any spot in your text. To define a character,

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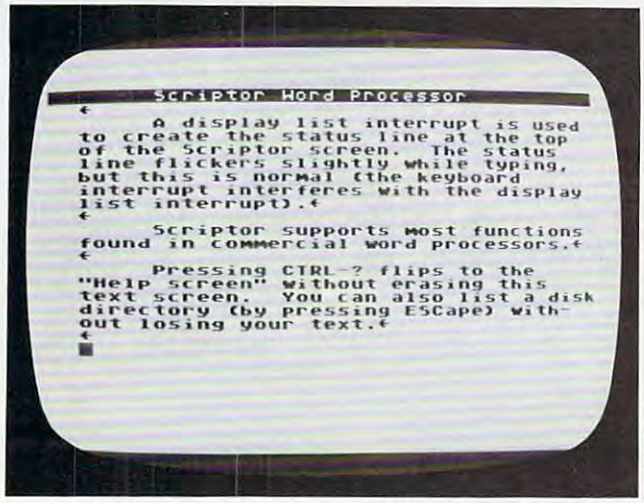

A sample text screen created with the "Scriptor" word processor.

set up a format line (see the discussion of format lines, below) with ‹CTRL-F› and enter your definitions such as "1=123:2=125:3=27", etc. You can then output the CHR$ code of the defined characters by embedding a caret ("^") in your text, followed by the number (e.g., ^4). If you don't put a number after it, a caret will print; otherwise, the character associated with the number (0-9) will be output. You can also output ASCII characters from within a format line with the "as" format command. For example, "as27:as18" will activate proportional spacing on the 825 printer. Use "as27:as69" for emphasized mode on the MX-80.

Formatting Text

Since you are typing in the raw text, with no margins or line breaks, how does the computer print a nice formatted page? The computer assumes a left margin of five, a right margin of 75, single spacing, a page length of 66, and 50 lines to be printed per page. You can change these "default" values with a format line.

A format line is like an embedded command line. The line starts with a "format character" to prevent the line from being printed out. To get the format character, press ‹CTRL-F›. You should get a right-pointed "wedge." Then type in your commands. All commands are two lowercase letters, usually followed by a number. You can put multiple commands on the same line if you separate them with colons. For example, the following line:

```
►lm10:rm70:sp2←
```

will set the left margin to ten, the right margin to 70, and line spacing to two. Here is an explanation of each formatting command. Also see Table 2 for quick reference.

Note that n *represents a number, with no space between the command and the number. No real error-checking is performed on the number.*

as *n* Send byte *n* to printer.

cm: Comment line. You can type one screen line of comments. They will not be printed to the printer. They are just for your convenience.

cn *n* Centering. If n=1, then centering will be ON, and all following lines will be centered until reset by cn0. If n=0, then centering is turned OFF.

fp Forced paging. Normally, the printer will "page," or go on to the next page, when the number of lines printed equals your lines per page (lp), which defaults to 50. Forced paging pages to the next page, regardless.

lm *n* n=left margin, which should be less than the right margin.

ln *n* Print *n* blank lines.

lp *n* Sets lines per page to *n* – *n* should be less than the page length, to allow some blank space at the bottom of each page.

nf: *filename* Will "chain" to next specified file, permitting a document to be split up into many parts. The *nf* insures that they will all print as one big file. The formatting commands carry over to each file.

pl *n* Sets the page length, which is almost always (and defaults to) 66.

rm *n* *n*=right margin, which should be less than the maximum width and greater than the left margin.

sp *n* *n*=1 single spacing, *n*=2 double spacing, *n*=3 triple spacing, etc.

Start The Presses

To print your document, press ‹CTRL-P›. You should see:

```
PRINT:  (C/F)
```

To start printing, just press ‹RETURN›. The printer head should be positioned at about the start of the page. The "C/F" indicates any selected option. "C" stands for Continuous Print. You would use this option with pinfeed or roll paper. It will automatically page to the start of each sheet. If you do not select continuous print, the computer will beep at the end of each page and pause. You should put in another sheet of paper and press ‹RETURN› to continue printing.

Note that pressing a key any other time during printing will abort the printout. The "F" option stands for Fast Printout. It will blank the screen during the printing, increasing printing speed better than 30%. Some people, however, find a

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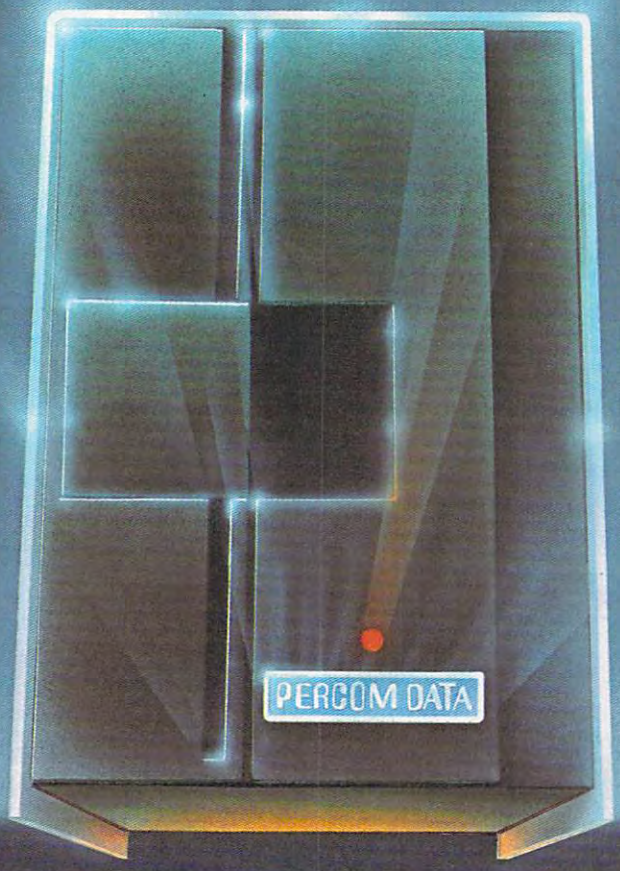

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blank screen disconcerting. To select one of the options, press either "C" or "F." The appropriate letter will light up and flash. To reset the option (cancel it), press the key again. Press ‹RETURN› when you are ready to print the text.

Customizing Scriptor

The program is fairly well-structured, with separate sections for all functions. The control keys are executed via a branching IF/THEN "bucket brigade." Just patch in your own command where desired. Some functions you may want to add are: block transfer (performs both block insert and block delete), Search and Replace, Insert from Disk, simple data merge, etc. Machine language programmers may want to try their hand at speeding up certain aspects of the program, such as Insert Line, Delete Line, and even Print Text.

Some useful subroutines are: GOSUB 540 returns the number of lines the user has typed (not necessarily the maximum number of lines) in EOT. GOSUB 600 clears the top line of the screen and positions the cursor at the first character, ready for a message. GOSUB 460 performs error-checking and adjustments on the X-Y position of the cursor. GOSUB 2650 returns an adjusted (uppercase if AL = 1, no cursor controls, etc.) character in A. GOSUB 2730 is a pseudo-INPUT routine that returns IN$. Variable MX controls the maximum number of characters.

TRAP 2170 will vector errors to an "I/O Error" message. There are two re-entry points for the editor proper: GOTO 650 which clears and "refreshes" the screen, and GOTO 680 which just adjusts the cursor and continues keyboard entry (faster).

Primary variables are: CL – the pointer to the top line (from 0-#lines) of the screen; X – the horizontal position of the cursor 2-39; Y – the vertical position of the cursor on the screen, 1-23; TX$ – the string that contains all the text and is organized in 38 character substrings, one for each line; T$ and T – "temporary variables"; A – usually a keystroke typed; SCR – the address of the screen memory origin; NL – number of defined lines; FRL – the starting line in text of the defined lines; RL – the starting line in TX$ for reserved lines (the buffer). Several constants are Q0, Q1, Q23 – which return 0, 1, or 23 (saves memory); L2 = 38; L = 40; B$ is 38 null (CHR$(0)) characters.

The HELP Screen in "Scriptor."

Quick Reference

Table 1: Editing Commands

Control Keys

A	Advance one screen forward
B	Back up one screen
D	Define Lines
F	Print Format Character
G	Go to specified line
K	Clear all tab settings
L	Duplicate defined lines
P	Print Document
Q	Quit Program

SHIFT-INSERT	Insert a line
SHIFT-DELETE	Delete a line
CTRL-INSERT	Insert a space
CTRL-DELETE	Delete a character
CLEAR	Erase: A = All R = Remainder D = Defined Lines
CAPS/LOWR	Upper or lowercase
ESC	Mini DOS
Cursor keys	Moves cursor with two-way scrolling
[OPTION]	Non-destructive carriage return
[SELECT]	Save or Recall text
[START]	"Home" cursor
[CTRL-,]	Underlining ON
[CTRL-.]	Underlining OFF
^x	Print special character

Table 2: Formatting Commands

Command	Description	Default
as *n*	Send ASCII character *n* to printer.	—
cm:xxxx	Comment line	—
cn *n*	Centering 1 = on, 0 = off	0 Off
fp	Forced Paging	—
lm *n*	Set left margin to *n*	5
ln *n*	Do *n* linefeeds	—
lp *n*	Set lines per page to *n*	50
nf:*file*	Link to Next File	—
pl *n*	Page length	66
rm *n*	Set right margin to *n*	75
sp *n*	Set line spacing	1 (single)

Program 1.

```
100 REM SCRIPTOR WORD PROCESSOR
110 GOTO 5000
455 RUN "D:SCRIPTOR"
460 PF=Q0:IF X<2 THEN X=39:Y=Y-Q1
470 IF X>39 THEN X=2:Y=Y+Q1
480 IF Y<Q1 THEN Y=Q1:CL=CL-Q1:PF=Q1
490 IF Y>Q23 THEN Y=Q23:CL=CL+Q1:PF=
    Q1
```


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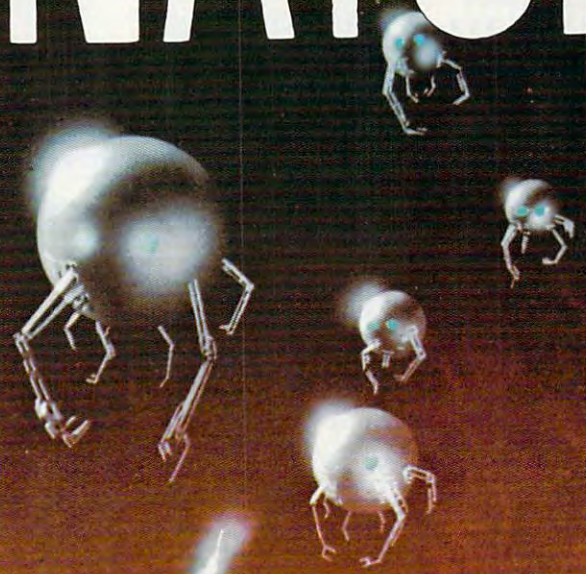

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```
500 IF CL<Q0 THEN CL=Q0
510 IF CL>(MXL-Q23) THEN CL=MXL-Q23
520 IF PF=Q0 THEN RETURN
530 LOC=CL*L2+Q1:T=USR(SCRZAP,ADR(TX
    $(LOC))):RETURN
540 REM ***  FIND END OF TEXT
550 P=ADR(TX$):T=P+RL*L2-Q1
560 A=USR(EDCOM,T,P,2):A=A-P
570 LC=A:EOT=INT(A/L2)
580 RETURN
590 REM ***  ERASE TOP LINE
600 COLOR 32:PLOT Q1,Q0:DRAWTO L2,Q0
    :PLOT Q1,Q0:RETURN
610 REM ***  START OF EDITOR
611 MXL=INT(FRE(Q0)/40)-25:RL=MXL+1
612 DIM TX$((MXL+Q23)*L2):? CHR$(125
    );
613 TX$=CHR$(Q0):TX$((MXL+Q23)*L2)=T
    X$:TX$(2)=TX$
620 SCR=PEEK(88)+256*PEEK(89):POKE 5
    59,46:POKE 842,12
630 X=2:Y=Q1:CL=Q0:POKE 702,Q0
640 REM ***  ENTRY FOR EACH PAGE
650 POKE 54286,192
655 POSITION Q0,Q0:? "{7 SPACES}Scri
    ptor Word Processor";:COLOR 32:D
    RAWTO L2,Q0:PLOT 32,Q0
660 LOC=CL*L2+Q1:T=USR(SCRZAP,ADR(TX
    $(LOC)))
670 IF TF THEN TF=Q0:GOTO 810
675 IF FIRST=Q0 THEN POSITION 31,Q0:
    ? MXL;" Free";:TF=Q1:FIRST=Q1
680 POKE 53248,X*4+44
690 IF Y=OY THEN 740
710 ADJOY=OY*4+16:ADJY=Y*4+16
720 A=USR(CURSOR,PMB+ADJOY,Q0):A=USR
    (CURSOR,PMB+ADJY,15):OY=Y
740 K=PEEK(53279):IF K<7 THEN 2570
770 T=PEEK(764):IF T=255 OR T=39 OR
    T=154 THEN 740
775 IF T=166 THEN POKE 764,255:GOTO
    1570
790 POKE 694,Q0:A=USR(GCHAR)
800 IF TF THEN 650
810 IF A<32 OR A>122 OR A=96 THEN 88
    0
820 A=A-32*(A<96)
830 POKE SCR+X+L*Y,A
840 LOC=(CL+Y-Q1)*L2+X-Q1
850 TX$(LOC,LOC)=CHR$(A)
860 X=X+Q1-BF:GOSUB 460
870 BF=Q0:GOTO 680
880 IF A<>155 THEN 910
890 GOSUB 2640:POKE SCR+X+L*Y,94:TX$
    (LOC,LOC+L2-X+Q1)=B$:X=2:Y=Y+1
900 TX$(LOC,LOC)=CHR$(94):GOSUB 460:
    GOTO 650
910 IF A=6 THEN A=127:GOTO 830
920 IF A=28 THEN Y=Y-Q1:GOSUB 460:GO
    TO 680
930 IF A=29 THEN Y=Y+Q1:GOSUB 460:GO
    TO 680
940 IF A=30 THEN X=X-Q1:GOSUB 460:GO
    TO 680
950 IF A=96 THEN A=74:GOTO 830
960 IF A=31 THEN X=X+Q1:GOSUB 460:GO
    TO 680
970 IF A=Q0 THEN A=72:GOTO 830
980 IF A=126 THEN X=X-Q1:GOSUB 460:A
    =Q0:BF=Q1:GOTO 830
1040 IF A<>255 THEN 1070
1050 A=USR(EDCOM,ADR(TX$((CL+Y-Q1)*L
     2+X-Q1)),ADR(TX$(MXL*L2+37)),Q0
     )
1060 GOTO 650
1070 IF A<>254 THEN 1100
1080 A=USR(EDCOM,ADR(TX$((CL+Y-Q1)*L
     2+X-Q1)),ADR(TX$(MXL*L2+37)),Q1
     )
1090 GOTO 650
1100 IF A<>157 THEN 1160
1110 GOSUB 590:? "Insert Line";
1120 GOSUB 540:POKE 559,Q0
1130 FOR I=EOT+(EOT<MXL) TO CL+Y STE
     P -Q1:T$=TX$((I-Q1)*L2+Q1,I*L2)
     :TX$(I*L2+Q1,I*L2+L2)=T$:NEXT I
1140 T=(CL+Y-Q1)*L2:TX$(T+Q1,T+L2)=B
     $
1150 X=2:POKE 559,46:GOTO 650
1160 IF A=159 THEN GOSUB 590:? "Tab
     set at ";X-Q1:TF=Q1:TB$(X-Q1,X-
     Q1)="*":GOTO 740
1170 IF A=158 THEN GOSUB 590:? "Tab
     cleared at ";X-Q1:TF=Q1:TB$(X-Q
     1,X-Q1)=CHR$(Q0):GOTO 740
1180 IF A<>127 THEN 1230
1190 IF TB$=B$ THEN GOSUB 590:? "No
     tabs set":TF=Q1:GOTO 740
1200 FOR I=X TO L2:IF TB$(I,I)=CHR$(
     Q0) THEN NEXT I:T=L2:X=2:Y=Y+Q1
     :GOSUB 460:GOTO 1200
1210 T=I:I=L2:NEXT I
1220 X=T+Q1:GOTO 680
1230 IF A<>156 THEN 1290
1240 GOSUB 590:? "Delete Line";
1250 GOSUB 540:POKE 559,Q0
1260 FOR I=CL+Y-Q1 TO EOT:T$=TX$((I+
     Q1)*L2+Q1,(I+2)*L2):TX$(I*L2+Q1
     ,I*L2+L2)=T$:NEXT I
1270 T=EOT*L2:TX$(T+Q1,T+L2)=B$
1280 X=2:POKE 559,46:GOTO 650
1290 IF A=11 THEN GOSUB 590:TF=Q1:?
     "Clear all tabs":TB$=B$:GOTO 74
     0
1320 IF A<>125 THEN 1450
1330 GOSUB 590:? "Erase: ";
1340 GOSUB 2650
1350 IF A=155 THEN 650
1355 IF A<>65 THEN 1370
1360 ? "[ALL] - ";:GOSUB 2540
1365 GOTO 613
1370 IF A<>82 THEN 1380
1372 ? "Remainder - ";:GOSUB 2540:GO
     SUB 2640
1375 TX$(LOC)=CHR$(Q0):TX$((MXL+Q23)
     *L2)=CHR$(Q0):TX$(LOC+Q1)=TX$(L
     OC):GOTO 650
1380 IF A<>68 OR NL=-Q1 THEN 650
1400 ? "Defined Lines - ";
1410 GOSUB 2540:POKE 559,Q0:GOSUB 54
     0
1420 FOR I=FRL-Q1 TO EOT:T$=TX$((I+N
     L+Q1)*L2+Q1,(I+NL+2)*L2):TX$(I*
     L2+Q1,I*L2+L2)=T$:NEXT I
1430 FOR I=EOT-NL TO EOT:TX$(I*L2+Q1
     ,I*L2+L2)=B$:NEXT I:NL=-Q1
1440 POKE 559,46:GOTO 650
1450 IF A<>4 THEN 1810
1460 GOSUB 590:? "Define Lines";
1470 FL=CL:FR=Y:FRL=FL+FR:NL=Q0
1480 POKE SCR+1+L*(FR+NL),223
1490 LOC=CL*L2+(FR+NL-Q1)*L2:T=RL*L2
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    +NL*L2:T$=TX$(LOC+Q1,LOC+L2):TX
    $(T+Q1,T+L2)=T$
1500 GOSUB 2650
1510 IF A=29 AND FR+NL<22 THEN NL=NL
    +Q1:GOTO 1480
1520 IF A=28 AND FR+NL>FR THEN POKE
    SCR+1+L*(FR+NL),Q0:NL=NL-Q1
1530 IF A=155 THEN 1550
1540 GOTO 1500
1550 FOR I=Q0 TO NL:POKE SCR+1+L*(FR
    +I),Q0:NEXT I:GOTO 650
1570 POKE 53248,Q0:PRINT CHR$(125):P
    OSITION 13,Q0:? "  HELP Screen  "
1580 ? "{DOWN}{TAB}{3 SPACES}Control
     Keys:"
1590 ? "A=Advance Page  B=Page Back"
1595 ? "D=Define Lines  F=Print form
    at char."
1610 ? "K=Kill all tabs L=Line Dupli
    cate"
1620 ? "P=Print text{4 SPACES}Q=Quit
    "
1630 ? "Atari Key=Cancel Command":?
1635 ? "^x Print special character"
1640 ? "{DOWN}[CLEAR] Erase:All  Def
    ined Lines":POKE 85,16:? "Remai
    nder"
1650 ? "[OPTION] Non-destructive CR"
1660 ? "{DOWN}[SELECT] Filer:Recall
    or Save"
1670 ? "{DOWN}[START]  'Home' cursor
    .  Press twice  to go to start
    of text."
1680 ? "{DOWN}[ESC] Mini DOS"
1700 ? "{DOWN}Press RETURN.":A=USR(G
    CHAR):GOTO 650
1810 IF A<>12 THEN 1910
1820 GOSUB 590:? "Duplicate defined
    lines";
1830 IF NL<Q0 THEN 650
1840 FOR I=Q0 TO NL
1850 IF CL+Y+I-Q1>MXL THEN I=NL:GOTO
     1900
1860 T=RL*L2+I*L2
1870 T2=CL*L2+(Y+I-Q1)*L2
1880 T$=TX$(T+Q1,T+L2)
1890 TX$(T2+Q1,T2+L2)=T$
1900 NEXT I:Y=Y+NL+Q1:GOSUB 460:GOTO
     650
1910 IF A<>27 THEN 2400
1920 POSITION 2,Q0:? "Directory,Lock
    ,Unlock,Rename,Scratch?"
1930 GOSUB 2650:J=A
1940 IF J<>76 AND J<>85 AND J<>83 AN
    D J<>68 AND J<>82 THEN 1930
1950 IF J<>ASC("D") THEN 2020
1960 ? CHR$(125):POKE 53248,Q0
1970 TRAP 2170:OPEN #2,6,Q0,"D:*.*"
1980 INPUT #2,T$:? T$:IF LEN(T$)<17
    THEN 2000
1990 GOTO 1980
2000 CLOSE #2:TRAP 40000:GOSUB 590:?
     "Press a key..■";:OK=1:GOSUB 2
    650:IF A=27 THEN 1920
2010 GOTO 650
2020 GOSUB 590:J=A
2030 IF J=76 THEN ? "  LOCK  >";:J=35
2040 IF J=83 THEN ? "SCRATCH>";:J=33
2050 IF J=85 THEN ? "  UNLOCK>";:J=36
2060 IF J=ASC("R") THEN 2130
2070 ? "Enter Filename:";
2080 MX=12:AL=Q1:GOSUB 2720
2090 T$(3)=IN$:T$(1,2)="D:":POSITION
     10,Q0:? DEL$(1,15);
2100 TRAP 2170:IF J=33 THEN POSITION
     24,Q0:GOSUB 2540:COLOR 32:PLOT
     24,Q0:DRAWTO 38,Q0
2110 TRAP 2170:XIO J,#2,Q0,Q0,T$:TRA
    P 40000
2120 TRAP 40000:GOTO 650
2130 GOSUB 590:? "RENAME>Current nam
    e? ";:MX=12:GOSUB 2720:T$(3)=IN
    $:T$(1,2)="D:"
2140 GOSUB 590:? "RENAME>New name? "
    ;:MX=12:GOSUB 2720:T$(LEN(T$)+Q
    1)=",":T$(LEN(T$)+Q1)=IN$
2150 TRAP 2170:XIO 32,#2,Q0,Q0,T$:TR
    AP 40000
2160 GOTO 650
2170 TRAP 2170:POKE 559,46:CLOSE #2:
    CLOSE #3:GOSUB 590:? CHR$(253);
    "I/O Error #";PEEK(195);:TF=Q1:
    GOTO 740
2180 GOSUB 590:? "Save or Recall";
2190 ICCOM=834+48:ICBAL=ICCOM+2:ICBL
    L=ICBAL+4:ICSTAT=835+48:REM IOC
    B#3
2200 GOSUB 2650:IF A=155 THEN 1380
2210 IF A<>ASC("S") THEN 2290
2220 GOSUB 600:? "SAVE:{3 SPACES}Fil
    e name? ";:MX=12:GOSUB 2720:T$(
    3)=IN$:T$(1,2)="D:":GOSUB 550
2230 POSITION 5,0:? DEL$(1,12);"ING"
    ;
2232 TRAP 2238:OPEN #3,4,Q0,T$:CLOSE
     #3:GOSUB 600:? "REPLACE:  ";IN
    $;" - ";:GOSUB 2540
2233 GOSUB 600:? "REPLACING ";IN$:GO
    TO 2240
2238 CLOSE #3:IF PEEK(195)<>170 THEN
     2170
2240 TRAP 2170:OPEN #3,8,Q0,T$
2250 POKE ICCOM,11:P=ADR(TX$):POKE I
    CBAL+Q1,INT(P/256):POKE ICBAL,P
    -(INT(P/256)*256)
2260 LN=(CL+EOT+Q1)*L2:POKE ICBLL+Q1
    ,INT(LN/256):POKE ICBLL,LN-(INT
    (LN/256)*256)
2270 A=USR(ADR(CIO$),48):ERR=PEEK(IC
    STAT):POKE 195,ERR:IF ERR>1 THE
    N 2170
2280 CLOSE #3:TRAP 40000:POKE 53279,
    Q0:GOTO 650
2290 IF A<>ASC("R") THEN 650
2300 LK=Q0
2310 GOSUB 590:? "RECALL: Filename?
    ";:MX=12:GOSUB 2720:T$(3)=IN$:T
    $(1,2)="D:"
2315 LOC=(CL+Y-Q1)*L2+Q1:TX$(LOC)=CH
    R$(Q0):TX$((MXL+Q23)*L2)=CHR$(Q
    0):TX$(LOC+Q1)=TX$(LOC)
2320 TRAP 2170:POSITION 8,0:? DEL$(1
    ,8);"ING";:OPEN #3,4,Q0,T$
2330 ICCOM=834+48:ICBAL=ICCOM+2:ICBL
    L=ICBAL+4
2340 POKE ICCOM,5:P=ADR(TX$((CL+Y-Q1
    )*L2+Q1)):POKE ICBAL+Q1,INT(P/2
    56):POKE ICBAL,P-(INT(P/256)*25
    6)
2350 LN=(MXL-(CL+Y-Q1))*L2:POKE ICBL
    L+Q1,INT(LN/256):POKE ICBLL,LN-
    (INT(LN/256)*256)
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2360 A=USR(ADR(CIO$),48):ERR=PEEK(IC
     STAT):POKE 195,ERR:IF ERR>1 AND
      ERR<>136 THEN 2170
2370 CLOSE #3:POKE 53279,0:TRAP 400
     00:IF LK=0 THEN 650
2380 CL=0:Y=1:X=2:T=USR(SCRZAP,ADR
     (TX$))
2390 GOTO 2950
2400 IF A<>17 THEN 2410
2403 GOSUB 600:? "QUIT: ";:GOSUB 254
     0
2405 POKE 53277,0:POKE 53248,0:POK
     E 53774,192:POKE 16,192:GRAPHIC
     S 0:POKE 702,64:END
2410 IF A=16 THEN 2840
2420 IF A=1 THEN CL=CL+23:Y=1:GOS
     UB 460:GOTO 650
2430 IF A=2 THEN CL=CL-23:Y=1:GOSU
     B 460:GOTO 650
2500 GOTO 640
2540 ? "Are you sure?";:GOSUB 2650:I
     F 1-(A=121 OR A=89) THEN POP :G
     OTO 650
2550 RETURN
2570 REM ***  Handle console keys
2580 POKE 764,130:A=USR(GCHAR):POKE
     77,0
2590 IF K=5 THEN 2180
2600 IF K=3 THEN X=2:Y=Y+1:GOSUB 46
     0:GOTO 680
2610 IF K=6 AND Y=1 AND X=2 THEN CL
     =0:X=2:GOTO 650
2620 IF K=6 THEN Y=1:X=2:GOTO 650
2630 GOTO 740
2640 LOC=(CL+Y-1)*L2+X-1:RETURN
2650 T=0:REM GET A KEY
2660 IF PEEK(20)>20 THEN T=1-T:POKE
      20,0:POKE 755,T*2
2665 IF OK THEN IF PEEK(53279)=5 THE
     N POKE 755,2:POKE 559,46:POP :P
     OKE 764,130:A=USR(GCHAR):OK=0:G
     OTO 2180
2670 IF PEEK(764)=255 THEN 2660
2680 IF PEEK(764)=154 THEN 2660
2690 IF PEEK(764)=39 THEN POKE 764,2
     55:SOUND 0,5,12,4:POP :FOR T=1
      TO 5:NEXT T:SOUND 0,0,0,0:
     GOSUB 2710:GOTO 650
2700 TRAP 2700:A=USR(GCHAR):TRAP 400
     00:IF A>96 AND A<123 THEN A=A-3
     2*AL
2710 POKE 755,2:POKE 559,46:RETURN
2720 REM ***  PSEUDO-INPUT
2730 IN$=""
2740 ? CHR$(21);CHR$(30);:GOSUB 2650
     :? CHR$(32);CHR$(30);
2750 IF A=155 THEN 2820
2760 IF A=126 AND LEN(IN$)>1 THEN IN
     $=IN$(1,LEN(IN$)-1):? CHR$(A);
     :GOTO 2740
2770 IF A=126 AND LEN(IN$)=1 THEN ?
      CHR$(A);:GOTO 2730
2780 IF LEN(IN$)=MX THEN 2740
2790 IF (A<32 OR A>90) AND A<96 OR A
     >122 THEN 2740
2800 ? CHR$(A);:IN$(LEN(IN$)+1)=CHR
     $(A)
2810 GOTO 2740
2820 AL=1:IF IN$="" THEN POP :GOTO
     650
2830 RETURN
2840 REM ***  Printer Output
2850 GOSUB 590:? "PRINT: (C/F)"
2860 CON=0:F=0:FOR I=0 TO 9:PC(I)
     =48+I:NEXT I
2870 GOSUB 2650:IF A=155 THEN 2910
2880 IF A=67 THEN CON=1-CON:POSITION
      10,0:? CHR$(67+128*CON);:GOTO
      2870
2890 IF A=70 THEN F=1-F:POSITION 12,
     0:? CHR$(70+128*F):GOTO 2870
2900 GOTO 2870
2910 TRAP 2170:OPEN #2,8,0,"P:"
2920 GOSUB 590:? "Printing..."
2930 LM=5:RM=75:CN=0:NL=0
2940 SP=1:PL=66:LP=50:C=LM
2950 GOSUB 540:IF F=1 THEN POKE 559,
     0
2960 FOR P=1 TO LC
2970 IF PEEK(764)<255 THEN GOSUB 265
     0:POP :GOTO 3140
2980 Z=ASC(TX$(P))
2990 IF CN=1 AND Z<>127 THEN 3460
3000 IF Z<62 OR (Z>96 AND Z<123) THE
     N 3070
3010 IF Z=94 THEN GOSUB 3210:GOSUB 3
     150:GOTO 3120
3020 IF Z=72 THEN UL=1:PUT #2,27:PU
     T #2,52:GOTO 3120
3030 IF Z=74 THEN UL=0:PUT #2,27:PU
     T #2,53:GOTO 3120
3040 T=ASC(TX$(P+1)):IF Z=62 AND T>
     15 AND T<26 THEN PUT #2,PC(T-16
     ):P=P+1:GOTO 3120
3060 IF Z=127 THEN 3230
3070 IF C=LM THEN FOR I=1 TO LM:PUT
      #2,32:NEXT I
3080 C=C+1
3090 PUT #2,Z+32*(Z<64)
3100 T=0:IF RM-C>=10 THEN 3110
3105 FOR I=1 TO LEN(BRK$):IF Z+32<>A
     SC(BRK$(I,I)) THEN NEXT I:GOTO
     3110
3107 TT=ASC(TX$(P+1)):IF TT=0 OR T
     T=94 OR Z=0 OR Z=13 THEN I=LEN
     (BRK$):NEXT I:GOSUB 3150:T=1
3110 IF T=1 AND ASC(TX$(P+1))=0 T
     HEN P=P+1:IF P<LC THEN 3110
3120 NEXT P
3130 GOSUB 3150
3140 PRINT #2:CLOSE #2:POKE 559,46:T
     RAP 40000:GOTO 650
3150 FOR I=1 TO SP:PRINT #2:NEXT I
3160 C=LM:NL=NL+SP:IF CN<0 THEN CN=
     1
3170 IF NL<LP THEN RETURN
3180 IF CON=0 THEN FOR I=0 TO 255
     STEP 17:SOUND 0,255-I,10,15-IN
     T(I/17):NEXT I:T=USR(GCHAR):GOT
     O 3200
3190 FOR I=1 TO PL-LP:PRINT #2:NEXT
      I
3200 NL=0:RETURN
3210 REM ***  SKIP TRAILING BLANKS
3220 T=INT(P/L2):P=(T+1-(P/L2=T))*L
     2:RETURN
3230 REM Handle special formatting
3240 P=P+1
3250 CM$=TX$(P,P+1):T$=""
3260 FOR I=P+2 TO LC
3270 IF TX$(I,I)>=CHR$(16) AND TX$(I
     ,I)<CHR$(26) THEN T$(LEN(T$)+1
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    )=CHR$(ASC(TX$(I,I))+32):NEXT I
3280 V=Q0:P=I:TRAP 3290:V=VAL(T$)
3290 TRAP 2170:IF CM$="cn" THEN CN=V
3300 IF CM$="ln" THEN FOR J=Q1 TO V:
     GOSUB 3150:NEXT J
3310 IF CM$="sp" THEN SP=V
3320 IF CM$="pl" THEN PL=V
3330 IF CM$="lp" THEN LP=V
3340 IF CM$="lm" AND V>0 THEN LM=V:C
     =V
3350 IF CM$="rm" AND V>0 THEN RM=V
3360 IF CM$="fp" THEN GOSUB 3180:POK
     E 559,46-46*F
3370 IF CM$="as" THEN PUT #2,V
3380 IF CM$="cm" THEN FOR I=P TO P+7
     9:IF TX$(I,I)<>"^" THEN NEXT I:
     I=I-Q1
3390 IF CM$="cm" THEN P=I+Q1:GOTO 34
     50
3400 IF CM$<>"nf" THEN 3430
3410 T$="D:":FOR I=Q0 TO 11:Z=ASC(TX
     $(P+I,P+I)):IF Z<>94 AND P+I<=L
     C THEN T$(3+I)=CHR$(Z+32*(Z<63)
     ):NEXT I
3415 TX$(Q1)=CHR$(Q0):TX$((MXL+Q23)*
     L2)=CHR$(Q0):TX$(2)=TX$
3420 POKE 559,46:GOSUB 590:? "Printi
     ng ";T$:LK=Q1:CL=Q0:Y=Q1:GOTO 2
     320
3430 IF ASC(CM$)>15 AND ASC(CM$)<26
     THEN PC(ASC(CM$)-16)=V
3440 IF TX$(P,P)<>"^" AND P<LC THEN
     3240
3450 GOSUB 3220:P=P+Q1:GOTO 2970
3460 REM ***  CENTER STRING
3470 LN=Q0:FOR I=P TO P+79:IF TX$(I,
     I)<>"^" THEN LN=LN+Q1:NEXT I
3480 WIDTH=RM-LM:UL=Q0:IF TX$(P,P)=C
     HR$(72) THEN UL=Q1
3490 FOR I=Q1 TO (WIDTH-LN)/2+LM:PUT
      #2,32:NEXT I
3500 C=C+I:CN=-Q1:GOTO 2990
5000 REM  INITIALIZATION
5010 GRAPHICS 17:SETCOLOR 4,1,10
5020 DL=PEEK(560)+256*PEEK(561)+4:PO
     KE DL+5,7:POKE DL+10,7:POKE DL+
     14,7
5030 POSITION 6,4:? #6;"Scriptor":PO
     SITION 3,7:? #6;"WORD PROCESSOR
     "
5040 ? #6:? #6;" ";CHR$(136);CHR$(22
     7);CHR$(137);" Copyright ";CHR$
     (145);CHR$(153);CHR$(152);CHR$(
     147)
5045 ? #6:? #6;" small systems svcs"
     ;CHR$(14);
5050 ? #6:? #6;"{3 SPACES}CHARLES BR
     ANNON"
5070 Q0=0:Q1=1:Q23=23:RL=MXL+Q1:SCRZ
     AP=1680:CURSOR=1739:EDCOM=1536:
     AL=1:L2=38:GCHAR=1303:SND=1331
5080 DIM T$(79),IN$(20),B$(L2),TB$(L
     2),CM$(2),BRK$(8),PC(9),DEL$(20
     ),CIO$(7)
5090 B$=CHR$(Q0):B$(L2)=B$:B$(2)=B$:
     DEL$=CHR$(254):DEL$(20)=DEL$:DE
     L$(2)=DEL$
5100 TB$=B$:BRK$=" ,.!?;:-":CIO$="hh
     h":CIO$(4)=CHR$(170):CIO$(5)="L
     V":CIO$(7)=CHR$(228)
5110 OPEN #1,4,Q0,"K:"
5120 T=Q0:OY=Q0:CL=Q0:L=40:NL=-Q1
5130 PMB=PEEK(106)-8:POKE 559,46:POK
     E 53248,Q0
5140 POKE 54279,PMB:POKE 53277,3
5150 PMB=PMB*256+512:POKE 704,56
5160 FOR I=Q0 TO 255:POKE PMB+I,Q0:P
     OKE 708+3*RND(Q0),PEEK(53770):N
     EXT I
5180 SETCOLOR 4,8,2
5250 FOR I=0 TO 70:READ A:POKE 1280+
     I,A:CHECKSUM=CHECKSUM+A:POKE 70
     8+3*RND(Q0),PEEK(53770):NEXT I
5290 FOR I=0 TO 247:READ A:POKE 1536
     +I,A:CHECKSUM=CHECKSUM+A:POKE 7
     08+3*RND(Q0),PEEK(53770):NEXT I
5300 IF CHECKSUM<>47765 THEN PRINT C
     HR$(253);"Error in DATA stateme
     nts...":END
5310 DATA 72,138,72,169,10,162,2,141
     ,10,212,141,24,208,141,26,208,1
     42,23,208,104,170,104,64
5320 DATA 104,173,252,2,201,255,240,
     249,133,124,162,255,142,252,2,3
     2,51,5,32,254,246,133,212,169,0
     ,133,213,96
5330 DATA 162,0,142,0,210,162,15,142
     ,1,210,160,0,234,200,208,252,20
     2,16,244,96
5340 DATA 216,104,104,133,213,104
5350 DATA 133,212,104,133,204,104
5360 DATA 133,203,104,104,208,47
5370 DATA 32,109,6,165,205,76
5380 DATA 43,6,160,0,177,205
5390 DATA 200,145,205,198,205,165
5400 DATA 205,201,255,208,2,198
5410 DATA 206,197,212,208,235,165
5420 DATA 206,197,213,208,229,160
5430 DATA 0,177,205,200,145,205
5440 DATA 136,152,145,205,96,201
5450 DATA 1,240,3,76,221,6
5460 DATA 32,109,6,76,91,6
5470 DATA 160,1,177,212,136,145
5480 DATA 212,230,212,208,2,230
5490 DATA 213,165,213,197,206,208
5500 DATA 237,165,212,197,205,208
5510 DATA 231,169,0,168,145,212
5520 DATA 96,165,212,133,205,165
5530 DATA 213,133,206,160,0,177
5540 DATA 205,201,94,240,18,230
5550 DATA 205,208,2,230,206,165
5560 DATA 206,197,204,208,238,165
5570 DATA 205,197,203,208,232,96
5580 DATA 165,88,133,203,165,89
5590 DATA 133,204,104,104,133,206
5600 DATA 104,133,205,162,24,76
5610 DATA 188,6,160,0,177,205
5620 DATA 200,200,145,203,136,192
5630 DATA 38,208,245,24,169,38
5640 DATA 101,205,133,205,144,2
5650 DATA 230,206,24,169,40,101
5660 DATA 203,133,203,144,2,230
5670 DATA 204,202,208,218,96,104
5680 DATA 104,133,204,104,133,203
5690 DATA 104,168,104,145,203,200
5700 DATA 192,4,208,249,96,160
5710 DATA 0,177,212,208,20,198
5720 DATA 212,165,212,201,255,208
5730 DATA 2,198,213,197,203,208
5740 DATA 238,165,213,197,204,208
5750 DATA 232,96
6000 GRAPHICS 0:POKE 559,Q0:POKE 16,
```

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```
      64:POKE 53774,64
6010 FOR I=5000 TO 5900 STEP 100:? C
     HR$(125):POSITION 2,3:FOR J=I+9
     0 TO I STEP -10:? J:NEXT J:? 11
     0:? "CONT"
6020 POKE 712,PEEK(53770):POKE 842,1
     3:POSITION 0,0:STOP
6030 POKE 842,12:NEXT I
6040 SETCOLOR 2,12,Q0:SETCOLOR 4,8,1
     0:SETCOLOR Q1,Q0,12:POKE 752,Q1
6050 POKE PEEK(560)+256*PEEK(561)+3,
     194:POKE 512,0:POKE 513,5
6060 ? CHR$(125):? :? :FOR I=6000 TO
      6060 STEP 10:? I:NEXT I:? "GOT
     0610":POSITION 0,0:POKE 842,13:
     STOP
```

Program 2: Change these lines of Program 1 if you have an 825 Printer.

```
3020 IF Z=72 THEN UL=Q1:PUT #2,15:GOT
     O 3120
3030 IF Z=74 THEN UL=Q0:PUT #2,14:GOT
     O 3120
3070 IF C=LM THEN PUT #2,14:FOR I=Q1
     TO LM:PUT #2,32:NEXT I:PUT #2,15
     *UL                              ©
```


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Retirement Planner

Steve Hamilton

There are versions here for VIC (any memory size), Apple, Atari, TI-99, and TRS-80 Color Computer. This program asks you for an estimate of future interest rates, your current financial situation, and your age at retirement. It then assists you in determining how much you should invest each year towards a retirement nest egg so that you can maintain your present standard of living.

Trying to plan for financial requirements at retirement is a little like entering a contest at a local candy store and trying to guess the number of jelly beans in that five gallon jar behind the counter. Fortunately, there are some tools available to aid in retirement planning. If we are able to anticipate the future based on what has happened in the past, we can at least begin to make a reasonable estimate of our needs.

This program is one tool for retirement planning and is designed to help determine how much you should invest each year from now until retirement. The program assumes two critical factors: the first is that you can estimate the average inflation rate from now until retirement, and the second is that you can predict the average earning rate of investment over that time frame. Although these figures will be highly speculative, we can still use available information to make the best judgment possible.

The program begins by asking for the anticipated average inflation rate until retirement, your current age, and your expected age at retirement. A series of questions follows concerning current monthly expenses. Using answers to these questions, a subroutine at line 580 figures what these expenses will be at retirement. The prompts are self-explanatory. When asked for the anticipated inflation and interest rates, remember to use the decimal form of these figures. For example, if the expected interest rate is 12%, enter it as: .12.

The total savings required will be displayed following the command at line 320. The next prompt will be for the number of years until retirement: be sure to enter only 10, 15, 20, 25, 30, or 35. The input from this prompt is used to determine which factor will figure the amount you must invest each year until retirement. I obtained the factors from my local banker.

When the program is finished, a figure will be displayed representing the amount you must invest each year – at the anticipated earning rate – in order to reach the total savings figure specified from line 320.

Program 1: VIC Version

```
100 PRINT"{CLEAR}"
110 PRINT"{REV}RETIREMENT NEEDS"
120 FOR YR=1TO6:READ F(YR):NEXT YR
130 INPUT"AVE.INFL.RATE";I
140 INPUT"YOUR AGE";A
150 INPUT"RETIREMENT AGE";R
160 Y=R-A
170 PRINT"MONTHLY UTILITIES COST"
180 GOSUB 580
190 PRINT"MONTHLY FOOD COSTS"
200 GOSUB580
210 PRINT"MONTHLY HOUSING COSTS"
220 GOSUB580
230 PRINT"MONTHLY TRANSPORTATION"
240 GOSUB580
250 PRINT"MONTHLY MEDICAL COSTS"
260 GOSUB 580
270 PRINT"MONTHLY TAXES & INSUR."
280 GOSUB580
290 PRINT"MONTHLY MISC."
300 GOSUB580
310 PRINT"{CLEAR}"
320 PRINT"ANTICIPATED MONTHLY"
330 PRINT"EXPENSES=$";INT(LE)
340 PRINT"ANTICIPATED YEARLY"
350 PRINT"SOCIAL SECURITY"
360 INPUT"INCOME";SS
370 REM LINE 280 FIGURES ANNUAL
380 REM LIVING EXPENSES.
390 AL=LE*12
400 PRINT"ANTICIPATED AVE."
410 INPUT"INTEREST RATE";AI
420 PRINT"{CLEAR}"
430 PRINT"TOTAL SAVINGS REQ.="
440 SR=INT((AL-SS)/AI)
450 PRINT"$";SR
460 PRINT"NO. OF YEARS TO"
470 PRINT"RETIREMENT?(ENTER"
480 PRINT"ONLY 10,15,20,25"
490 PRINT"30 OR 35)"
500 INPUTYR:YR=YR/5-1
510 Q=(F(YR)*AI)/.12
520 PRINT"SAVINGS ALREADY"
530 INPUT"ACCUMULATED";S1
540 W=(SR-S1)/Q
550 PRINT"ANNUAL SAVINGS REQ.="
560 PRINT"$";INT(W)
570 END
580 INPUTX:Z=X*(1+I)↑Y:LE=LE+Z:RETURN:REM ~
    LE=MONTHLY RETIREMENT EXPENSES
590 DATA 20.28498,43.86578,86.45534
600 DATA 163.37683,302.30558,553.22637
```


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Program 2: Apple Version

```
100  HOME : VTAB 2: HTAB 14: INVERSE : PRINT
     "RETIREMENT NEEDS": NORMAL
110  FOR YR = 1 TO 6: READ F(YR): NEXT YR
120  VTAB 6: INPUT "AVE. INFLATION RATE? ";I
130  INPUT "YOUR AGE? ";A
140  INPUT "RETIREMENT AGE? ";R
150 Y = R - A: PRINT : PRINT :A$ = "MONTHLY
     UTILITIES COSTS": GOSUB 460
160  GOSUB 430
170  INPUT "MONTHLY FOOD COSTS=$";X
180  GOSUB 430
190 A$ = "MONTHLY HOUSING COSTS": GOSUB 460
200  GOSUB 430
210  INPUT "MONTHLY TRANSPORTATION COSTS=$";
     X
220  GOSUB 430
230 A$ = "MONTHLY MEDICAL COSTS": GOSUB 460
240  GOSUB 430
250  INPUT "MONTHLY TAXES AND INSURANCE=$";X
260  GOSUB 430
270 A$ = "MONTHLY MISCELLANEOUS": GOSUB 460
280  GOSUB 430
290  VTAB 20: PRINT "** ANTICIPATED MONTHLY
     EXPENSES=";: INVERSE : PRINT "$"; INT (
     LE);: NORMAL : PRINT " **"
300  PRINT : HTAB 5: PRINT "--PRESS ANY KEY
     TO CONTINUE--": GET B$
310  HOME : PRINT : PRINT " ANTICIPATED YEAR
     LY SOCIAL SECURITY": INPUT " INCOME=$ "
     ;SS
320 AL = LE * 12: REM  CALCULATES ANNUAL LIV
     ING EXPENSES
330  PRINT : INPUT " ANTICIPATED AVE. INTERE
     ST RATE? ";AI
340 SR =  INT ((AL - SS) / AI)
350  PRINT : PRINT : PRINT : PRINT "  ** ";:
      INVERSE : PRINT "TOTAL SAVINGS REQUIRE
     D=";: NORMAL : PRINT "$";SR;" **"
360  PRINT : PRINT : PRINT " NUMBER OF YEARS
      UNTIL RETIREMENT(ENTER"
370  INPUT " ONLY 10,15,20,25,30, OR 35)?";Y
     R:YR = YR / 5 - 1
380 Q = (F(YR) * AI) / .12
390  PRINT : INPUT " SAVINGS ALREADY ACCUMUL
     ATED=$ ";S1
400 W = (SR - S1) / Q
410  PRINT : PRINT : PRINT : PRINT "  ** ";:
      INVERSE : PRINT "ANNUAL SAVINGS REQUIR
     ED=";: NORMAL : PRINT "$"; INT (W);:
     PRINT " **"
420  END
430 Z = X * (1 + I) ^ Y:LE = LE + Z: RETURN
     : REM  LE=MONTHLY RETIREMENT EXPENSES
440  DATA  20.28498,43.86578,86.45534
450  DATA  163.37683,302.30558,553.22637
460  INVERSE : PRINT A$;: NORMAL : INPUT "=$
     ";X: RETURN
```

Program 3: TI Version

```
100 DIM F(6)
110 GOSUB 710
120 FOR YR=1 TO 6
130 READ F(YR)
140 NEXT YR
150 INPUT "AVE. INFLATION RATE?":I
160 INPUT "YOUR AGE?":A
170 INPUT "RETIREMENT AGE?":R
180 PRINT
190 PRINT
200 Y=R-A
210 PRINT "MONTHLY UTILITIES COSTS"
220 GOSUB 650
230 PRINT "MONTHLY FOOD COSTS"
240 GOSUB 650
250 PRINT "MONTHLY HOUSING COSTS"
260 GOSUB 650
270 PRINT "MONTHLY TRANSPORTATION COS
    TS"
280 GOSUB 650
290 PRINT "MONTHLY MEDICAL COSTS"
300 GOSUB 650
310 PRINT "MONTHLY TAXES AND INSURANC
    E"
320 GOSUB 650
330 PRINT "MONTHLY MISCELLANEOUS"
340 GOSUB 650
350 PRINT
360 PRINT "ANTICIPATED MONTHLY EXPENS
    ES=$";INT(LE)
370 INPUT "PRESS enter TO CONTINUE":G
    $
380 GOSUB 710
390 PRINT "ANTICIPATED YEARLY SOCIAL"
400 INPUT "SECURITY INCOME?":SS
410 REM{3 SPACES}LINE 430 FIGURES ANN
    UAL{4 SPACES}
420 REM  LIVING EXPENSES
430 AL=LE*12
440 PRINT
450 PRINT "ANTICIPATED AVE. INTEREST"
460 INPUT "RATE?":AI
470 PRINT
480 PRINT "TOTAL SAVINGS REQUIRED="
490 SR=INT((AL-SS)/AI)
500 PRINT "$";SR
510 PRINT
520 PRINT "NO. OF YEARS TO RETIREMENT
    ?"
530 PRINT "(ENTER ONLY 10,15,20,25,30
    "
540 INPUT "OR 35)":YR
550 YR=YR/5-1
560 Q=(F(YR)*AI)/.12
570 PRINT
580 INPUT "SAVINGS ALREADY ACCUMULATE
    D?":S1
590 W=(SR-S1)/Q
600 PRINT
610 PRINT "ANNUAL SAVINGS REQUIRED="
620 PRINT "$";INT(W)
630 END
640 REM  LE=MONTHLY RETIREMENT EXPENS
    ES
650 INPUT X
660 Z=X*(1+I)^Y
670 LE=LE+Z
680 RETURN
690 DATA 20.28498,43.86578,86.45534
700 DATA 163.37683,302.30558,553.2263
    7
710 CALL CLEAR
720 FOR J=9 TO 11
730 CALL COLOR(J,2,7)
740 NEXT J
750 PRINT "{5 SPACES}retirement needs
    "
760 FOR I=1 TO 15
770 PRINT
780 NEXT I
790 RETURN
```

Program 4: TRS-80 Version

```
10 DIM F(6)
20 CLS
30 PRINT@200
40 PRINT"{7 SPACES}RETIREMENT NEEDS"
50 FOR I=1 TO 1000:NEXTI:CLS
60 FOR YR=1TO6:READ F(YR):NEXT YR
```


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```
70 INPUT"AVE. INFLATION RATE";I
80 INPUT"YOUR AGE";A
90 INPUT"RETIREMENT AGE";R
100 PRINT:Y=R-A
110 PRINT"MONTHLY UTILITIES COSTS";:G
    OSUB 370
120 PRINT"MONTHLY FOOD COSTS";:GOSUB
    370
130 PRINT"MONTHLY HOUSING COSTS";:GOS
    UB 370
140 PRINT"MONTHLY TRANSPORTATION";:GO
    SUB 370
150 PRINT"MONTHLY MEDICAL COSTS";:GOS
    UB 370
160 PRINT"MONTHLY TAXES AND INSUR.";:
    GOSUB 370
170 PRINT"MONTHLY MISC.";:GOSUB370
180 PRINT:PRINT" ANTICIPATED MONTHLY
    EXPENSES="
190 PRINT INT(LE)
200 PRINT:PRINT"{3 SPACES}PRESS ENTER
     TO CONTINUE";
210 IF INKEY$="" THEN 210
220 CLS:PRINT"ANTICIPATED YEARLY SOCI
    AL"
230 INPUT"SECURITY INCOME";SS
240 AL=LE*12:REM CALCS ANNUAL LIVING
    EXPENSES
250 PRINT:PRINT"ANTICIPATED AVERAGE"
260 INPUT"INTEREST RATE";AI
270 SR=INT((AL-SS)/AI)
280 PRINT:PRINT"TOTAL SAVINGS REQ. =$"
    ;SR
290 PRINT:PRINT"NO. OF YEARS TO RETIR
    EMENT?"
300 PRINT" (ENTER ONLY 10,15,20,25,30
310 INPUT" OR 35)";YR:YR=YR/5-1
320 Q=F(YR)*AI/.12
330 PRINT:PRINT"SAVINGS ALREADY ACCUM
    ULATED":INPUT S1
340 W=(SR-S1)/Q
350 PRINT:PRINT"ANNUAL SAVINGS REQ.=$
    ";INT (W)
360 END
370 INPUT X:Z=X*(1+I)^Y:LE=LE+Z:RETUR
    N:REM LE=MONTHLY RETIREMENT EXPEN
    SES
380 DATA 20.28498,43.86578,86.45534
390 DATA 163.37683,302.30558,553.2263
    7
```

Program 5: Atari Version

```
90 DIM F(6):OPEN #1,4,0,"K:"
100 GRAPHICS 2+16
110 POSITION 2,5:? #6;"RETIREMENT NEE
    DS"
120 FOR I=1 TO 1000:NEXT I
130 FOR YR=1 TO 6:READ F:F(YR)=F:NEXT
     YR
140 PRINT "{3 DOWN}AVE. INFLATION RAT
    E";:INPUT I
150 PRINT "YOUR AGE";:INPUT A
160 PRINT "RETIREMENT AGE";:INPUT R
170 Y=R-A:PRINT "{DOWN}MONTHLY UTILIT
    IES COSTS ";:GOSUB 650
180 PRINT "MONTHLY FOOD COSTS ";:GOSU
    B 650
190 PRINT "MONTHLY HOUSING COSTS ";:G
    OSUB 650
200 PRINT "MONTHLY TRANSPORTATION ";:
    GOSUB 650
210 PRINT "MONTHLY MEDICAL COSTS ";:G
    OSUB 650
220 PRINT "MONTHLY TAXES AND INSUR. "
    ;:GOSUB 650
230 PRINT "MONTHLY MISCELLANEOUS ";:G
    OSUB 650
240 PRINT "{3 DOWN}**ANTICIPATED MONT
    HLY EXPENSES=$";INT(LE);"**"
250 PRINT "{2 DOWN}  PRESS ANY KEY TO
     CONTINUE:";
260 GET #1,A
280 GRAPHICS 0:PRINT "{2 DOWN} ANTICI
    PATED YEARLY SOCIAL SECURITY":PRI
    NT " INCOME=$ ";:INPUT SS
290 AL=LE*12:REM CALCULATES ANNUAL LI
    VING EXPENSES
300 PRINT "{DOWN} ANTICIPATED AVE.INT
    EREST RATE";:INPUT AI
310 SR=INT((AL-SS)/AI)
320 PRINT "{2 DOWN} * TOTAL SAVINGS R
    EQUIRED=$";SR;" *"
330 PRINT "{3 DOWN} NUMBER OF YEARS U
    NTIL RETIREMENT"
340 PRINT " (ENTER ONLY 10,15,20,25,3
    0,OR 35)";:INPUT YR:YR=YR/5-1
350 Q=F(YR)*AI/0.12
360 PRINT "{DOWN} SAVINGS ALREADY ACC
    UMULATED=$";:INPUT S1
370 W=(SR-S1)/Q
380 PRINT "{2 DOWN} **ANNUAL SAVINGS
    REQUIRED=$";INT(W);"**"
390 END
440 DATA 20.28498,43.86578,86.45534
450 DATA 163.37683,302.30558,553.2263
    7
650 INPUT X:Z=X*(I+1)^Y:LE=LE+Z:RETUR
    N :REM LE=MONTHLY RETIREMENT EXPE
    NSES
```

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Typing Teacher

Alan McCright

For Atari, VIC, TI-99/4A, and Apple. Typing in program listings is far easier if you really know the keyboard and don't need to watch your fingers. The typing program given here helps you learn the keyboard, and will give you a score based either on characters per minute or in words per minute.

Those who must rely on hunt-and-peck typing have likely discovered just how tedious it can be, especially when you are typing in programs. This program is a self-teacher that will help familiarize you with keyboard layout and help you learn to touch type.

The idea is to let your fingers find the correct key, and not to look at the keyboard. When this program is RUN, a representation of the keyboard layout appears on the screen. The characters are printed in an approximation of their keyboard positions. Check the key's location on the display, and try to get your finger to move there without looking down at the keyboard.

The Atari version starts the clock at memory location 19 and will print a non-SHIFTed character on the upper center of the screen. It will then wait for your response, flash the screen character that corresponds to your typed key, and check to see if it matches the test character. If so, your score will be incremented by one. After one minute, the test will end, your score in characters per minute will be printed, and you will be asked to try again. If you are not using the Atari version of this program, see the notes specific to your computer.

Getting the proper screen character to flash was a problem. I know of no way to read the keyboard in x,y, and a data READ after each GET was much too slow. Finally, I hit upon the idea of POKEing the screen characters' x,y positions into page six at the locations corresponding to the characters' ATASCII values times two and their values times two plus one (lines 160 and 400). Since the GET function returns the ATASCII value, a simple algorithm and a couple of PEEKs will fetch the proper screen coordinates.

The four DATA statements contain the ATASCII values of the characters in their relative keyboard positions (line 1000 = keyboard row 1).

At line 100, the screen y coordinate starts at row 5. This is incremented by one at the end of each DATA statement.

Line 120 is set to 3 at the beginning of each row, incremented by 1 after each READ, and is POKEd into memory as the screen x position.

Line 160 POKEs this data into the appropriate memory location.

Line 170 then uses these values to print the character in its proper screen position before going to the next READ.

The rows are put on the screen beginning at column 3. The last two DATA lines are padded with spaces (32) at the beginning, to position those rows one column over.

If you prefer to see your score in words per minute, make these changes:

```
500 POSITION 9,2: ?#6;CHARCNT/5
510 POSITION 3,3: ?#6;"WORDS PER MINUTE"
```

This assumes that the average English word is five letters long. However, since the characters are chosen at random (which I found ideal for learning to type in programs), each individual character has to be recognized rather than recalled as part of a word. Thus, scoring in words per minute will lead to some appallingly low, though accurate, scores, even for good typists.

How fast can the program run? In the word-per-minute mode, by deleting line 360 and all of the REMs, and holding down any key after RUNning, a score of 60-70 words per minute is typical. However, when you are actually testing, your own reaction time will keep you from reaching that level. You might want to modify the routine using word lists instead of random characters to get an idea of your true secretarial speed.

Program 1: Atari Version

```
10 GRAPHICS 2+16
20 POSITION 2,0:? #6;"TYPING  TEACHE
   R":REM INVERSE VIDEO
30 OPEN #1,4,0,"K:"
40 CHARCNT=0:REM ZERO CHARACTER COUN
   TER
99 REM ** ROUTINE TO ENTER CHARACTER
    POSITION DATA **
100 FOR ROW=5 TO 8:REM ROW DATA TO P
    OKE
120 FOR COL=3 TO 15:REM COLUMN DATA
    TO POKE
130 READ CHAR
```


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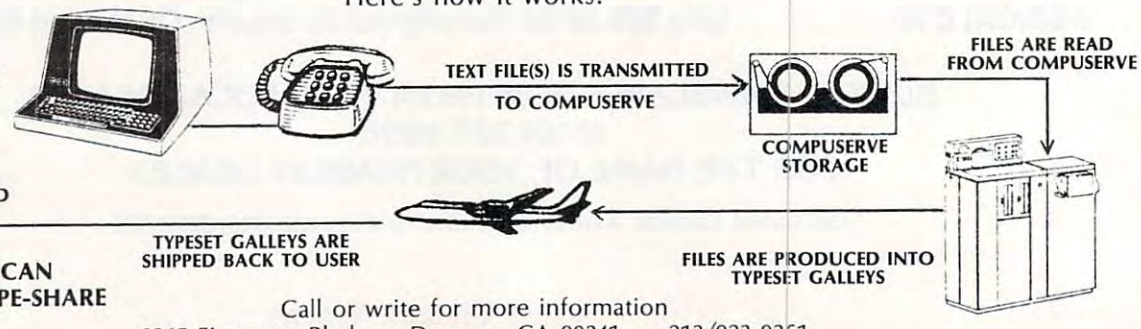

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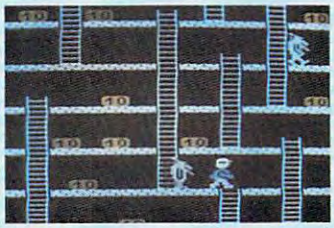

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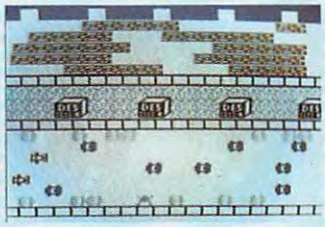

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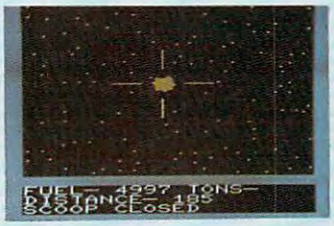

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Apple, VIC, And TI-99/4A Notes

Apple

Because the Apple lacks a realtime clock, a special counter routine must be employed in this version of the program. Incrementing occurs in line 320 while waiting for a keyboard response, and again in line 350 to account for the time required to process each response. After approximately a minute, a certain counter value will be reached (in line 330) and the testing routine will be halted and a score displayed. As in the Atari version, your score can be given in words per minute by making line 440 read:

```
440 HTAB12:VTAB7:INVERSE:PRINT"WORDS/
    MINUTE=";" ";CCNT/5:NORMAL
```

If you modify this program, be sure to check the timing for you may have affected it. If so, adjust line 350.

VIC

The VIC version of "Typing Teacher" POKEs the X,Y coordinates for each character used on the screen keyboard in an area of memory normally used as a "cassette buffer" (to hold items coming into or going out from the cassette during SAVEs or LOADs). Typing skill can be evaluated on a words per minute basis by changing line 580 to read:

```
580 PRINT"[HOME][06 DOWN][04 RIGHT]
    [REV]WORDS/MINUTE[OFF]";"=";CCNT/5
```

TI-99/4A

The TI-99/4 version, much like the Apple version, uses an incrementing counter to time the speed of keyboard response. This process occurs in lines 570 and 640. Since POKEs aren't allowed in TI BASIC, the X,Y coordinates for the characters in the keyboard displayed on the screen must be stored in an array. The TI-99/4 is somewhat slower in processing, and the sorting that is required to flash the correct keyboard response in lines 770 to 850 causes further delay. Processing speed for each keyboard response can be increased somewhat by changing line 650 to read:

```
650 IF CR<>N THEN 860
```

so that the character flashing routine on the screen-formatted keyboard is not executed. If this change is made in the program, line 640 should be changed to:

```
640 TIME=TIME+4
```

since processing time has been reduced. Unfortunately, however, you may still find yourself pushing the speed limits of the TI-99/4. Line 680 can be changed to:

```
680 PRINT" words/minute= ";CHARCNT/5
```

if a words per minute score is desired.

If you modify the program, see if the timing went off and make any necessary adjustments to line 640.

```
140 IF CHAR=0 THEN NEXT ROW:GOTO 120
150 IF CHAR=-1 THEN 200
160 POKE 1536+(CHAR*2),COL:POKE 1536
    +(CHAR*2)+1,ROW:REM POKE POSITIO
    N DATA
170 POSITION COL,ROW:? #6;CHR$(CHAR+
    128):REM PRINT CHAR TO SCREEN
180 NEXT COL
190 GOTO 120
199 REM **START CLOCK AND SELECT RAN
    DOM CHARACTER **
200 POSITION 2,10:? #6;"ANY KEY TO S
    TART":GET #1,CHAR:POSITION 2,10:
    ? #6;"{16 SPACES}":REM 16 SPACES
210 POKE 19,0:REM ZERO & START TIME
    COUNTER
220 N=INT((RND(0)*49)+42):REM CHOOSE
     A RANDOM CHARACTER
230 IF N=63 OR N=64 OR N=58 OR N=OLD
    CHAR THEN 220:REM IGNORE CERTAIN
     CHARACTERS
240 OLDCHAR=N
250 POSITION 9,3:? #6;CHR$(N):REM PR
    INT RANDOM NUMBER CHARACTER
260 IF PEEK(19)>=14 THEN 500:REM TIM
    E UP?
295 IF PEEK(764)=255 THEN 260
299 REM **PROCESS YOUR RESPONSE**
300 GET #1,CHAR
305 SOUND 0,10,10,8:CHARCNT=CHARCNT+
    1:REM ADD ONE TO TOTAL
310 SOUND 0,0,0,0:GOSUB 400
320 ? #6;CHR$(CHAR):REM FLASH CHARAC
    TER...
330 FOR X=1 TO 10:NEXT X
340 GOSUB 400
350 ? #6;CHR$(CHAR+128):REM ...AND R
    ETURN TO NORMAL
360 IF CHAR<>N THEN SOUND 0,150,12,8
    :FOR X=1 TO 10:NEXT X:SOUND 0,0,
    0,0:CHARCNT=CHARCNT-1:REM YOU ER
    RED
370 GOTO 220
399 REM ** POSITION CURSOR OVER TYPE
    D CHARACTER **
400 TRAP 360:POSITION PEEK(1536+(CHA
    R*2)),PEEK(1536+(CHAR*2)+1)
410 RETURN
499 REM ** CALCULATE AND PRINT SCORE
     **
500 POSITION 9,2:? #6;CHARCNT
510 POSITION 1,3:? #6;"CHARACTERS/MI
```


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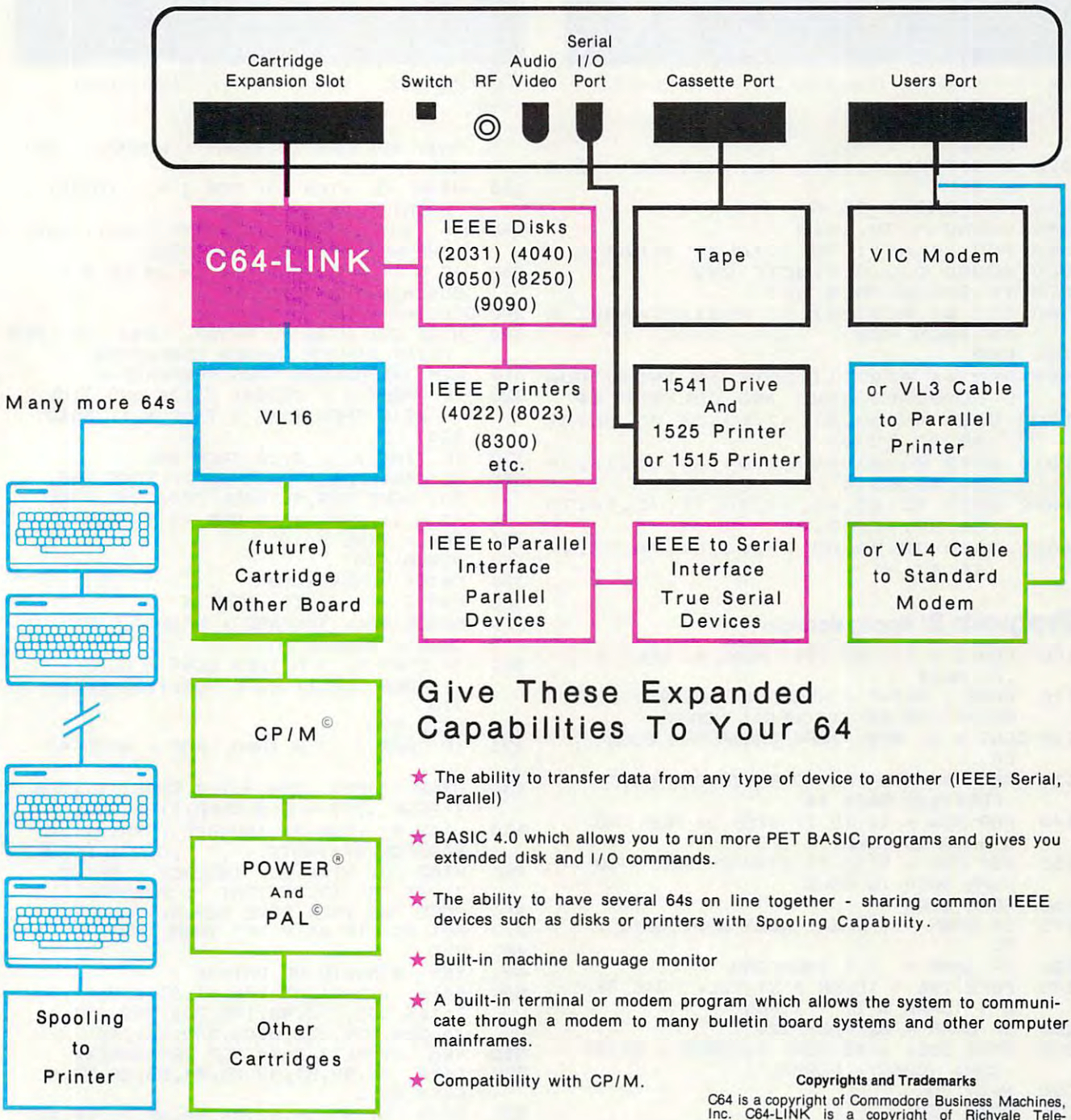

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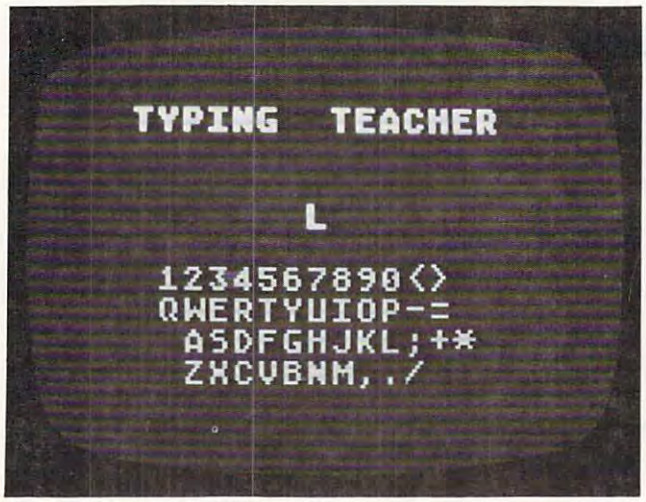

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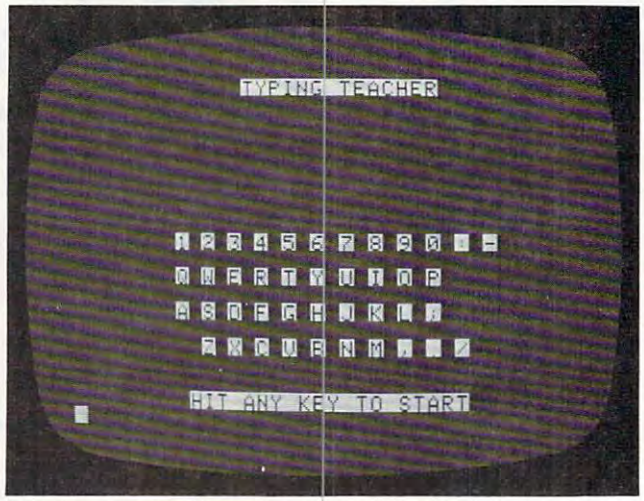

"Typing Teacher," Apple version. (TI-99/4A version similar.)

```
    NUTE"
520 POSITION 1,10:? #6;"HIT 'R' TO R
    ESTART"
530 FOR SND=1 TO 5
540 SOUND 0,30,10,8
550 FOR DELAY=1 TO 50:NEXT DELAY
560 SOUND 0,0,0,0:NEXT SND
570 IF SND<5 THEN 540
580 GET #1,RESTART:IF RESTART=ASC("R
    ") THEN RUN
700 END
999 REM ** ATASCII DATA IN INDIVIDUA
    L KEYBOARD ROWS AND COLUMNS **
1000 DATA 49,50,51,52,53,54,55,56,57
     ,48,60,62,0
1010 DATA 81,87,69,82,84,89,85,73,79
     ,80,45,61,0
1020 DATA 32,65,83,68,70,71,72,74,75
     ,76,59,43,42,0
1030 DATA 32,90,88,67,86,66,78,77,44
     ,46,47,-1
```

Program 2: Apple Version

```
100  FOR I = 770 TO 795: READ M: POKE I
     ,M: NEXT
110  HOME : PRINT : HTAB 14: INVERSE :
     PRINT "TYPING TEACHER": NORMAL
120 CCNT = 0: REM  ZERO CHARACTER COUNT
     ER
130  REM  ** ROUTINE TO ENTER CHARACTER
      POSITION DATA **
140  FOR ROW = 11 TO 17 STEP 2: REM  RO
     W DATA TO POKE
150  FOR COL = 9 TO 33 STEP 2: REM  CO
     LUMN DATA TO POKE
160  READ CHAR
170  IF CHAR = 0 THEN  NEXT ROW: GOTO 1
     50
180  IF CHAR =  - 1 THEN 250
190  POKE 796 + (CHAR * 2),COL: POKE 79
     6 + (CHAR * 2) + 1,ROW
200  IF CHAR = 32 THEN 220
210  HTAB COL: VTAB ROW: INVERSE : PRINT
      CHR$ (CHAR): NORMAL
220  NEXT COL
230  GOTO 150
240  REM  ** TIMER AND SELECT RANDOM CH
     ARACTER **
250  HTAB 10: VTAB 20: INVERSE : PRINT
     "HIT ANY KEY TO START": NORMAL : GET
     A$
260  HTAB 10: VTAB 20: FOR I = 1 TO 20:
      PRINT " ";: NEXT I
270 N =  INT (( RND (1) * 47) + 44): REM
      CHOOSE A RANDOM CHARACTER
280  IF N >  = 60 AND N <  = 64 OR N =
     OLDCHAR THEN 270
290 OLDCHAR = N
300  HTAB 20: VTAB 7: PRINT  CHR$ (N): REM
      PRINT RANDOM NUMBER CHARACTER
310  REM  **PROCESS YOUR RESPONSE**
320  IF  PEEK ( - 16384) < 128 AND TIME
      < 2710 THEN TIME = TIME + 1: GOTO
     320
330  IF TIME >  = 2710 THEN 440
340  GET A$:CHAR =  ASC (A$): POKE 768,
     30: POKE 769,1: CALL 770:CCNT = CC
     NT + 1: REM  *ADD ONE TO TOTAL*
350 TIME = TIME + 10
360  GOSUB 420
370  PRINT  CHR$ (CHAR)
380  FOR I = 1 TO 10: NEXT I
390  GOSUB 420: INVERSE : PRINT  CHR$ (
     CHAR): NORMAL
400  IF CHAR <  > N THEN CCNT = CCNT -
     1: POKE 768,1: POKE 769,175: CALL
     770
410  GOTO 270
420  IF CHAR <  > N THEN  POP : GOTO 40
     0
430  HTAB ( PEEK (796 + 2 * CHAR)): VTAB
     ( PEEK (797 + 2 * CHAR)): RETURN
440  HTAB 9: VTAB 7: INVERSE : PRINT "C
     HARACTERS/MINUTE =";" ";CCNT: NORMAL
450  HTAB 10: VTAB 20: INVERSE : PRINT
     " HIT 'R' TO RESTART ": NORMAL
460  POKE 768,250: POKE 769,2: CALL 770
470  GET A$: IF A$ = "R" THEN  RUN
480  END
490  REM  **MUSIC ML DATA**
500  DATA  172,01,03,174,01,03,169,04,3
     2,168,252,173,48,192,232,208,253,1
     36,208,239,206,0,03,208,231,96
510  REM  **ASCII DATA FOR KEYBOARD**
520  DATA  49,50,51,52,53,54,55,56,57,4
     8,58,45,0
530  DATA  81,87,69,82,84,89,85,73,79,8
     0,0
540  DATA  65,83,68,70,71,72,74,75,76,5
     9,0
```


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```
550  DATA  32,90,88,67,86,66,78,77,44,4
     6,47,-1
```

Program 3: VIC Version

```
100 PRINT"{CLEAR}{Ø3 DOWN}{Ø4 RIGHT}{REV}T
    YPING{OFF} {REV}TEACHER{OFF}{Ø6 DOWN}"

110 CCNT=Ø:POKE 36878,10:X=RND(-TI):REM ZE
    RO CHAR COUNTER AND SET VOLUME
120 S2=36875:S4=36877:REM SPEAKER NUMBERS
130 REM *ROUTINE TO ENTER CHARACTER POSITI
    ON DATA*
140 FOR ROW=1 TO 4:REM ROW DATA TO POKE
150 PRINT"{Ø5 RIGHT}";
160 FOR COL=1 TO 12:REM COLUMN DATA TO POK
    E
170 READ CHAR
180 IF CHAR=Ø THEN NEXT ROW:GOTO 160
190 IF CHAR=-1 THEN 260
200 POKE 828+CHAR*2,COL:POKE 829+CHAR*2,RO
    W:REM POKE DATA POSITION
210 IF CHAR=32 THEN PRINT" ";:GOTO 230
220 PRINT"{REV}";CHR$(CHAR);
230 NEXT COL
240 PRINT"{DOWN}"
250 GOTO 160
260 PRINT"{OFF} "
270 REM **ZERO TIMER AND SELECT RANDOM CHA
    R**
280 PRINT"{Ø3 DOWN}{RIGHT}{REV}HIT ANY KEY
     TO START{OFF}"
290 GET A$:IF A$="" THEN 290
300 PRINT"{UP}";:FOR I=1 TO 21:PRINT" ";:N
    EXT I
310 TI$="ØØØØØØ"
320 N=INT((RND(1)*49)+42):REM CHOOSE A RAN
    DOM CHARACTER
330 IF N=6Ø OR N=62 OR N=63 OR N=OLDCHAR T
    HEN 320
340 OLDCHAR=N
350 PRINT"{HOME}{Ø6 DOWN}";SPC(1Ø);CHR$(N)
360 IF TI>36ØØ THEN 580:REM TIME UP?
370 REM **PROCESS YOUR RESPONSE**
380 GET A$:IF A$="" THEN 360
390 REM*PLEASANT SOUND*
400 CHAR=ASC(A$):POKE S2,225:FOR I=1 TO 5:
    NEXT I:POKE S2,Ø
410 CCNT=CCNT+1
420 IF CHAR<>N THEN 490
430 GOSUB 52Ø
440 PRINT CHR$(CHAR)
450 FOR I=1 TO 1Ø:NEXT I
460 GOSUB 52Ø:PRINT"{REV}";CHR$(CHAR);"{OF
    ØFF}"
470 GOTO 32Ø
480 REM *YOU ERRED*
490 CCNT=CCNT-1:POKE S4,13Ø:FOR I=1 TO 1Ø ~
    :NEXT I:POKE S4,Ø
500 GOTO 32Ø
510 REM*POSITION CURSOR OVER TYPED CHAR*
520 PRINT"{HOME}{Ø9 DOWN}";
530 FOR I=2 TO PEEK(829+CHAR*2)*2:PRINT:NE
    XT I
540 PRINT"{Ø4 RIGHT}";
550 FOR J=1 TO PEEK(828+CHAR*2):PRINT"{
    RIGHT}";:NEXT J
560 RETURN
570 REM**CALC AND PRINT SCORES**
580 PRINT"{HOME}{Ø6 DOWN}{Ø4 RIGHT}{REV}CH
    AR/MINUTE{OFF}";"=";CCNT
590 PRINT"{HOME}":FOR I=1 TO 18:PRINT:NEXT
     I:PRINT"{RIGHT}{REV} HIT 'R' TO ~
    RESTART {OFF}"
600 REM *SCORE SOUND*
610 FOR I=244 TO 252 STEP 2:POKE S2,I:FOR ~
    J=1 TO 50:NEXT J:NEXT I:POKE S2,Ø
620 GET A$:IF A$="" THEN 620
630 IF A$="R" THEN RUN
640 END
650 REM*ASCII DATA FOR KEYBOARD*
660 DATA 49,50,51,52,53,54,55,56,57,48,43,
    45,Ø
670 DATA 81,87,69,82,84,89,85,73,79,80,64,
    42,Ø
680 DATA 65,83,68,70,71,72,74,75,76,58,59,
    61,Ø
690 DATA 32,90,88,67,86,66,78,77,44,46,47,
    -1
```

"Typing Teacher," VIC-20 version.

Program 4: TI Version

```
100 DIM CHAR(23,30)
110 RANDOMIZE
120 D=20
130 F1=300
140 F2=4000
150 V1=10
160 V2=2
170 CALL CLEAR
180 FOR J=9 TO 12
190 CALL COLOR(J,2,14)
200 NEXT J
210 FOR J=2 TO 8
220 CALL COLOR(J,2,15)
230 NEXT J
240 IF R=82 THEN 270
250 RESTORE
260 CALL CLEAR
270 PRINT "{6 SPACES}typing teacher"
280 FOR I=1 TO 18
290 PRINT
300 NEXT I
310 REM  ZERO CHARACTER COUNTER AND
    TIME
320 CHARCNT=0
330 TIME=0
340 REM  ROUTINE TO ENTER CHARACTER
    POSITION DATA
350 FOR ROW=11 TO 23 STEP 3
```


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```
360 FOR COL=6 TO 30 STEP 2
370 READ CHAR(ROW,COL)
380 IF CHAR(ROW,COL)=0 THEN 450
390 IF CHAR(ROW,COL)=-1 THEN 460
400 IF CHAR(ROW,COL)=32 THEN 430
410 CALL HCHAR(ROW,COL,CHAR(ROW,COL)
    )
420 GOTO 440
430 PRINT " ";
440 NEXT COL
450 NEXT ROW
460 PRINT
470 PRINT "  PRESS any key TO START"
    ;
480 CALL KEY(3,S,STATUS)
490 IF STATUS=0 THEN 480
500 CALL HCHAR(24,5,32,22)
510 REM  *CHOOSE A RANDOM NUMBER*
520 N=INT((RND*47)+44)
530 IF (N>=60)*(N<=64)+(N=45)+(N=58)
    +(N=OLDCHAR)THEN 520
540 OLDCHAR=N
550 CALL VCHAR(7,16,N)
560 REM  **PROCESS YOUR RESPONSE**
570 TIME=TIME+1
580 IF TIME>900 THEN 670
590 CALL KEY(0,CR,STATUS)
600 IF STATUS=0 THEN 570
610 CALL SOUND(D,F1,V1)
620 CHARCNT=CHARCNT+1
630 REM  ADD ONE TO TOTAL
640 TIME=TIME+12
650 GOTO 760
670 PRINT TAB(4);
680 PRINT "characters/minute= ";CHAR
    CNT
690 PRINT
700 PRINT "{5 SPACES}HIT r TO RESTAR
    T";
710 CALL KEY(3,R,STATUS)
720 IF STATUS=0 THEN 710
730 IF R=ASC("R")THEN 250
750 END
760 IF CR<>N THEN 860
770 FOR ROW=11 TO 23 STEP 3
780 FOR COL=6 TO 30 STEP 2
790 IF CHAR(ROW,COL)=N THEN 820
800 NEXT COL
810 NEXT ROW
820 CALL HCHAR(ROW-1,COL,N)
830 CALL HCHAR(ROW-1,COL,32)
840 CALL HCHAR(ROW-1,COL,N)
850 GOTO 520
860 CHARCNT=CHARCNT-1
870 CALL SOUND(D,F2,V2)
880 GOTO 520
890 REM  *ASCII DATA FOR KEYBOARD*
900 DATA 49,50,51,52,53,54,55,56,57,
    48,61,0
910 DATA 81,87,69,82,84,89,85,73,79,
    80,47,0
920 DATA 65,83,68,70,71,72,74,75,76,
    59,0
930 DATA 32,90,88,67,86,66,78,77,44,
    46,-1
```

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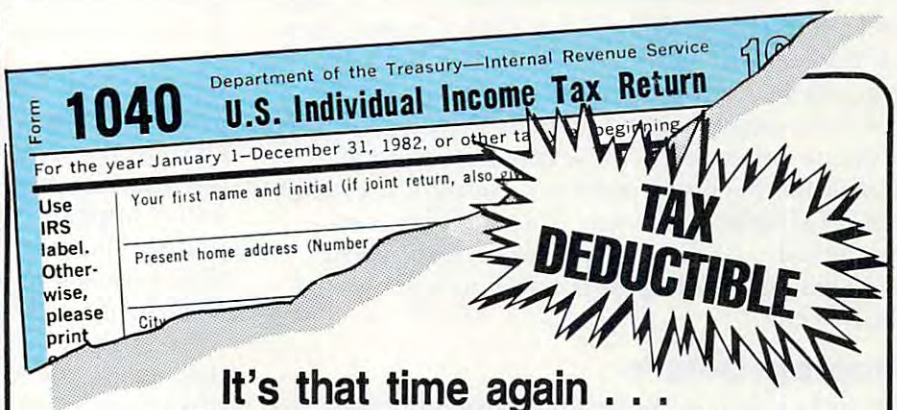

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Chutes For Atari

Matt Giwer

Did you ever wonder how to write a game in 3-D? This fast-paced game illustrates how to use Atari's "size registers" to create realistic three-dimensional graphics.

You are in a hyperdimensional universe. You are piloting an inter-dimensional exploration ship. In this universe there are only three tracks that you can follow with your ship; the rest are too narrow. There is only the flat surface you fly on; there is no up and no down. You can only go forward, and left and right. You must pass through this universe, but others would stop you – they are the Risen Ones of this universe, the RAM-ships.

They roar down the Chutes off in the distance and come at you. Once down their Chutes, they cannot leave the surface either. Fortunately for you, they come only in groups of three, and if you can dodge them you will live. However, there is one problem: each wave comes at you faster and faster. As if that were not enough, the faster the RAM-ship, the longer is its invisible, anti-matter exhaust. If you dodge too close astern, your exhausts will collide, and you will both be destroyed.

Program Details

At the beginning, the program execution at line 10 immediately falls through to line 30, which is a series of GOSUBs. The first subroutine at line 30000 sets up the graphics mode, turns off the cursor, and sets MVB, MVC, and MVD, which are the initial movements of the RAM-ships, to two P/M graphics increments. The second subroutine at 30200 sets up the P/M graphics and the machine language subroutine for the movement of the players.

Registers of interest to be used later are in line 30210. These control the sizes, the horizontal width of each of the four players used in this game. Later, these sizes will be changed to give the illusion that the players become larger as they come closer.

The machine language routine POKEd into page six (published in **COMPUTE!**, February 1982) is an excellent routine to use for producing vertical motion in the players. (Note that when a game restarts, GAM>0, this routine is skipped by line 30237.) Finally, we read in the shapes of the players.

The subroutine at line 30400 draws the background graphics for the playing field. This routine is called later in the game when there has been an explosion and the background has been disturbed.

The execution of the game is contained in two sets of lines which are nearly identical. These are the routines in lines 4000-5100. However, the opening of the game is found at line 4002, which directs execution to the lines above 6000. (At this point, it may be best to enter the program in order to follow the rest of the discussion.)

Movement And Graphics

The lines between 6000-6200 produce a random start for the attackers. From the top of the screen, the attackers begin moving down the Chutes which appear to be in the distance. They remain points on the screen until they level off and begin their head-on attack run at you. The IF control statements in this routine are set to 20, 20 being the "leveling off" location down from the top of the screen, the X position. When the Graphics 7 pixels have a location value greater than 20, the P/M Graphic is substituted for the pixel. (To help you follow this listing, the variables B, C, D, and MVB, MVC, MVD, and so forth refer to Players 2, 3, and 4, respectively. "A" is used later to control you, Player 1.)

The horizontal position POKEs, registers 53249 and 53251 in lines 6074 and 6094, provide the cross mapping required to keep the P/M locations of 0 to 255 and the Graphics 7 locations of 0 to 179 related.

No correction is needed in line 6084, as this path is down the center and corresponds directly to GR.7 X position of 159. The others need correcting because they move diagonally down the screen. These rather complicated values POKEd into the registers keep the attacking players moving down the centers of their respective

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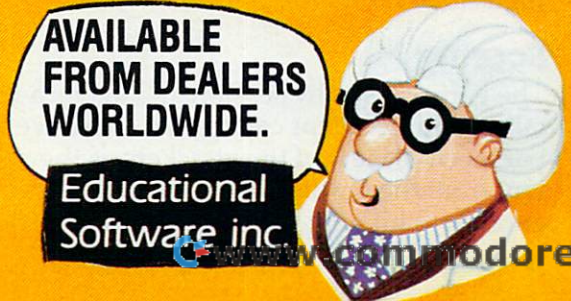

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Chutes.

When all three players are greater than the Y position of 20, tested by line 6100, program execution reverts to the routine at the 4000 lines. Since the limits of the random selection of the start position at the beginning of the 6000 lines does not permit a collision before they have all cleared the 20 position, there is no need for additional tests.

Line 4003 converts the variable of the 6000 routine to the 4000 and 6000 line routines. Line 4010 starts a routine that is closed by line 4900. This group of lines will continue to execute until a collision occurs as tested by line 4028. Which collision has occurred is determined by lines 5002, 5003, and 5004 after the GOSUB has been executed. Here the variable A is introduced – this is Player 1, *you*, at the bottom of the playing field above the alphanumeric window.

Lines 4021, 4023, and 4025 keep the attackers moving on diagonals down the screen. Lines 4030 to 4040 control the size registers as the players move down the screen; the further down the screen, the larger they become. This, along with the radiating lines, provides the illusion of perspective.

Speed And Motion

When a collision occurs (you have lost the round), the player you have collided with stops moving, but the rest continue to move. This is accomplished by the use of nearly identical routines in the lines between 5000-6000. This second routine is required because the instructions in the subroutine at 4000 have slowed the motion enough so that the differences in the subroutine at 5000 (if incorporated as additional conditions in the 4000 subroutine) would make the game too slow and/or too jerky.

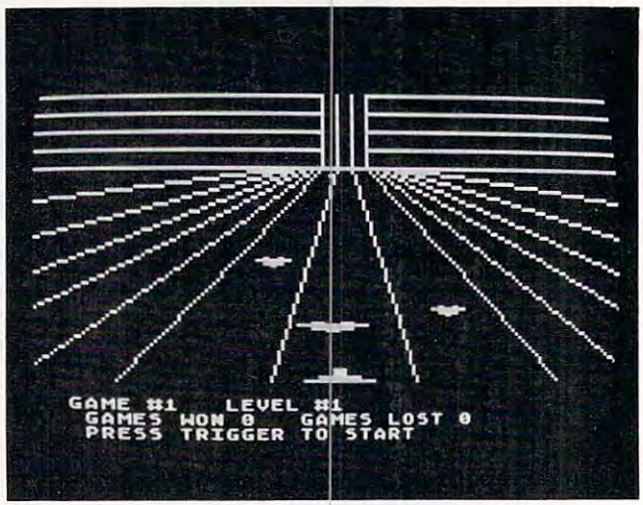
The explosion resulting from the collision is generated randomly by line 5020. If the round has fallen through to this routine, the variable JUMP is set; and, among other things, the background lines will be redrawn since the explosion graphics lines are difficult both to store as variables and to generate quickly. Lines 5045-5047 shut off the sound of the attackers as they leave the screen.

What else must the game do? The subroutine at 8000 keeps rolling up the current score into the bottom alphanumeric window. The subroutine at 9000 keeps track of your current score and the high score for the session.

Scoring

The game scores by session and keeps a running tally of the score for each game. We have a rolling perspective view of the attackers as they come at you from the far distance until they pass close enough to hit you; those that miss keep on going. We have the rules of translation from GR.7 graphics to P/M graphics locations on the screen. We have several setup routines, one of which is called later when it is necessary to redraw the screen.

This game demonstrates the uses of the P/M size registers and shows how to use them to give a three-dimensional effect to the screen. These registers are little utilized in most Atari games and deserve further exploitation. As a matter of interest, when the players become larger as a result of the POKEs, they become larger from the left-hand edge. That is, if it is in the middle of the screen, the player will not stretch out to the left and the right. Rather it will extend further to the right, but the left edge will not move. Keeping this in mind will keep your players from jerking to the right each time that you change the size. (This technique is well demonstrated in *Star Raiders* where the machine language code makes the motion and the size transitions much smoother.)



Oncoming alien saucers rush toward you in "Chutes."

```
6 RESTORE
10 GOSUB 30
12 GOTO 10
30 GOSUB 30000:GOSUB 30200:GOSUB 304
   00
31 LEV=1:GAM=1:WIN=0:SCR=0
32 ? :? :? "GAME #";GAM;"{3 SPACES}L
   EVEL #";LEV
33 ? " GAMES WON ";WIN;"{3 SPACES}GA
   MES LOST ";GAM-WIN-1
34 ? " PRESS TRIGGER TO START";
35 IF STRIG(0)=1 THEN 35
40 GOSUB 8000
50 NW=0
90 RETURN
4000 REM MOVEMENT
4002 POKE 53256,3:POKE PLY,184:POKE
     PLX,109:GOSUB 6000
4003 B=BB:C=CD:D=DD:POKE 53278,255
4010 IF STICK(0)=11 AND A<>69 THEN A
     =A-40
4012 IF STICK(0)=7 AND A<>149 THEN A
     =A+40
```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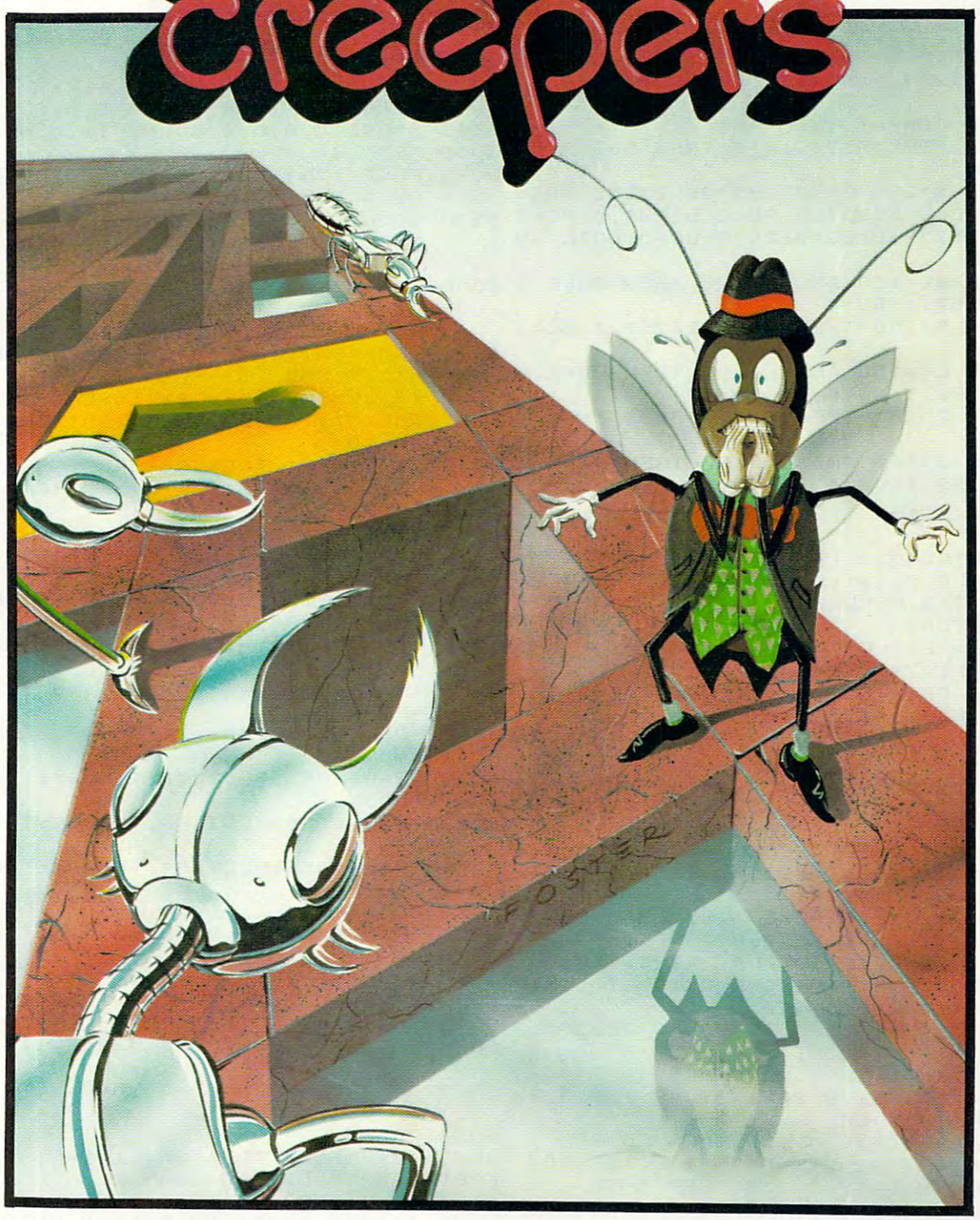

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```
4014 POKE 53248,A
4020 B=B+MVB:IF B>255 THEN 4022
4021 POKE 1781,B:POKE 53249,119-0.29
     *(B-71)-BC
4022 C=C+MVC:IF C>255 THEN 4024
4023 POKE 1782,C:POKE 53250,123-CC
4024 D=D+MVD:IF D>255 THEN 4026
4025 POKE 1783,D:POKE 53251,129+0.29
     *(D-71)-DC
4026 IF B>255 OR C>255 OR D>255 THEN
      POKE 53257,0:POKE 53258,0:POKE
      53259,0:BC=0:CC=0:DC=0:GOTO 49
     85
4027 IF JUMP=1 THEN 4030
4028 IF PEEK(53260)<>0 THEN GOSUB 50
     00
4029 IF B>255 OR C>255 OR D>255 THEN
      POKE 53257,0:POKE 53258,0:POKE
      53259,0:BC=0:CC=0:DC=0:GOTO 49
     85
4030 IF B<=150 AND B>100 THEN POKE 5
     3257,1:BC=4
4032 IF B>150 THEN POKE 53257,3:BC=1
     6
4034 IF C<=150 AND C>100 THEN POKE 5
     3258,1:CC=4
4036 IF C>150 THEN POKE 53258,3:CC=1
     6
4038 IF D>100 AND D<=150 THEN POKE 5
     3259,1:DC=4
4040 IF D>150 THEN POKE 53259,3:DC=1
     6
4900 GOTO 4010
4985 POKE PLX+1,0:POKE PLX+2,0:POKE
     PLX+3,0:POKE PLX,0
4990 RETURN
5000 REM EXPLOSION
5001 EXPY=79
5002 IF PEEK(53260)=2 THEN MVB=0:TS=
     1:EXPX=41
5003 IF PEEK(53260)=4 THEN MVC=0:TS=
     2:EXPX=79
5004 IF PEEK(53260)=8 THEN MVD=0:TS=
     3:EXPX=119
5006 JUMP=1
5007 FOR I=1 TO 2:POKE 710,15:POKE 7
     12,15:SOUND 0,250,0,15:SOUND TS
     ,200,0,15:Q=1^1
5008 POKE 710,0:POKE 712,0:SOUND 0,0
     ,0,0:SOUND TS,0,0,0:NEXT I
5020 FOR I=0 TO 10:PLOT EXPX,EXPY:DR
     AWTO EXPX+INT(RND(0)*20-10),EXP
     Y-INT(RND(0)*20)
5022 SOUND 0,250,0,15:SOUND TS,200,0
     ,15
5030 B=B+MVB:IF B>255 THEN 5032
5031 POKE 1781,B:POKE 53249,119-0.29
     *(B-71)-BC
5032 C=C+MVC:IF C>255 THEN 5034
5033 POKE 1782,C:POKE 53250,123-CC
5034 D=D+MVD:IF D>255 THEN 5036
5035 POKE 1783,D:POKE 53251,129+0.29
     *(D-71)-DC
5036 IF B>255 OR C>255 OR D>255 THEN
      POKE 53257,0:POKE 53258,0:POKE
      53259,0:BC=0:CC=0:DC=0:GOTO 50
     95
5037 IF B>255 OR C>255 OR C>255 THEN
      5095
5038 IF B<=150 AND B>100 THEN POKE 5
     3257,1:BC=4
5039 IF B>150 THEN POKE 53257,3:BC=1
     6
5040 IF C<=150 AND C>100 THEN POKE 5
     3258,1:CC=4
5041 IF C>150 THEN POKE 53258,3:CC=1
     6
5042 IF D>100 AND D<=150 THEN POKE 5
     3259,1:DC=4
5043 IF D>150 THEN POKE 53259,3:DC=1
     6
5045 IF B>230 THEN SOUND 1,0,0,0
5046 IF C>230 THEN SOUND 2,0,0,0
5047 IF D>230 THEN SOUND 3,0,0,0
5048 SOUND 0,0,0,0:SOUND TS,0,0,0
5050 NEXT I
5095 POKE 1781,0:POKE 1782,0:POKE 17
     83,0
5100 SOUND 0,0,0,0:SOUND 1,0,0,0:SOU
     ND 2,0,0,0:SOUND 3,0,0,0:RETURN

6000 REM ATTACK PATTERN
6005 BB=71:CD=71:DD=71:TEMPBY=-1:TEM
     PCY=-1:TEMPDY=-1:POKE 53278,255
6010 TEMP=INT(RND(0)*3):JUMP=0:POKE
     53278,255
6020 IF TEMP=0 THEN B=-59:C=-59+INT(
     RND(0)*20+20):D=-59+INT(RND(0)*
     40+10)
6030 IF TEMP=1 THEN C=-59:B=-59+INT(
     RND(0)*30+16):D=-59+INT(RND(0)*
     20+26)
6040 IF TEMP=2 THEN D=-59:B=-59+INT(
     RND(0)*20+20):C=-59+INT(RND(0)*
     30+10)
6044 POKE 53256,3:POKE PLY,184:POKE
     PLX,109:A=109
6045 IF STICK(0)=11 AND A<>69 THEN A
     =A-40
6046 IF STICK(0)=7 AND A<>149 THEN A
     =A+40
6047 POKE 53248,A
6049 COLOR 3
6050 TRAP 6052:PLOT 76,TEMPBY:TRAP 4
     0000
6052 TRAP 6054:PLOT 80,TEMPCY:TRAP 4
     0000
6054 TRAP 6056:PLOT 84,TEMPDY:TRAP 4
     0000
6056 COLOR 1
6069 IF B>20 THEN BB=BB+MVB:GOTO 607
     4
6070 B=B+MVB
6072 TRAP 6073:PLOT 76,B:TRAP 40000
6073 TEMPBY=B:GOTO 6079
6074 POKE 1781,BB:POKE 53249,119-0.2
     9*(BB-71)
6079 IF C>20 THEN CD=CD+MVC:GOTO 608
     4
6080 C=C+MVC
6082 TRAP 6083:PLOT 80,C:TRAP 40000
6083 TEMPCY=C:GOTO 6089
6084 POKE 1782,CD:POKE 53250,123
6089 IF D>20 THEN DD=DD+MVD:GOTO 609
     4
6090 D=D+MVD
6092 TRAP 6093:PLOT 84,D:TRAP 40000
6093 TEMPDY=D:GOTO 6100
6094 POKE 1783,DD:POKE 53251,129+0.2
     9*(DD-71)
6100 IF B>20 AND C>20 AND D>20 THEN
     6200
```


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```
6130 GOTO 6045
6200 RETURN
8000 REM
8010 MVB=LEV*2+1:MVC=LEV*2+1:MVD=LEV
     *2+1:POKE 53278,255
8040 GOSUB 4000:GAM=GAM+1:LEV=INT(GA
     M/5)+1:SETCOLOR 1,LEV+1,8
8050 IF LEV=7 THEN 9000
8055 IF NW=1 THEN 8200
8060 IF JUMP=0 THEN WIN=WIN+1:SCR=SC
     R+LEV*2:GOTO 8082
8069 GOSUB 30000:GOSUB 30200:GOSUB 3
     0400
8082 ? :? :? "GAME #";GAM;"
     {3 SPACES}LEVEL #";LEV
8083 ? " GAMES WON ";WIN;"
     {3 SPACES}GAMES LOST ";GAM-WIN-
     1
8084 ? "{5 SPACES}SCORE :";SCR
8085 ? " PRESS TRIGGER TO START
     {BELL}";
8086 IF STRIG(0)=1 THEN 8086
8090 GOTO 8010
8100 GOSUB 4000
8200 RETURN
8990 RETURN
9000 REM NEW GAME
9012 POKE PLX,0:POKE PLX+1,0:POKE PL
     X+2,0:POKE PLX+3,0
9014 SOUND 0,0,0,0:SOUND 1,0,0,0:SOU
     ND 2,0,0,0:SOUND 3,0,0,0
9016 IF SCR>HSCR THEN HSCR=SCR
9020 GRAPHICS 18
9030 ? #6;"  CONGRATULATIONS"
9035 ? #6
9040 ? #6;"{3 SPACES}YOUR SCORE IS":
     REM inverse video
9045 ? #6
9050 ? #6;"{8 SPACES}";SCR
9055 ? #6
9056 ? #6;"{3 SPACES}HIGH SCORE IS":
     REM inverse video
9057 ? #6
9058 ? #6;"{8 SPACES}";HSCR
9059 ? #6
9060 ? #6;" press trigger for":REM i
     nverse video
9070 ? #6;"{3 SPACES}another round":
     REM inverse video
9075 Q=1^1^1^1^1^1^1^1
9080 IF STRIG(0)=1 THEN 9080
9082 NW=1
9090 RETURN
13000 FOR I=MYPMBASE+1024 TO MYPMBAS
      E+2048:POKE I,0:NEXT I
13001 STOP
29990 STOP
30000 REM SETUP
30005 POKE 53278,255
30015 GRAPHICS 7:POKE 752,1
30020 MVB=2:MVC=2:MVD=2
30190 RETURN
30200 REM PM SETUP
30204 POKE 53277,3:REM GRACTL PLAY&M
      ISS
30206 POKE 559,62:REM DMACTL,1LINE,P
      LAY,MIS,NORM FIELD
30208 POKE 54279,(PEEK(106)-32):REM
      32PAGE RESERVE
30210 POKE 53256,0:POKE 53257,0:POKE
       53258,0:POKE 53259,0:REM PLAY
      SIZES
30212 POKE 623,8:REM PRIORITY PF OVE
      R PL
30214 MYPMBASE=256*(PEEK(106)-32):RE
      M NEW PM BASE
30215 IF ZZZ=0 THEN ? "Please Wait..
      .";:FOR I=1024 TO 2047:POKE MY
      PMBASE+I,0:NEXT I:ZZZ=1
30230 POKE 704,150:POKE 705,199:POKE
       706,246:POKE 707,119:POKE 178
      8,(PEEK(106)-28):REM START OF
      PM DATA
30232 SETCOLOR 1,LEV+1,10:POKE 710,0
      :POKE 711,29:POKE 712,0
30236 REM VBLANK INTERUPT ROUTINE
30237 IF GAM>0 THEN 30390
30238 FOR I=1536 TO 1706:READ A:POKE
       I,A:NEXT I
30240 FOR I=1774 TO 1787:POKE I,0:NE
      XT I
30242 DATA 162,3,189,244,6,240,89,56
      ,221,240,6,240,83,141,254,6,10
      6,141
30244 DATA 255,6,142,253,6,24,169,0,
      109,253,6,24,109,252,6,133,204
      ,133
30246 DATA 206,189,240,6,133,203,173
      ,254,6,133,205,189,248,6,170,2
      32,46,255
30248 DATA 6,144,16,168,177,203,145,
      205,169,0,145,203,136,202,208,
      244,76,87
30250 DATA 6,160,0,177,203,145,205,1
      69,0,145,203,200,202,208,244,1
      74,253,6
30252 DATA 173,254,6,157,240,6,189,2
      36,6,240,48,133,203,24,138,141
      ,253,6
30254 DATA 109,235,6,133,204,24,173,
      253,6,109,252,6,133,206,189,24
      0,6,133
30256 DATA 205,189,248,6,170,160,0,1
      77,203,145,205,200,202,208,248
      ,174,253,6
30258 DATA 169,0,157,236,6,202,48,3,
      76,2,6,76,98,228,0,0,104,169
30260 DATA 7,162,6,160,0,32,92,228,9
      6
30262 S=USR(1696)
30276 PLX=53248:PLY=1780:PLL=1784
30278 POKE PLL,8:POKE PLL+1,6:POKE P
      LL+2,6:POKE PLL+3,6
30280 POKE MYPMBASE+1280,1:POKE MYPM
      BASE+1536,1:POKE MYPMBASE+1792
      ,1
30282 FOR I=MYPMBASE+1024 TO MYPMBAS
      E+1031:READ A:POKE I,A:NEXT I
30283 DATA 8,8,8,8,28,28,62,62
30284 FOR I=MYPMBASE+1280 TO MYPMBAS
      E+1285:READ A:POKE I,A:POKE I+
      256,A:POKE I+512,A:NEXT I
30285 DATA 20,62,62,28,28,8
30286 POKE PLY+1,58:POKE PLY+2,78:PO
      KE PLY+3,98
30390 RETURN
30400 REM DRAW CHUTES
30401 COLOR 1
30407 PLOT 78,20:DRAWTO 78,0:PLOT 82
      ,20:DRAWTO 82,0:PLOT 74,20:DRA
      WTO 74,0:PLOT 86,20:DRAWTO 86,
      0
```


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30408 FOR I=0 TO 15 STEP 5:PLOT 0,I:
      DRAWTO 74,I:NEXT I:FOR I=0 TO
      15 STEP 5:PLOT 86,I:DRAWTO 159
      ,I:NEXT I
30409 PLOT 0,20:DRAWTO 159,20
30410 PLOT 78,20:DRAWTO 60,79:PLOT 8
      2,20:DRAWTO 100,79
30420 PLOT 74,20:DRAWTO 20,79:PLOT 8
      6,20:DRAWTO 140,79
30422 PLOT 70,20:DRAWTO 0,59:PLOT 90
      ,20:DRAWTO 159,59
30424 PLOT 66,20:DRAWTO 0,39:PLOT 94
      ,20:DRAWTO 159,39
30426 PLOT 72,20:DRAWTO 0,75:PLOT 88
      ,20:DRAWTO 159,75
30428 PLOT 68,20:DRAWTO 0,49:PLOT 92
      ,20:DRAWTO 159,49
30430 PLOT 64,20:DRAWTO 0,29:PLOT 96
      ,20:DRAWTO 159,29
30590 RETURN                          ©
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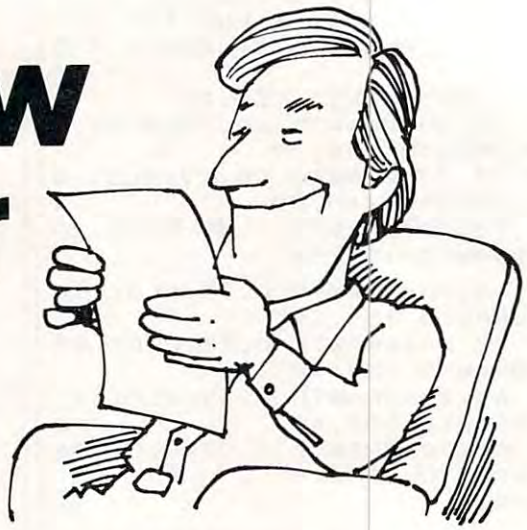

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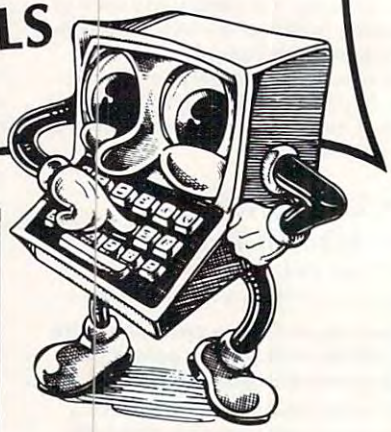

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Table 1: Monthly Cash Report And Forecast

	A B C	D	E	F	G	H	I	J	K	L	M	N	O	P
1	JUNE REPORT						** MONTH **							
2	*1983 EXPENSES*	JAN	FEB	MAR	APR	MAY	JUN	(JUL)	(AUG)	(SEP)	(OCT)	(NOV)	(DEC)	TOTAL
3	==========													
4	MONTHLY													
5	-------													
6	RENT	600	600	600	600	600	600	600	600	600	600	660	660	7320
7	ELECTRICITY	85	97	72	75	81	93	110	125	130	100	90	80	1138
8	GAS	103	110	98	104	82	75	60	60	60	65	70	90	977
9	TELEPHONE	85	50	56	64	60	56	65	65	65	65	65	65	761
10	CABLE TV	10	10	10	10	10	10	10	10	10	10	10	10	120
11	WATER & SEWER	28	26	32	25	23	28	35	37	35	30	30	30	359
12	TRASH PICK-UP	12	10	10	10	12	10	10	10	10	14	10	10	128
13	GASOLINE	115	98	90	112	118	94	120	120	120	100	100	100	1287
14	CAR PAYMENT	162	162	162	162	162	162	162	162	162	162	162	162	1944
15	LIFE INSURANCE	104	104	104	104	104	104	104	104	104	104	104	104	1248
16														
17	FOOD	389	445	392	375	423	490	400	400	400	400	400	400	4914
18	MASTERCARD	100	368	294	222	162	183	250	250	250	250	250	250	2829
19	SEARS	126	85	43	71	106	53	50	50	50	50	50	50	784
20	HAIR CARE	75	35	48	25	32	43	40	40	40	40	40	40	498
21	MISCELLANEOUS	32	89	59	110	54	12	100	100	100	100	100	100	956
22														
23	NON-MONTHLY													
24	----------													
25	AUTO INS (1)					150						150		300
26	AUTO INS (2)					150						150		300
27	AUTO REG (1)			45										45
28	AUTO REG (2)									45				45
29	PROPERTY INS.		416											416
30	NEWSPAPER	15			15			15			15			60
31	MEDICAL		236	78										314
32	AUTO REPAIR				152		83							235
33														
34	TAXES													
35	-----													
36	FEDERAL (1040)				2140									2140
37	FEDERAL (EST.)	350			350		350			350				1400
38	STATE													0
39		==========												
40	TOTAL EXP.:	2391	2941	2193	4726	2329	2446	2131	2133	2531	2105	2441	2151	30518
41														
42														
43	INCOME STATEMENT													
44	----------													
45	SALARY 1	1745	1745	1745	1745	1760	1862	1862	1862	1862	1862	1862	1862	21774
46	SALARY 2	1460	1460	1460	1460	1460	1460	1575	1575	1575	1575	1575	1575	18210
47	INVESTMENT			200			200			300			400	1100
48	MISCELLANEOUS													0
49		----------												
50	TOTAL INCOME :	3205	3205	3405	3205	3220	3522	3437	3437	3737	3437	3437	3837	41084
51	TOTAL EXPENSE:	2391	2941	2193	4726	2329	2446	2131	2133	2531	2105	2441	2151	30518
52		==========												
53	NET CASH FLOW:	814	264	1212	-1521	891	1076	1306	1304	1206	1332	996	1686	10566
54	CUMULATIVE CF:	814	1078	2290	769	1660	2736	4042	5346	6552	7884	8880	10566	10566
55														
56	NET CASH ASSETS	10814	11078	12290	10769	11660	12736	14042	15346	16552	17884	18880	20566	20566
57	CAR FWD: 10000													
58														
59														
60														

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3. Compose and enter a set of line titles to suit your Monthly expense items. If you are buying your home, use Mortgage for a line title instead of Rent. If you have an all-electric home, eliminate the Gas line. Remember to keep the Monthly expense lines in a separate group.

4. Enter a group of Non-monthly expense line titles to suit your known requirements. The Taxes lines are identified separately, but typically are Non-monthly expense items.

5. Enter the Income Statement line titles to provide appropriate Salary and other income lines.

6. Enter the VisiCalc formulas needed to calculate the bottom line and cross-foot totals; the VisiCalc summation function and replication command can be used to good advantage. Table 2 displays the formulas used with the model cash report of Table 1.

When you have your VisiCalc cash report template completed, before proceeding save it on your data file diskette under an appropriate file name as a master file.

Forecasting The Full Year

Round off data entries to the nearest dollar; all data entered and calculated will be printed only to the nearest dollar. You will find this a convenience that causes no significant loss in accuracy, and it's one of the reasons the system will print a report on a single sheet within the limits of your 132 character per line (in compressed print mode) printer. To build the full year Cash Forecast, use the following steps:

1. In your cash report template, enter your best estimate in each line of the Monthly expense group for January expense only.

Table 2:
Cash Report Template VisiCalc Formulas

Item	Location	VisiCalc Formula
Total Expense	D40	@SUM(D6...D38)
	through	through
	O40	@SUM(O6...O38)
Total Income	D50	@SUM(D45...D48)
	through	through
	O50	@SUM(O45...O48)
Total Expense (Repeated)	D51	+D40
	through	through
	O51	+O40
Net Cash Flow	D53	+D50-D51
	through	through
	O53	+O50-O51
Cumulative Cash Flow	D54	+D53
	E54	+D54+E53
	through	through
	O54	+N54+O53
Net Cash Assets	D56	+C57+D53
	E56	+D56+E53
	through	through
	O56	+N56+O53
Column P Totals	P6	@SUM(D6...O6)
	through	through
	P15	@SUM(D15...O15)
	P17	@SUM(D17...O17)
	through	through
	P21	@SUM(D21...O21)
	P25	@SUM(D25...O25)
	through	through
	P32	@SUM(D32...O32)
	P36	@SUM(D36...O36)
	through	through
	P38	@SUM(D38...O38)
	P40	@SUM(D40...O40)
	P45	@SUM(D45...O45)
	through	through
	P48	@SUM(D48...O48)
	P50	@SUM(D50...O50)
	P51	@SUM(D51...O51)
	P53	@SUM(D53...O53)
	P54	+O54
	P56	+O56

2. Use the VisiCalc "Replicate" command (/R...) to replicate the January Monthly expense data to the destination range from February through December.

3. Where required, through the full year, enter your best estimate for each item in the Non-monthly expense group.

4. In the Income Statement group, enter the January Salary data and replicate it to the destination range February through December. Then enter your best estimates for any Investments and Miscellaneous income you anticipate.

5. Finally, in Column C, "seed" the Net Cash Assets line with your estimate of cash assets Carried Forward from last year.

Save this file to your VisiCalc data file diskette; replace the existing master template with this one, if you wish. At this point, you have a complete cash forecast template for a full calendar year on your diskette. You can easily "fine tune" it by modifying selected entries. For example:

– Expect to pay more for electricity in winter than in summer? Look through last year's electric bills and modify the Electricity line to reflect a realistic trend for the new year.

– Expecting a scheduled raise in July? Enter the modification at July and replicate from there through the rest of the year.

When you have made the forecast entries as reasonable and realistic as you think they need to be, save the file again. Then print a hard copy for

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