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TeleLearning and TeleTravel

SOFTWARE REVIEWS:

Micro Cookbook
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TYPE AND SAVE

"Big Ben" chimes for the Commodore 64

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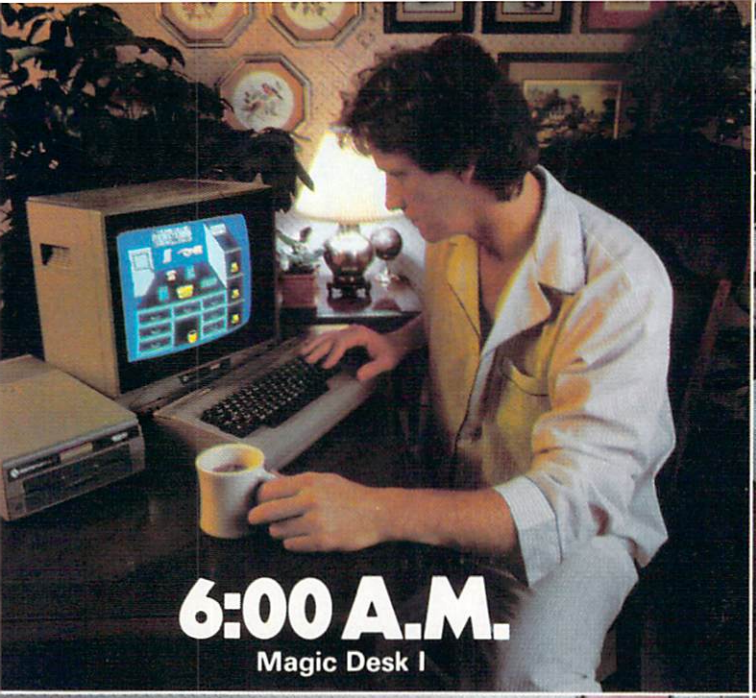

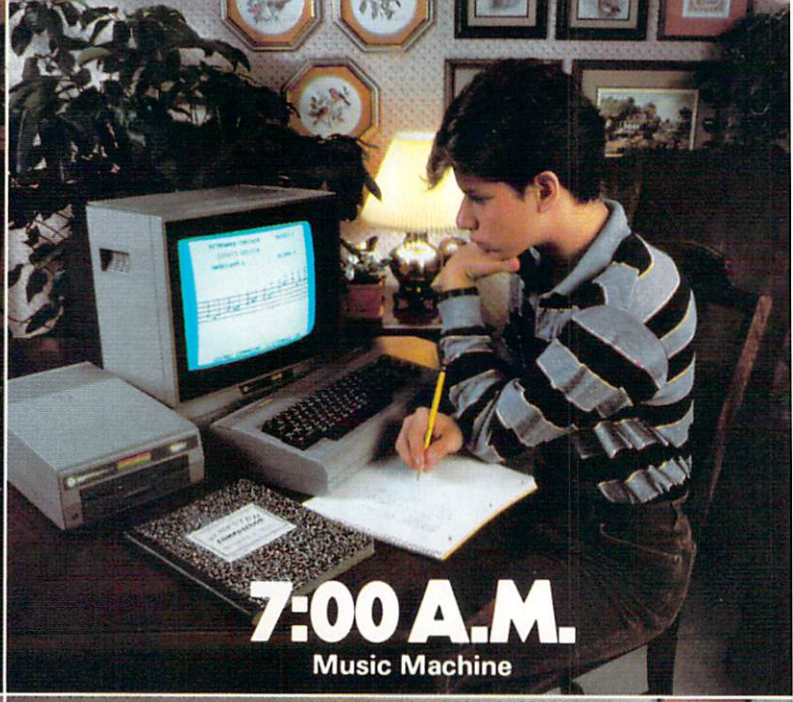

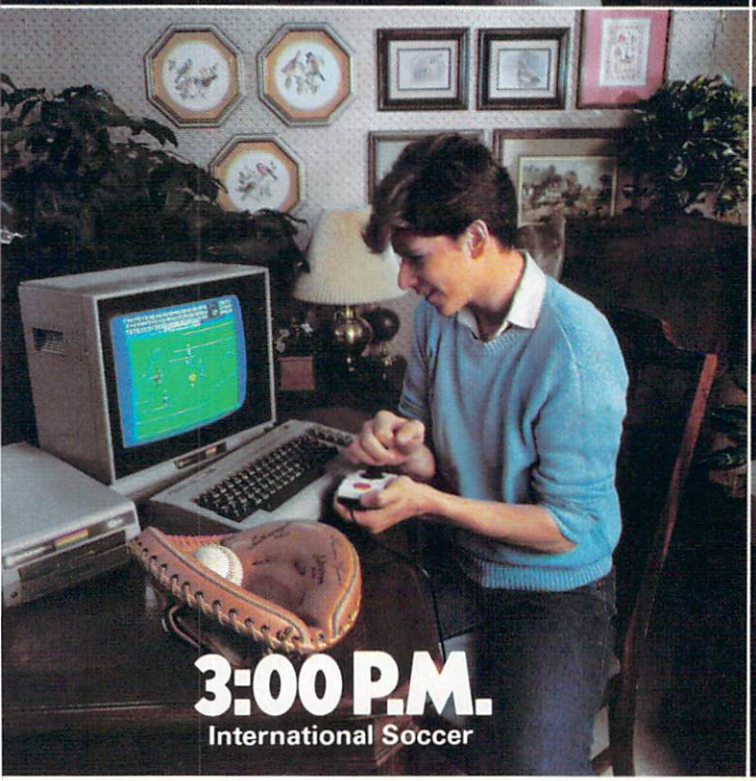

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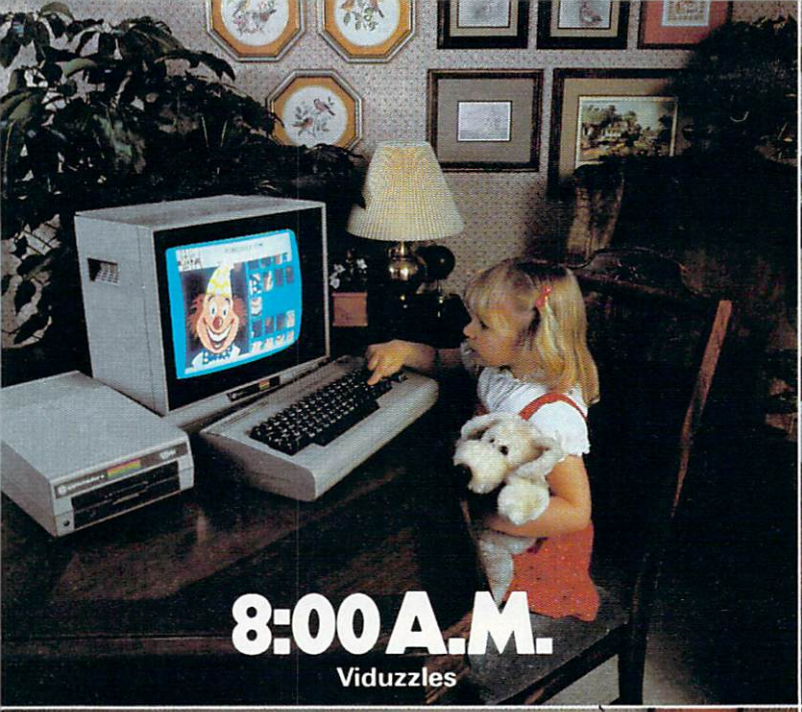

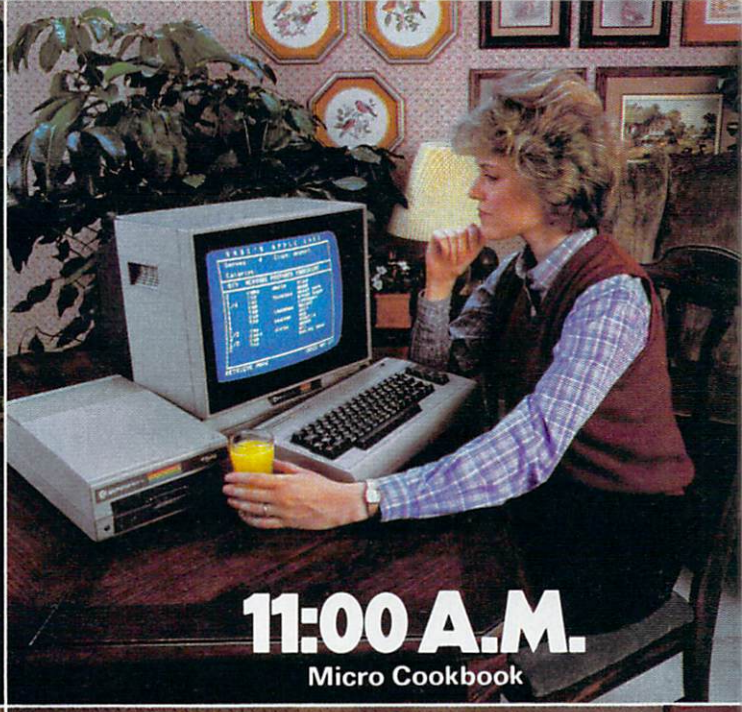

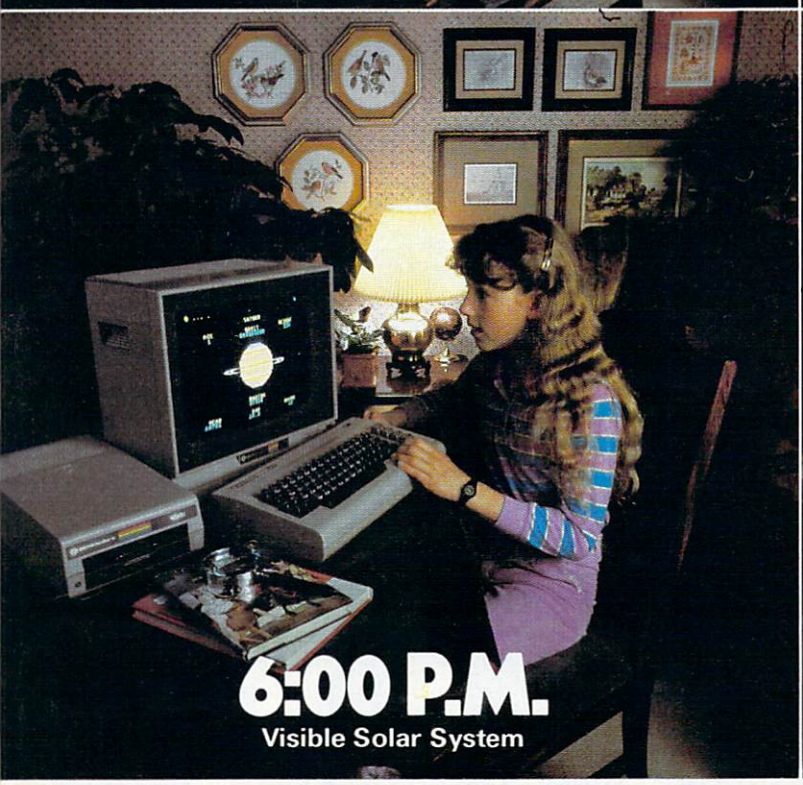

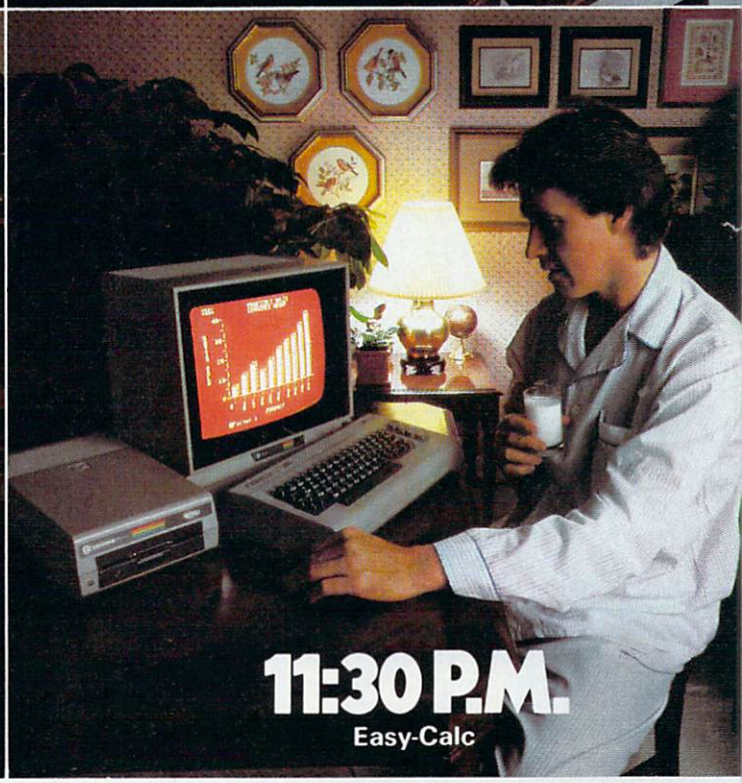

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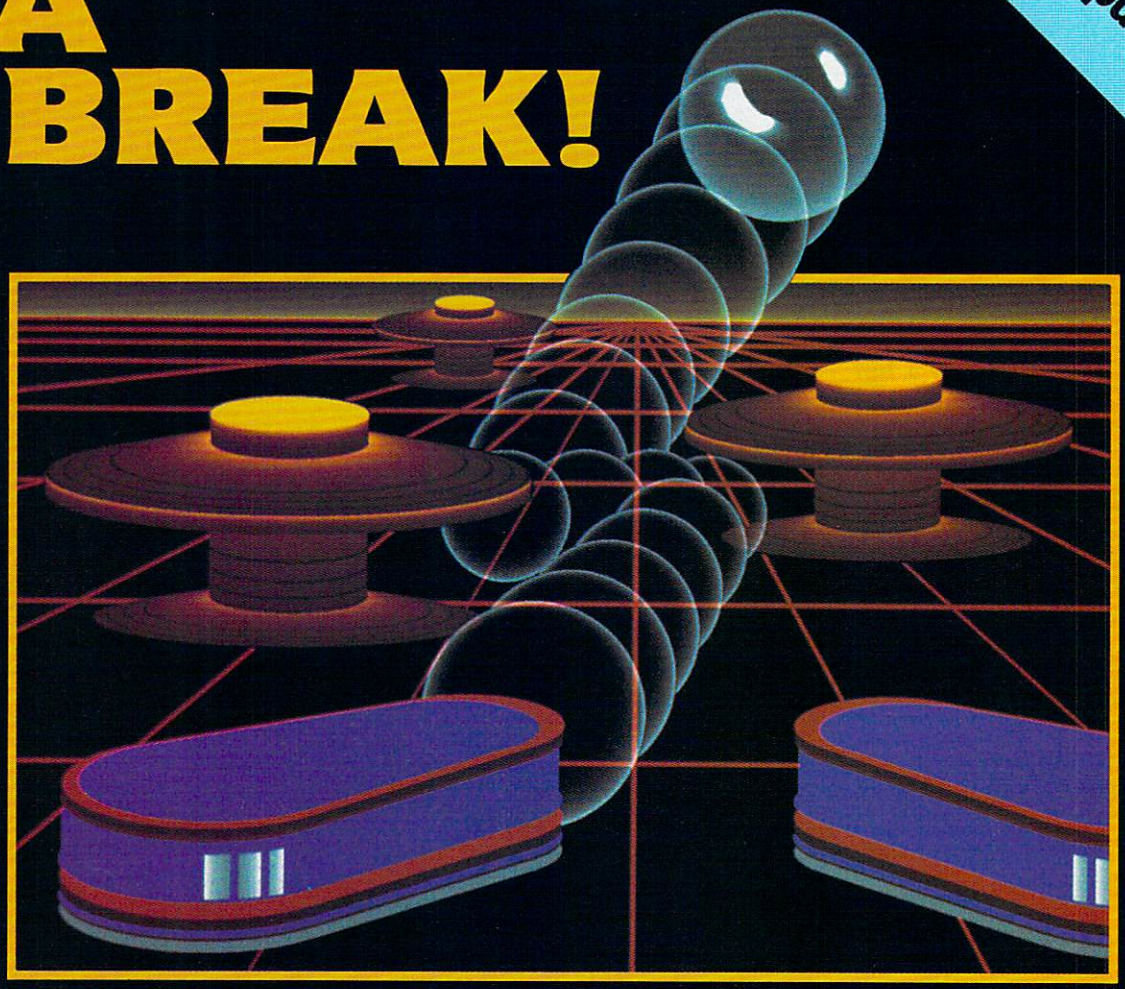

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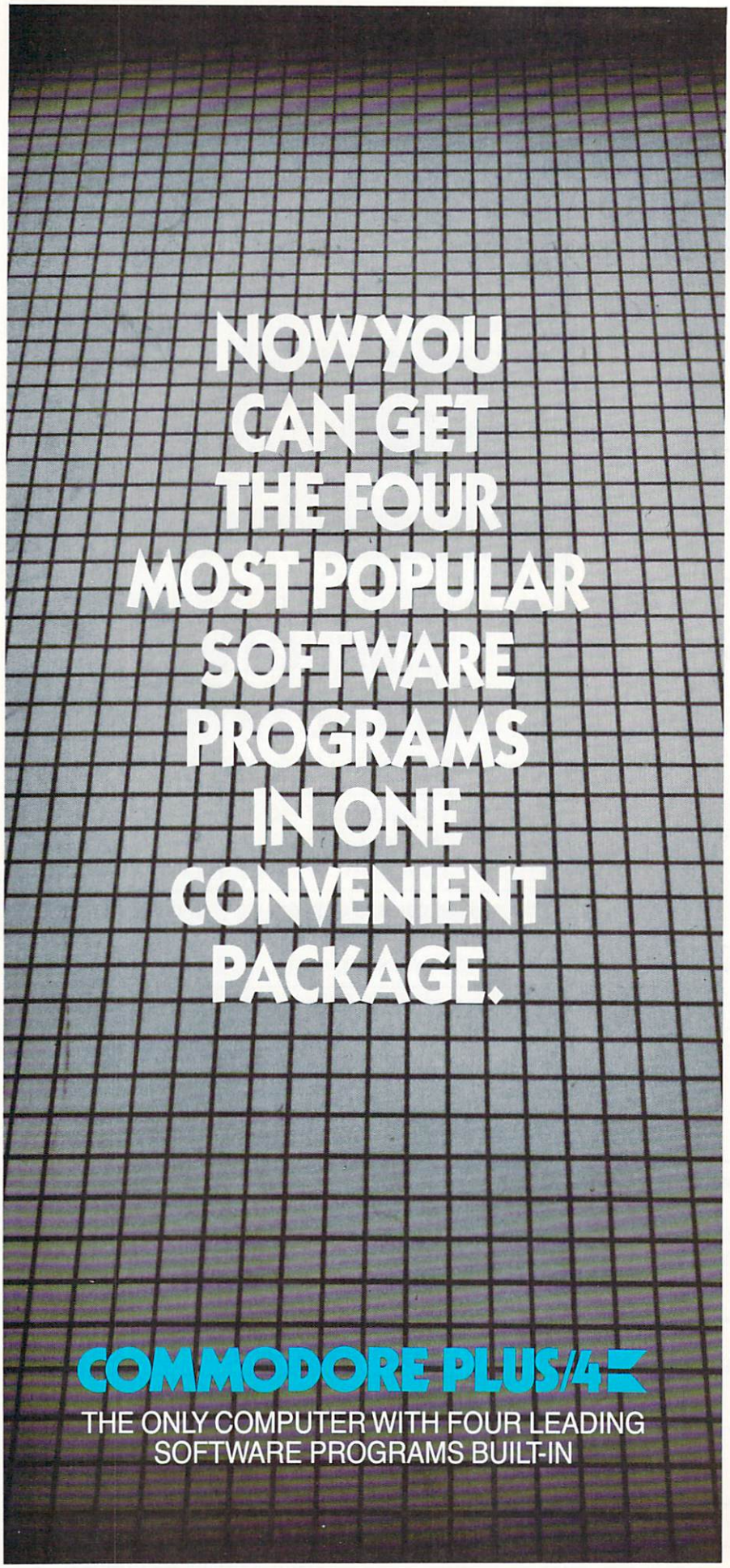

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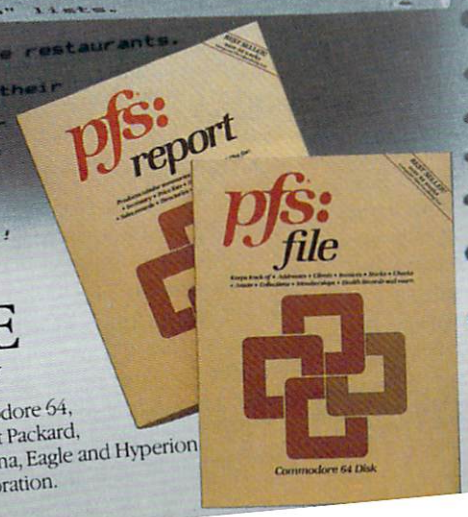

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Computers Come to Sicily

To the Editor:

It took the Arabs 20 years to conquer Enna, a little town on the side of a hill in the mountains of central Sicily. Guarded by its medieval watchtowers, Enna seems even today a place impregnable to change, a holdout against the modern world. Or so I thought, until I discovered Enna's computer store.

The store is located in a little piazza not far from the town's market. Coming out of the narrow, cobblestone street into the piazza, I noticed a little building I thought was a church. It was 17th-century baroque, with a crumbling bell tower and a narrow arched entrance. The sign next to the entrance proclaimed: "When you think personal computers, think Number One." Below the words was a picture of the VIC 20.

Nearby, a man was selling tiny clams out of a wheelbarrow. He seemed to think it amusing that I wanted to take a picture of the store. Didn't he find it strange, I asked him, to see computers being sold in what had once been a church?

"Not really," he said, "You see, that's Sicily. We've seen it all: the Greeks, the Romans, the Byzantines, the Arabs, the Normans. They've all left their mark here. Take a look at our cathedral: the pillars are from Rome, the doors are gothic, the tower is renaissance and the facade is baroque. A blend of them all."

"Now we have this new religion, the church of the computer. They say it's going to change things. But here, things don't change, they blend. Better that way."

He wished me good day. I took one last picture of the computer store and went off in search of the cathedral.

Joe Skrapits
Freemansburg, Pennsylvania

Travel With a Computer

To the Editor:

Government regulations concerning the exportation and importation of personal computers can be very confusing even to the experienced traveler. Because your article ("The Globetrotting Computer," Issue 31, page 25) contains some very valuable

This ancient church in Enna, Sicily, is now a computer store.

information, I advise those people who travel abroad with their computers to save a copy of it for future reference.

I do feel that you should have included in your article a section on U.S. Customhouse brokers. These people can often provide a painless alternative to making several trips to various government offices. For a reasonable fee, the broker will prepare the proper document package for any given situation. It has been my experience that U.S. Customs sometimes knows as little as you do. You must be very careful! My advice is to look in the yellow pages under Customhouse Brokers and make a few phone calls.

I did find one typographical error in the article. The correct form number for the Certificate of Registration is CF4455, not 4457.

Joseph F. Walter
Trans Border Customs Services, Inc.
Champlain, New York

Eliminate Paper Feed Problems

To the Editor:

This tip is for those of you who are using accordion-fold paper with the 1525 or 1526 printers and have a problem with the inverted folds of the paper wanting to go back in the machine. This is almost inevitable when the feed stack is placed behind the printer and the printed paper does not have enough weight to pull it straight. Here is a quick and easy solution.

You will need a piece of flat metal, 10-1/2 by three inches. Drill a hole in the center on each end, 1/8 inch in from the end. The hole needs to clear a number 4/40 screw. Through each hole, secure a 4/40 screw with a nut, then stack two or three other nuts directly behind the nut securing each screw. (The number of nuts will depend on the thickness of the nuts you use.) Measure the stack of nuts and remove any, if need be, to have about a 1/4-inch space between the last nut and the metal plate.

Next, remove the plastic cover from the printer. Take the metal plate, placing either long side of the metal plate under the back edge of the plastic paper deflector that is fastened to the printer and position the stack of nuts down so they will rest on the small ledge on each side of the paper inside the printer. Now replace the plastic cover, making sure it is positioned properly and seated normally. If the metal plate is keeping the cover from seating properly, remove a nut from each stock until it is seated right.

Bill Peden
Miami, Florida

Transfer VIC Programs

To the Editor:

I have discovered the following procedure very helpful in transferring BASIC programs from my VIC 20 computer to different types of computers. Since BASIC programs are stored in a compressed format, other computers will not be able to decode the program files. Therefore, a text file is first generated (and saved on disk). The text file contains the text of the program as it would look if listed. This text file can then be sent to other computers (via the modem) because the BASIC commands will be recognizable to other computers. The procedure for generating the text file is quite simple:

LOAD the Basic program as usual. Type the command sentence: OPEN2,8,2, 'FLNAME'+' TXT,S,W': CMD2 : LIST <RET>. When the cursor returns, type: PRINT#2 : CLOSE2 <RET>.

FOR COMMODORE 64

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A text copy of your program should now be on the disk with the name 'FLNAME TXT'. Any text editing program will be able to read this file. Note, however, that INPUT# should not be used to retrieve the data, since there will be commas and semicolons in the text. Instead, use the GET# statement. As an example, if I wish to generate a text copy of my BASIC program 'DISKFILES', I would type these commands to the VIC.

```
LOAD 'DISKFILES',8
OPEN2,8,2'DISKFILES
TXT,S,W':CMD2:LIST
(When cursor returns)
PRINT#2:CLOSE2
```

A sequential file named 'DISKFILES TXT' will now be on the diskette, containing the listing of my BASIC program 'DISKFILES'.

Also please note that all of the single quotes should be replaced by double quotes.

Krishna Myneni
Louisville, Kentucky

Speed Up Screen Plotting

To the Editor:

Readers of Rolf L. Miller's article "Standard Screen Plotting on the Commodore 64" (Issue 29, page 96) may be interested in a technique that doubles speed without sacrificing resolution (but at a cost in memory consumption).

Referring to the listing on page 96, make the modifications shown in Listing 1 below.

The technique as developed thus far is useful only for, in the words of the song, "turning darkness into light". The reverse effect can be accomplished by the following statement:

```
POKE SA, PC(NOT 2 ↑ (X-
2*INT(X/2)+2*(Y-2*INT(Y/2)))
AND CP (PEEK(SA))
```

The short low-resolution drawing program in Listing 2 exemplifies the capabilities of these combined techniques:

Note the following points:

1) The numbers in my DATA statement (line 160) are *not*) in the same order as those in Miller's program (line 20).
2) A joystick is required for operation (port 2).
3) Pressing the space bar will cycle through the modes.
4) In the interest of brevity, I have not included an exit routine; pressing the RUN/STOP key will have to suffice.

John Auer
Willow Street, Pennsylvania

Listing 1:

```
10 PRINT"[CLEAR]":R=1024
   :DIM PC(15),CP(255):FOR E=0 TO 15
   :READ C:PC(E)=C:CP(C)=E:NEXT'KSRN
20 DATA 32,123,108,98,126,97,127,252,
   124,255,225,254,226,236,251,
   160'BKJK
30 INPUT"SELECT: (1) (2) (3) (4) (5)";
   S:'BDTF
35 POKE 53281,1:PRINT"[CLEAR]"
   :POKE 53281,0:ON S GOTO 40,60,70,
   80,90'FHFN
40 FOR P=0 TO 35:X=P:Y=35-P
   :GOTO 100'HQDI
50 FOR P=0 TO 50:Y=P:X=0+P
   :GOTO 100'HPTJ
60 FOR P=0 TO 60 STEP.5:A=P/30*[PI]
   :X=INT(25.5+24*SIN(A))'NYIQ
65 Y=INT(24.5+18*COS(A)):GOTO 100'GQKO
70 FOR P=0 TO 109 STEP.5:A=P/30*[PI]
   :X=INT(EXP(P/25.5))'MXIQ
75 Y=INT(24.5+18*COS(A)):GOTO 100'GQKP
80 FOR P=0 TO 159 STEP.5:A=P/30*[PI]
   :X=INT(P/2):Y=INT(24.5+18*COS(A))
   :GOTO 100'RKQX
90 FOR P=0 TO 79:X=P:Y=INT(20*SQR
   (P/16)):GOTO 100'KWSQ
100 SA=R+INT(X/2)+40*(24-INT(Y/2))
    'JRQE
110 POKE SA,PC(2^(X-2*INT(X/2)+2*
    (Y-2*INT(Y/2))) OR
    CP(PEEK(SA)))'OIOM
190 NEXT:IF S=1 THEN S=0:GOTO 50'GIDJ
200 INPUT Q$:RUN'CDOW
```

Listing 2:

```
10 DIM E(255),P(15),T(15),X(15),Y(15)
   :READ S$(0),S$(1),S$(2)'CXGH
20 FOR I=0 TO 15:READ Q:P(I)=Q:E(Q)=I
   :NEXT:FOR I=5 TO 14:READ T(I),X(I),
   Y(I):NEXT'MPXO
30 A=0:B=0:E=0:J=56320:L=1064:P=32
   :Q=53281:R=L-40:S=0:X=0:Y=2:X%=0
   :Y%=0'OEIV
40 POKE Q-1,12:POKE Q,1
   :PRINT"[CLEAR,GRAY2,RVS]";
   :POKE Q,0'FPGH
45 FOR I=0 TO 39:PRINT" ";:NEXT
   :PRINT S$(S);'GOGL
50 GET K$:IF K$<>" "GOTO 70'FHIF
60 S=S+1-3*INT((S+1)/3)
   :PRINT S$(S);'ISYL
70 Q=PEEK(J)AND 15'DGQG
75 IF T(Q)THEN A=X+X(Q):B=Y+Y(Q)
   :IF A>-1 AND A<80 AND B>1 AND B<50
   GOTO 90'QFYA
80 GOSUB 140:POKE L,P(NOT 2^E AND
   E(P)):GOSUB 140:POKE L,
   P(2^E OR E(P)):GOTO 50'KJAR
90 X=A:Y=B:X%=X/2:Y%=Y/2
   :ON S GOTO 110,120'IYMQ
100 POKE L,P:GOTO 130'CHGW
110 POKE L,P(2^E OR E(P))
    :GOTO 130'EPSB
120 POKE L,P(NOT 2^E AND E(P))'ELSC
130 E=X-2*X%+2*Y-4*Y%:L=R+X%+40*Y%
    :P=PEEK(L):POKE L,P(2^E OR E(P))
    :GOTO 50'ROSS
140 FOR T=1 TO 200:NEXT:RETURN'FHND
150 DATA"[HOME]TRAVERSE","[HOME,
    SPACE2]DRAW[SPACE2]","[HOME,
    SPACE2]ERASE "'BCPH
160 DATA 32,126,124,226,123,97,255,
    236,108,127,225,251,98,252,254,
    160'BKJN
170 DATA 1,1,1,1,1,-1,1,1,,,,,1,-1,1,
    1,-1,-1,1,-1,,,,,1,,1,1,,-1'BFVM
```

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INDUSTRY NEWS

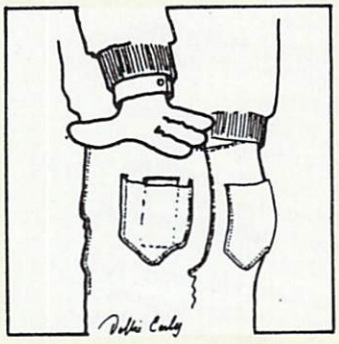
ColorTone Keyboard

The ColorTone Keyboard from Waveform Corporation lets a novice create enjoyable music on the Commodore 64 without long hours of drill and practice. It features the first ever real-time scoring of extemporaneous compositions. Waveform Corporation located in Berkeley, California, is the creator of **MusiCalc** music software.

The Colortone keyboard from Waveform lets a novice create music on the Commodore 64.

Commodore Association Plans 1985 Convention

The West Coast Commodore Association plans to hold a two-day exhibition in San Francisco that will feature software and peripheral vendors and noted speakers, all exclusively for the Commodore 64 and VIC 20 market. The convention will be in early February of 1985, after the January Consumer Electronics Show, to allow the software vendors the opportunity to test their new software products on the consumers. For more information, contact the West Coast Commodore Association, P.O. Box 210310, San Francisco, CA 94121. (The telephone number is 415-567-5046.)



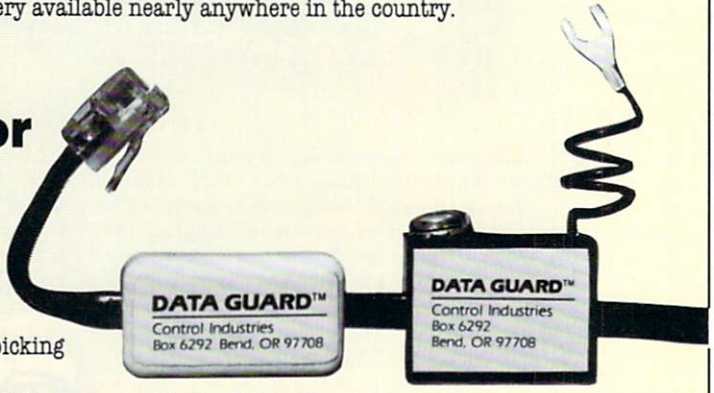
Off-Site Data Storage

Off-Site Data Inc. of Northbrook, Illinois, is offering an off-site data storage program designed exclusively for microcomputer users. . . .

Users who sign up for the program send diskettes or data cartridges containing software masters or data file backups to Off-Site's Chicago facility for secured storage. The program is applicable to small businesses, authors, medical practices, lawyers and accountants who use their computer for patient records, contracts, general ledger, accounts receivable, inventory, customer lists, marketing projections or word processing applications.

The service provides high security storage, a complete inventory system, return transportation, containers and insurance on the data stored. It also features next-day emergency delivery available nearly anywhere in the country.

Security and Privacy for Modem Users



Control Industries of Bend, Oregon, has released Dataguard, an electronics device that provides a protected, dedicated communications line. This eliminates data loss or tripped communication connections caused by someone accidentally picking up another phone on the same line.

Once Dataguard is installed, a modem (when logged on) will always have priority. In less than two minutes, it can be installed on any phone that may interfere with your modem. It requires no external power and comes in two models: an in-phone model which is not visible after installation and a 12-foot snap-in cord model which replaces your present phone cord. Dataguard won't disrupt your normal telephone function, is FCC approved and carries a full one-year warranty.

INDUSTRY NEWS

Magazine Resource Guides

Altacom Inc. of Alexandria, Virginia, has introduced **PcDex** and **PcDex Quarterly**, microcomputer magazine resource guides to the Commodore 64, VIC 20 and PET/CBM. The only exclusively Commodore magazine index, **PcDex** provides fast, easy access to the often overwhelming amount of microcomputer magazine literature. Designed as six separate indexes—subject, title, program listings, software reviews, hardware reviews and tables of contents—**PcDex** allows the serious home, business or educational user to quickly locate specific items of interest, including articles, columns, letters, programs and reviews. Special features include cross-referencing, program descriptions, updates and revisions, specific machine requirements and suggestions for locating back issues.

PcDex indexes the 12 most popular Commodore and related general microcomputer magazines published between January 1982 and April 1984, with yearly updates planned to include the current three years.

PcDex Quarterly follows the same format, but will be published four times a year with an annual cumulation and will include any relevant new publications. This one is available through subscription only.

Marshall F. Smith (r.), president of Commodore, accepts the Technology Council Award from Frederick D. Lipman, chairman of the Technology Council of the Greater Philadelphia Chamber of Commerce.

Commodore Recipient of Technology Award

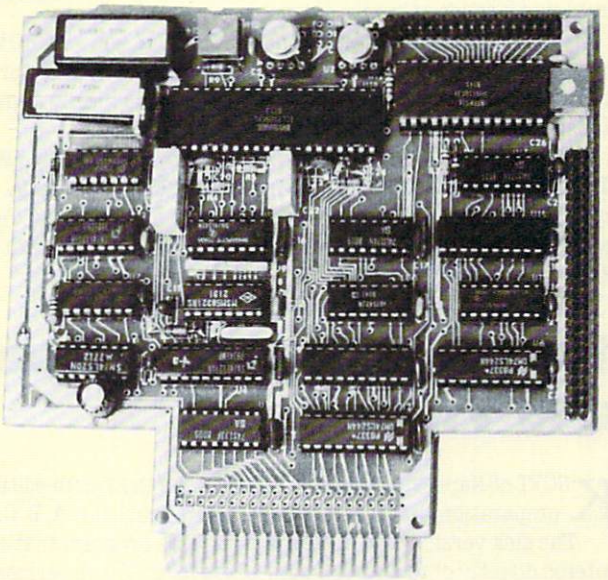
Commodore International Ltd. was awarded the First Annual Technology Council Award from the Greater Philadelphia Chamber of Commerce on September 17, 1984. The award, accepted by Commodore President Marshall Smith, honored Commodore for having the highest number of people employed in a high-technology company in the Philadelphia area.

Originated to heighten the awareness and importance of innovation, the award is a sign of commitment to growing companies' entrepreneurial achievement.

Data Acquisition and Control Board for the Commodore 64

CGRS Microtech of Langhorne, Pennsylvania, has introduced two controller boards called Diadacs-1 and Microdata-1.

Both the Diadacs-1 and the Microdata-1 modules are the same physical size and perform similar functions. The Diadacs-1 contains a 12-bit A/D converter which gives 4096 counts full-scale resolution, but can only do 20 to 30 conversions per second. The Microdata-1 contains an 8-bit A/D converter which gives only 256 counts full-scale resolution, but can do a conversion in 100 microseconds and is lower in cost.



INDUSTRY NEWS

Speech Synthesizer for the Commodore 64

Currah Technology of Hartlepool, England, has released the Voice Messenger Speech 64, a low-cost speech synthesizer. The $49.94 system is easy to install and features infinite vocabulary, two voice selections and intonation to add character.

Just 2-1/2 square inches and 3/4 inches deep, the Voice Messenger plugs into the cartridge port of the 64. The Voice Messenger's output is carried to the auxiliary 64 sound input and reproduced through the television speaker. It does not steal any RAM from the BASIC workspace and allows computing while talking. With built-in software, the Voice Messenger allows the 64 to talk immediately upon power-up.

The infinite vocabulary is made possible by the use of an allophone-based synthesizer chip which allows individual speech sounds to be strung together to make intelligible speech. By using the Voice Messenger, any word, sentence or paragraph in the English language can be spoken. BASIC commands such as SAY and KOFF allow for easy use. The Voice Messenger also allows individual keys to talk.

Expanded Stock Quotes Services

Users of Dow Jones News/Retrieval can now select from two new options. The first, Enhanced Current Quotes, adds a "news alert" feature to the 15-minute-delayed Current Quotes. The "news alert" flags current day news with a message that appears after the stock quote. The subscriber can then access the story from the Dow Jones News database in News/Retrieval. Earlier news stories can also be retrieved from Dow Jones News.

The second new option, Real Time Quotes, couples the news alert feature with real-time stock quotes that come directly from the exchanges. Real Time Quotes are available for all stock trading activity on the New York, American, Pacific and Midwest exchanges, including composites.

The lower usage fee which will be reduced by 25% also applies to the expanded services.

Commodore Canada Announces New Computer

Commodore Business Machines of Scarborough, Ontario, has announced a new personal computer for business applications, featuring a range of builtin software.

The Commodore 8296 system has 128K RAM and 18K ROM memory with detachable keyboard, tilt and swivel 80 x 25 screen and 1.05 MB dual disk drive, all designed in an economically appealing and visually attractive configuration.

Built-in software includes full-featured word processing (**Paper Clip**), database management (Oracle **Consultant**), financial spreadsheet (**CalcResult**) and a menu with eight options. Terminal communications, system utilities, system shutdown and exit to BASIC are all included.

1984 Tax Return Helper for the Commodore 64 and VIC 20

KSOFT of Naperville, Illinois, is producing the fourth edition of **Tax Return Helper,** a software package for income tax preparation that includes Form 1040, Schedules A, B, C, D, E, G, SE, W and Form 2441.

The disk version also contains a database program that allows the building and maintaining of tax-related records. Data is entered directly onto a screen copy of the form. The programs work like an electronic spreadsheet and perform all computations.

Continued on p. 124

A Real Music Keyboard for Just $99.00!

(Price Includes a Complete Music Software Package Featuring Four-Color Graphics, Recording and Playback!)

Tap the full power of your Commodore 64's® built-in musical instrument with the new MusicMate™ keyboard from Sequential.

The MusicMate keyboard is a fully functional, quality music tool with full-size keys that lets you play your music live and record it. *And* it's polyphonic so you can play 3 notes at a time. Best of all, the MusicMate gives you this creative flexibility at a *very* affordable price!

Playing music on a typewriter keyboard or a plastic overlay of miniature-size keys limits your music. We know. We're the largest American manufacturer of professional synthesizers. Our Prophet keyboards are used by your favorite artists on stage and in the studio. We've put our extensive experience in making quality musical instruments into every MusicMate keyboard.

The MusicMate comes with the Model 970 software diskette package that lets you select many different instrument sounds and record and playback up to 10 continuous minutes of your music.

Unlike other remote keyboards, ours doesn't tie up any of your expansion slots. Just plug your MusicMate into your Commodore's joystick port.

Add any one of our exciting software packages to extend the MusicMate's capabilities. They're just $39.95 each.

SONG BUILDER (Model 971)

Build your own songs by overdubbing up to 3 layers of notes (each with its own instrument sound!). Or record 1–2 layers of notes and play the third layer *live*. Also, change the key and speed of your music.

SONG EDITOR (Model 972)

See the songs you write with the SONG BUILDER displayed on a four-color Grand Staff on your monitor. And conveniently edit your songs.

SONG PRINTER (Model 973)

The SONG PRINTER prints out your songs in standard music notation.

SOUND MAKER (Model 974)

View a full color graphic display that looks like the front panel of a professional synthesizer to program the shape, volume and tone of your own personal sounds.

Express the music in yourself and your family. Order your MusicMate direct from Sequential *now*!

If you're not completely satisfied with the MusicMate keyboard, just return it within 10 days of receipt to Sequential for a full refund. *(Sorry, no returns on computer software, once opened.)*

SEQUENTIAL

For a complete Sequential catalog including decals, send $2.00 to: Sequential, 3051 North First Street Dept. CM, San Jose, CA 95134. Or call, (408) 946-0226.

Commodore 64 is a registered trademark of Commodore, Inc.
*MusicMate is a trademark of Sequential
© 1984, Sequential

Yes, I want to play my own songs on the MusicMate!

Name (Please Print) _____

Street _____

City/State _____ Zip _____

☐ Check or Money Order ☐ Visa ☐ MasterCard ☐ American Express Please do not send cash.

Card # _____

Valid from: _____ to: _____

Signature _____

Quantity			Price
_____	MusicMate(s)	@ $99.00	_____
_____	SONG BUILDER	@ $39.95	_____
_____	SONG EDITOR	@ $39.95	_____
_____	SONG PRINTER	@ $39.95	_____
_____	SOUND MAKER	@ $39.95	_____
		Shipping and Handling	$4.00
		CA residents add 6.5% Sales Tax	_____
		TOTAL PRICE	_____

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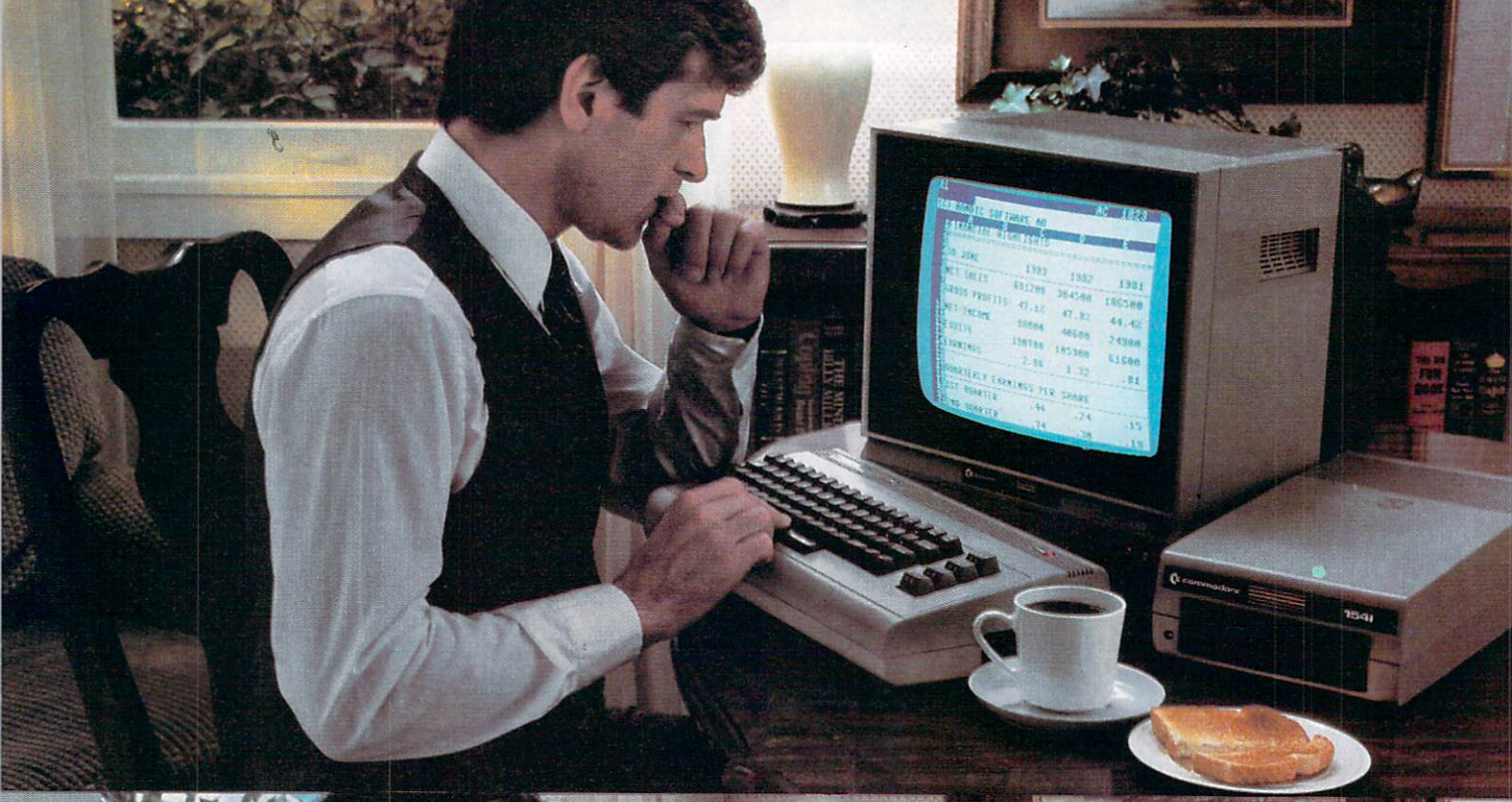
Circle Reader Service No. 33

Mail order form to: Sequential, 3051 North First Street, Dept. CM, San Jose, CA 95134 Or, use our order line (408) 946-0226.



COMMODORE MAKES SOFTWARE FOR EVERY MEMBER OF THE FAMILY.

Commodore makes software for uncles, cousins, aunts who teach, nieces, nephews, brothers, sisters preparing for exams, fathers, mothers and brothers-in-law in roofing and tiling.

You see, Commodore makes software for fun, profit, homework, housework and office work.

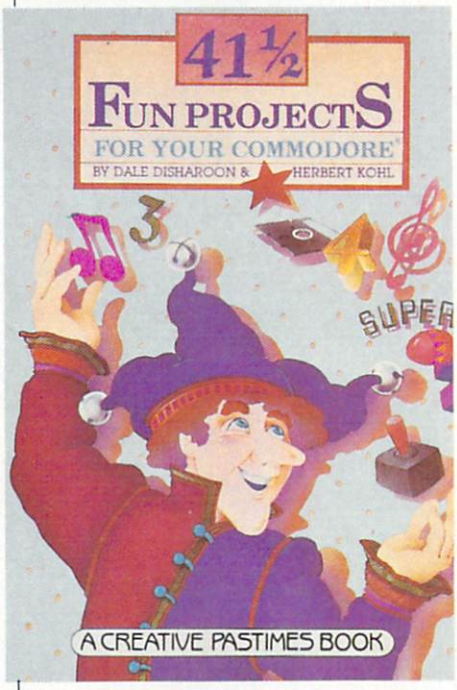
Our Easy-Calc (upper left) is an electronic spreadsheet that's 63 columns x 254 rows with graphics and bar charting. And even with color options.

Fish Metic™ (upper right) is an educational math program in a game format. With our Manager program (lower left), you get a sophisticated

REVIEWED BY LINDA LEE

Brought to You by Reston

Four books recently published by Reston Publishing Company provide fun and information for Commodore users.



41½ Fun Projects for Your Commodore

Authors: Dale Disharoon and Herbert Khol

Over the past few years, thousands of households around the country have made the 64 a must. Unfortunately, after the initial newness has worn off and the kids are tired of video games, many home computerists find themselves sequestered in a corner waiting for the monthly checkbook balancing or a BASIC programming course in school to bring back the kids to do "Ugh, homework!".

With *41½ Fun Projects*, you will find new dimensions in computing. Do you like to do word hunts? How about anagrams? These are just two of an assortment of programs.

The programs are short, direct and fun to work with. For instance, when you run out of valid excuses, did you ever wish you could just snap your fingers and one would magically appear? Well, with the "Excuse Generator" program, it's not magic, but it certainly adds variety to the old worn out apologies.

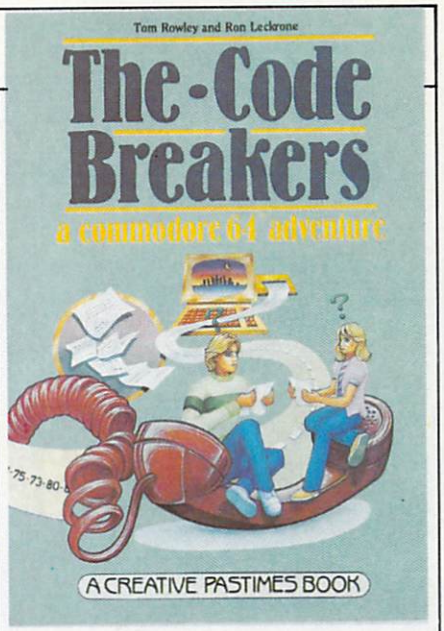
There are a variety of math, probability, estimating and memory programs. Have you ever tried to reconstruct a face that you saw briefly? There is actually a program called "Mug Shot" which enhances your ability to be a good witness (do you recognize the nose?).

The section titled "Strategy and Puzzles" contains a computer version of Dozo, a Japanese strategy game whose object is to not lose instead of to win. This is the longest program in the book. It contains over a page and a half of data statements to type in, which can be hairy. You need a keen eye to get this program to work.

If you are musically inclined, there is a program in the "Music and Noise" section which can help you tune your guitar and master chords. There is even a musical version of the "Match Game."

The "Computer Utilities" section contains some of the usual programs, like a calculator program, a decimal/hex/binary conversion and a graph generator, as well as some unique programs. If you have lost yourself so completely in your computer that you have lost all your friends, there is hope. Just use the "Computer Dating Service" program. Or maybe somewhere in the world there is a person who can't even time an egg without a computer at hand (the "Egg Timer" program).

The ½ of *41½ Fun Projects* is a list of ideas that expand on the programs already written in the book.



The Code Breakers

Authors: Tim Rowley and Ron Leckrone

Nikki and Adam have accompanied their father on a routine business trip to Chicago. But it doesn't stay routine for long.

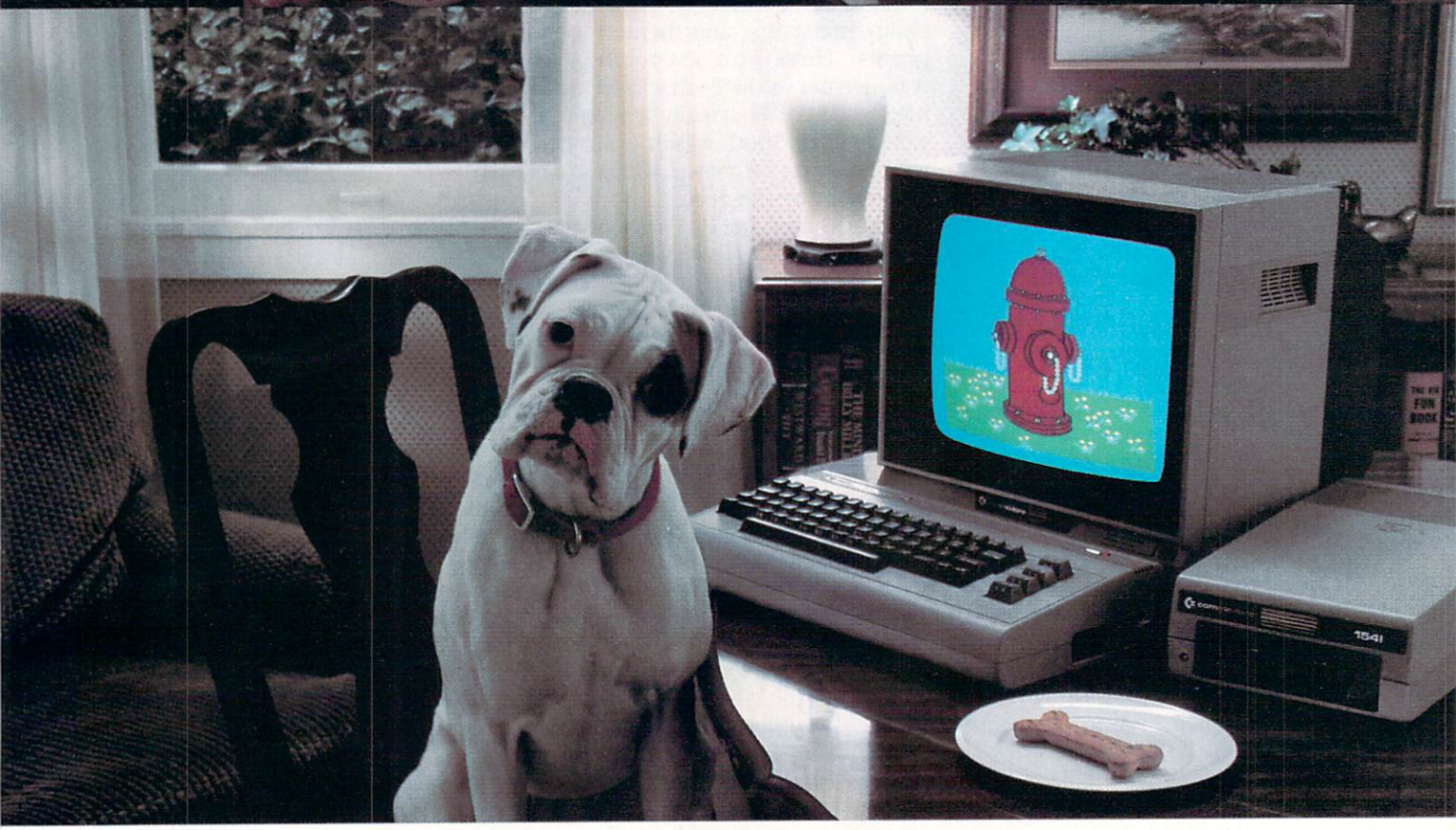
At the hotel, Nikki and Adam connect their Commodore 64 to the hotel TV. When they go to the lobby for a soda, they find papers crumbled in the hallway outside their room. One paper contains a computer program called Code Breaker and the others contain a series of two-digit numbers. When the program is run, strange words appear.

Meanwhile, downstairs is mass confusion: police are everywhere. An ambulance is taking a wounded bartender to the hospital. In the midst of the confusion, Nikki and Adam discover a computer with a display that looks like a translator program.

What does it all mean—the reservation mix-up, the hotel clerk who doesn't seem to know what he is doing, the mysterious computer programs and messages? And, even more, where is their Dad?

Following Nikki and Adam through the maze of clues and programs is a unique challenge for young computer buffs. The book is a pleasant blend of computing and super sleuthing. The six programs used throughout the book to solve the case provide further uses even after the book is read. And you don't have to be a kid to enjoy it.

BOOK PHOTOS BY GENE SMITH



ALMOST.

database system with four built-in filing applications. Or you can design your own.

Why, in the lower right hand corner, there's even a... oh, we don't make that one yet.

But we're working on it.

Incidentally, we also make the perfect place to use all these software programs (except the last one): the all purpose Commodore 64,™ the world's best selling computer.

COMMODORE 64

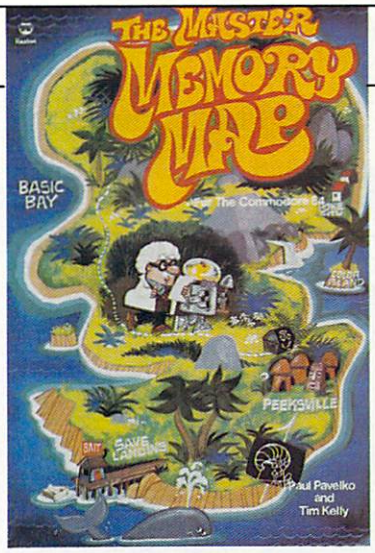
IT'S NOT HOW LITTLE IT COSTS, IT'S HOW MUCH YOU GET.

The Master Memory Map for the Commodore 64

Authors: Paul Pavelko and Tim Kelley

Attention all programmers: Professor Von Chip and his trusty sidekick, Prototype (Proto for short), are awaiting your next trip to the 64's internal neighborhood. To help you, they have prepared a map with all the addresses, decimal numbers and a roster of what goes on there.

The Master Memory Map is a skillfully crafted guide to the inner workings of the keyboard. After the initial breakdown of bits, bytes, peeks and pokes, the book jumps right into decimal location zero through 57343. But don't despair. The reading is anything but dull. For those serious about programming or those just learning, the descriptions, routines and explanations are just what the professor ordered.



Proto is always waiting right in the margin to point out the most important locations and routines so the programmer won't miss a trick. He also adds color and examples in the appendices.

The appendices take up nearly half the book, but they are well worth the room. What you may have missed in the memory map you can certainly pick up here. For example, for serious programmers, the Kernal routines as well as the BASIC ROM routine starting addresses are a must. There are also handy tips on programming all three voices with the extraordinary SID chip. Sample programs give you the feel for different frequencies, waveforms and voices. Don't be afraid to experiment.

Another appendix goes into graphics programming and sprites. There are also algorithms and flowcharts included to start the wheels turning for your own programming.

Although the appendices are helpful for programming sprites, sounds and machine language, there is not enough detail to allow a beginner to jump right in and create a new computerized symphony. You must do some paging through the book to find certain memory locations and their explanations. However, it will certainly get you off to a good start. And for those experts in the field, the hexadecimal locations are invaluable as a programming aid.

The Master Memory Map is a must for those who are no longer content with copying programs out of books. And it is especially valuable when used in conjunction with the *Commodore 64 Programmer's Reference Guide*.

Commodore 64 Color Graphics: A Beginner's Guide

Author: Shaffer & Shaffer Applied Research & Development

Do you shudder at the thought of graph paper, calculating bits and sprites? Open *Commodore 64 Color Graphics* and see what you can accomplish with some BASIC knowledge and a touch of creativity.

Since this is a beginner's guide, nothing is left to the imagination. As each new step is mastered, another one is added that will create a different part of the picture.

Chapter 1 reviews loading and saving procedures for both a datassette and a drive. Chapter 2 starts the actual process needed for graphics. Each subroutine that is used is explained in detail. These subroutines are appropriately called Tools. (For example, there is Tool 50, which will paint the background.) A general description of what it does and how it is used follows.

The best part of the book is the technical descriptions. Even minor detail is explained extensively, using charts and graphs. For painting the background, there is a graph of an eight-by-eight pixel block with each memory location displayed.

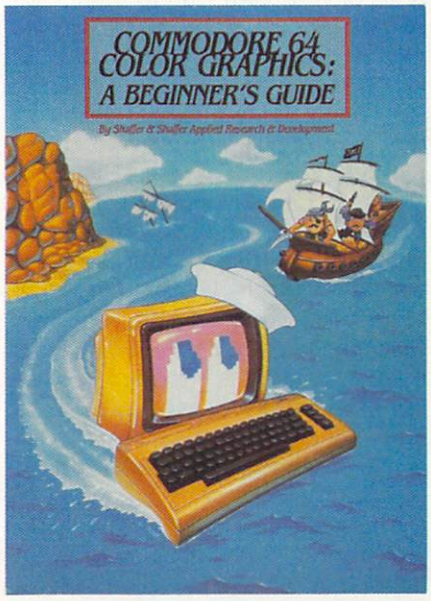
To expand on your creative abilities, there is a section on how to incorporate complex designs into your picture. Even the most unartistic person can successfully design complicated scenes.

The chapter on sprites (animated graphics) is straightforward. By the end of this chapter, you will be able not only to move those shapes across the screen, but also to make them larger, move them around and make them three-dimensional.

Although the book is not written as a textbook, the authors make use of some textbook features. There is a review of the material at the end of each chapter along with exercises to practice a new concept. The solutions are included so you know if you are on the right track.

The postscript at the end gives you additional scenes. The appendices contain a variety of information from a trouble-shooting guide to additional Tools and charts.

So, if high-resolution graphics make you nervous, but there is an artist inside dying to come out, take out your frustrations on the 64 and design your way to a new high. **C**



REVIEWED BY SUE WEST

Micro Cookbook

Computer: Commodore 64
Publisher: Commodore Business Machines
1200 Wilson Drive
West Chester, PA 19380
Medium: Disk

Micro Cookbook is one of those programs that, at first glance, seems unnecessary. Recipe cards and traditional cookbooks worked for your mother and your grandmother—why complicate things with a computer? But *Micro Cookbook* does more than just store recipes. It allows you to manipulate, search for and organize recipes in ways no conventional cookbook can.

Storing recipes is one of the things *Micro Cookbook* does very well. It comes with over 150 recipes that you can adjust to your liking or delete from the file entirely. Before you do that, try them. The recipes range from corn fritters to veal piccata and most are relatively easy to prepare. There are old standards—chicken cacciatore, quiche lorraine, beef stroganoff, variations on meatloaf and lemon meringue pie.

Recipes are grouped into 30 classifications such as entrees, desserts, salads, side dishes, meatless dishes, Russian, Italian, French and Mexican cuisine. You can also add classifications of your own—up to three classifications per recipe. For example, you can record and classify your old family recipe for Hungarian goulash (is it really written down anywhere?) under entree, Hungarian, and grandmother's.

Micro Cookbook, appropriately enough, is a menu-driven, disk-based program for the Commodore 64, which is extremely easy to use. If Mom hasn't gone near the computer (except, of course to dust it), this would be just the program to ease her into. Which is not to say that Mom will be the only one to use it. It makes meal planning so easy, even a husband can do it.

The main menu allows you to select from a list of recipes, a list of ingredients or a list of classifications. You can also choose to select a recipe by classification and ingredient, view tables of calorie and nutritional information, a glossary of preparation and cooking terms or a table of measurements and equivalents. You can enter, edit and print recipes. Or you can choose the HELP option, which explains each of the other options.

To select any of these options, hit the corresponding function key or point to the option by using the vertical cursor key. For example, to "Select from recipe index", hit F1 and a list of recipes will be displayed. To select a recipe, point to it using the cursor key. This will give you a standard recipe for four to six servings. On most recipes, you can modify the number of servings by entering the recipe name followed by the number of servings in parentheses. If you enter "beef stew (8)" *Micro Cookbook* will adjust the amounts of ingredients for eight servings. Caution: this feature merely adjusts the ingredient amounts mathematically. It does not adjust cooking times. Also, beef stew for eight will work out; but creating Babe's Apple Cake for one, instead of six would be disastrous, if not impossible. How do you measure a sixth of an egg?

To select a recipe by ingredient, hit F2, cursor to the ingredient and hit RETURN. *Micro Cookbook* will list all recipes using that ingredient. Conversely, you can also select all recipes which do not include a selected ingredient. When Aunt Harriet, who suffers from chronic hypertension, is on the guest list, you can call up all recipes without salt.

Similarly, you can view recipe classifications and retrieve a list of all recipes in each classification—list all German recipes or all salads, for example.

Check the refrigerator again. You have swiss cheese and bacon and you want to make an entree for tonight's dinner. Enter F4 to select a recipe from ingredients and classification. *Micro Cookbook* will tell you that swiss cheese is used in five recipes and bacon is used in seven recipes. One recipe combines them—quiche lorraine.

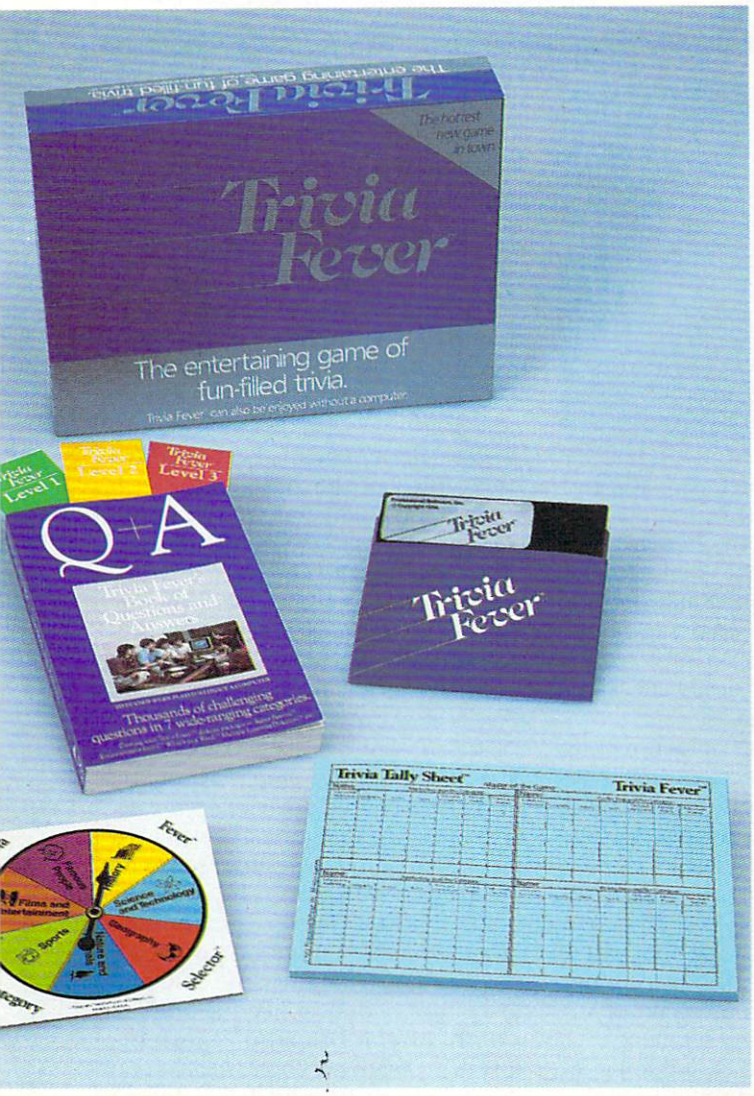
To enter your own recipes (or edit existing recipes) select F3. You can enter one page of ingredients and up to two pages of directions for preparation. When entering your own recipes, be careful to use the same ingredient name each time it is listed. Don't call it "ground beef" on one recipe and "hamburger" on another. This makes it easier to search for a recipe later. It is also helpful to include preparation time (not just cooking time) on the directions or add "quick" as a classification.

You won't need to move your 64

Continued on p. 115

Catch Trivia Fever™

"The Hottest New Game In Town"



Trivia Fever is absolutely unique — it's the only software entertainment package that can be enjoyed ***with*** or ***without*** a home computer! When played on your home computer, Trivia Fever is a refreshing alternative to all those shoot'em up games. An elected "Master of the Game" uses the computer to randomly select subject categories, handicap players, generate questions and answers, keep score automatically, and more! Instructive by its very nature, Trivia Fever can be enjoyed by up to 8 individuals or teams. And when played without a computer, Trivia Fever has all the best features of the "popular" trivia games plus more — all without the cumbersome board, cards, and little game pieces. You can play in a car, on vacation, anytime, anywhere! And Trivia Fever is by far the best Trivia game available anywhere. Here's why:

Trivia Fever offers thousands of challenging questions in 7 interesting categories, so there's something for everyone. Each category has questions with 3 levels of difficulty, which score comparable points. What's more, Trivia Fever allows players to HANDICAP all those so-called "trivia experts" three different ways, giving everyone a chance to win. And players can easily control the length of play from quick thirty minute games to multi-hour party marathons!

Trivia Fever is unique, entertaining, educational, and most of all FUN. And at $39.95, Trivia Fever is destined to quickly become the best selling software entertainment package of all time. There's even a $5 rebate available to any non-computer users who return the computer diskette.

Trivia Fever can be enjoyed on the Commodore 64, IBM PC & PCjr and compatibles, Apple II series, and others. So don't delay. Catch Trivia Fever at your favorite software retailer today!

For additional information call 617-444-5224, or write to:

At $39.95, Trivia Fever comes complete with Question and Answer Book, Category Selector, and Tally Sheets to be used when played without a computer.

PSI P.O. Box 533 Needham, MA 02194

Trivia Fever is a trademark of Professional Software, Inc.

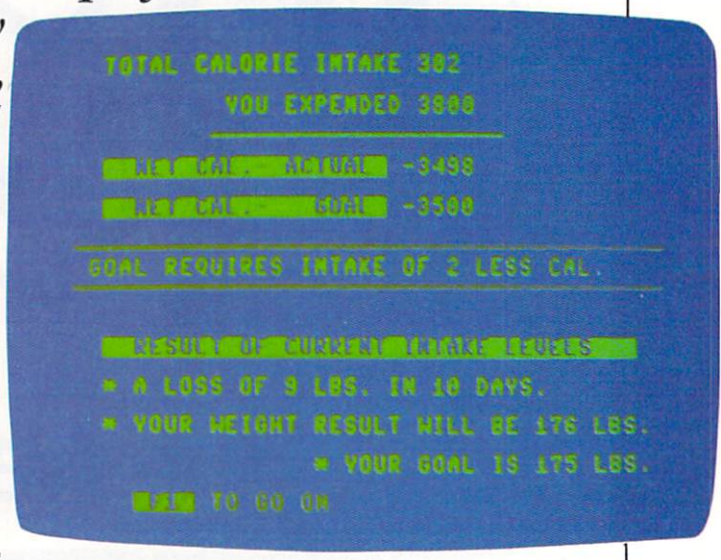
Circle Reader Service No. 29

REVIEWED BY TED SALAMONE

Total Health

Computer: Commodore 64
Publisher: Computer Software Associates
65 Teed Drive
Randolph, MA 02368
Medium: Disk

This program helps you maintain a properly balanced, personalized diet. The computer handles the details and you benefit from its record keeping abilities.



Computer Software Associates' *Total Health,* one of the earlier hybrids in the self-improvement software market, is a natural outgrowth of the nationwide emphasis on physical fitness. It also reflects the concern many people have about the pervasiveness of artificial ingredients and preservatives in today's foods.

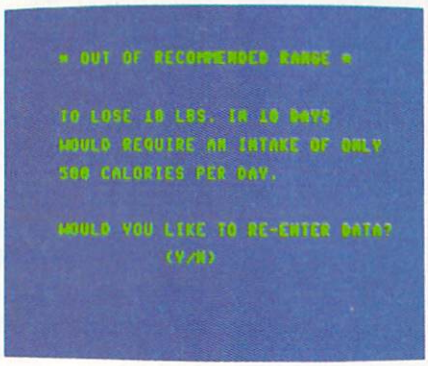
This program helps users maintain a properly balanced, personalized diet. The computer handles the details and you benefit from its record keeping abilities.

As with most software in this newly emerging category, a disclaimer makes it clear that *Total Health* is just an aid to help attain a goal; it is not intended to be a replacement for proper medical care or nutritional guidance. In other words, consult a trained professional before living your life based on the program's feedback. Beyond this bit of legalese designed to protect the firm, *Total Health* does what it was made to do.

Unfortunately, the program was born with a slight case of tunnel vision. Being menu driven, it is very easy to use. Most of the screens are identified clearly. But the food group listings are marked only on the first page. This oversight impedes computerists until they become more familiar with the program. (Menu printouts can help here.)

On the plus side, the documentaton is well organized, thorough and concise. Nine pages cover every angle, from loading and hardware handling to getting the most out of the program. When using *Total Health*, it's a good idea to have a formatted disk ready to store the data generated by the daily inputs.

The program is composed of two subroutines, the "Meal Plan" and the "Graphing" programs. (Essentially, the "Graphing" section produces a graph based on the data entered in the "Meal Plan".) The "Meal Plan"



monitors items such as carbohydrates, calories, protein, sodium and fat. Preliminary information needed includes sex of participant, activity level, age, actual weight and desired weight. If a user's desired weight differs from the actual, a time frame must be entered to designate when they should converge.

Next, the first of seventeen menus appears onscreen. Victuals are listed according to the four major food groups, with a fifth provided for the bane of *haute cuisine*, fast food.

Using the function keys and the space bar, it is possible to scroll through the items in the four main food groups. The fifth grouping, accessed independently, is never included in the graphing segment.

An item is entered by inputting its designated letter and the size of the portion consumed. Unlisted foods (there are plenty) can be added by typing a "+" followed by its food group and other details. The lack of a larger larder, with the subsequent need for the user to provide normally unavailable data about the edibles in question, is the biggest drawback to *Total Health*.

Typing "=" after a day's consumption has been entered produces a comparison of caloric intake versus caloric expenditure. A goal status report is also presented at this time.

The daily summary also provides a breakdown of the portions of each food group eaten and the amount of protein, fat, sodium and carbohydrates ingested for the day.

The next step is to permanently enter the information into the ongoing file. This cannot be amended later, so abstain from any midnight snacks after the entries are made.

For a visual overview of up to 14 days of intake, the graphing routine provides a chart display of each category. The five categories, as well as a pictogram of the food groups, can be created by hitting the proper numeric key. However, a composite of all the items cannot be produced; nor can the pictograms be dumped to a graphics printer like the 1525.

For uncomplicated, straightforward situations, *Total Health* is on the right track. Beyond that, it doesn't go any further. **C**

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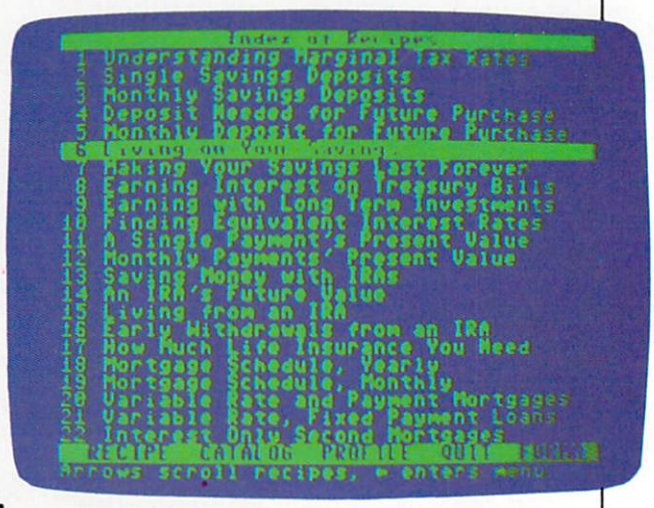
Circle Reader Service No. 27

REVIEWED BY WALT LOUNSBERY

Financial Cookbook

Computer: Commodore 64
Publisher: Electronic Arts
2755 Campus Drive
San Mateo, CA 94403
Medium: Disk

Thirty-two recipes for financial success from monthly deposits for future purchases to earning interest on treasury bills.



Electronic Arts' *Financial Cookbook* offers 32 recipes for financial success, in an easy-to-use format backed by a very good manual.

As soon as the program is loaded, the main menu pops up on the screen. This menu presents the 32 financial options, including things like understanding your marginal tax rate; monthly deposit for future purchase; making your savings last forever; earning interest on treasury bills; and 28 others.

Once a "recipe" has been selected, its use is just as easy as the main menu. A short list of financial assumptions is completed and the computer executes the computation. For example, suppose you had the program compute an allowance from your IRA investment after retirement. The *Cookbook* will present a table showing the monthly withdrawal (adjusted for inflation), the pre-tax withdrawal each year, the after-tax withdrawal and the balance of your IRA account. In this way, you can see how far your IRA can really go upon your retirement (an option that you may never get from Social Security). Ideally, you would like to contemplate the ebb and flow of compounded interest so that your account doesn't last 200 years more than you do. Well, the *Cookbook* allows you to do just that. This is probably the best feature of the program.

I do, however, have one complaint about the resulting tables. The calculations are so slow that it can take two seconds or more for each line of the table. This may be due to the nature of the exponential equations and the possibility that the *Cookbook* is either written in BASIC or uses the BASIC functions resident in the 64. If so, a lot of future purchasers would appreciate a faster program.

After a hard session of financial wizardry, it is worthwhile to save the results. If you own a printer, it is simple to get a quick copy of your calculations. The *Financial Cookbook* also allows you to save the results on disk. This allows you to change a figure later without re-entering everything. For example, suppose you computed payments on a new car, but decided later that you just had to get the sunroof option. The *Cookbook* can re-figure the payments in a jiffy and you can find out whether you must throw out the super-blast stereo to afford a hole in the roof. This ability to save calculations can be very helpful.

While use of the printer is very straightforward (with the single exception of the form-feed command at the end of the printout), the disk itself is too specialized. Electronic Arts, in their pursuit of the perfectly protected program, has managed to get the Commodore 1541 disk drive to format disks in new and bizarre ways. It is a bit difficult to see why any disk used for storage of recipe results under the *Cookbook* must be formatted under control of either the Cookbook or their *Cut and Paste* word processor. This strange use may frustrate people who believe that data on disks is precious and should be backed up, but it certainly doesn't interfere with the basic operation of the program itself.

Despite a couple of odd features like that, I am very satisfied with the program. The manual, in only 31 pages, covers a lot of ground. Even though there is a lot of information, it is written so well that a person would be tempted to think they knew it all along.

I think this is an excellent manual for what it does not do, as well as what it presents. It does not presume that you are an expert in computers or finance. It does not try to substitute obscure text for use of the program. Instead, it gives you good ideas of things to try out. It is not written to force you to read through the entire manual (although at 31 pages, it wouldn't take much effort). In other words, while it does help you learn about the numbers you are manipulating, it is not a tutorial.

The manual has a table of contents, an extensive glossary, an index, and (Holy Algebra, Batman!) a technical appendix. The technical appendix describes, in detail, the formulas used in the program and the way that each individual recipe computes using them. It should be no surprise that the body of the manual (the introduction, tutorial and complete descriptions of all 32 recipes) is only two-thirds of the entire booklet.

If you are interested in personal finances, then you should be interested in this product. It is remarkable to find a product that does exactly what you expect it to do, does it well and does not degrade you in the process. In fact, it could also save you a few dollars. **C**

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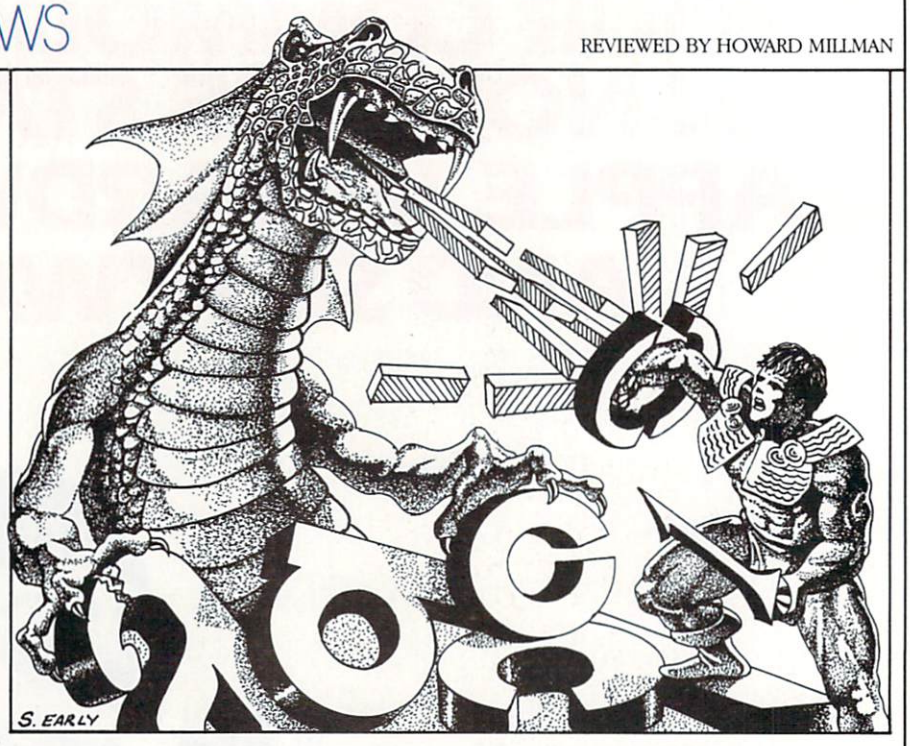
Circle Reader Service No. 23

REVIEWED BY HOWARD MILLMAN

Dungeon of the Algebra Dragons

Computer: Commodore 64
Publisher: Timeworks
405 Lake Cook Road
Deerfield, IL 60015
Medium: Disk/Tape



At the end of class, school may be over but your child's education isn't. And even though computer simulations now replace the drudgery of rote, most kids, given a choice, would rather play computer games than computer math. But why not do both? Enter the dragon.

Timeworks' entertaining educational package, *Dungeon of the Algebra Dragons*, skillfully manages to weave its subtle, yet effective, educational message by masquerading as an adventure game. It promises to entertain and sustain a child's interest by combining lively 3D color graphics, music and animation with an assortment of dragons, poisonous spiders, bottomless pits and ghosts to create just enough diversion to maintain a keen interest.

After reading the brief instruction manual, I booted the disk on my 64 (I recommend only the disk since the cassette version takes 15 minutes to load). The program then asks for your choice of four levels. Picking one, two or three enters a predetermined difficulty level of algebra questions—ranging from easy to modestly difficult—and the number of perils. The fourth level allows you to individually vary each of the program elements.

The story starts with the redheaded hero bravely walking into a castle where he promptly falls through a trap door and lands in a subterranean dungeon. Here the adventure begins.

Our carrot-top adventurer wanders through the dungeon collecting gold coins while seeking the two magic keys that will enable him to escape. Each room has three exits. He is guided through these exits into adjacent rooms by either keyboard directions or a joystick.

In his travels, he is confronted with a variety of fearsome challenges: hidden pits (some are bottomless and therefore deadly), ghosts that carry him off to other rooms (and occasionally drop him into pits), poisonous spiders whose bites are lethal and, of course, the dragons.

Whenever a dragon appears, all action freezes and an algebra problem flashes onto the screen. For a correct answer, you are rewarded with gold coins and the dragon quickly disappears in a starburst blaze. A wrong response, however, gets you the electronic equivalent of a raspberry, along with the right answer. The number of dragons encountered as well as the intricacy of the problems are determined from the difficulty level chosen.

Eventually, our adventurous hero, who with your skill and some good fortune has survived, finds both magic keys. So starts the final segment of the adventure. He still meanders from room to room, but now only searching for the ladder to ascend to the next higher floor. There are three floors in the dungeon and where you are when you decide to exit determines how many ladders you must find. Incidentally, climbing the ladder is just one of many humorous graphics sequences.

There are four ways to end this adventure: finding both magic keys and the topmost ladder; falling into a bottomless pit; suffering three poisonous spider bites and dying; or simply turning off the computer. Children are unlikely to opt for the last, since this adventure is just too engrossing to walk away from.

As an educational package, *Dungeons of the Algebra Dragons* will serve children eight to 13 years old. Even if the child hasn't had any algebra, the level one questions and concepts are simple enough to be explained by an older child or adult.

As an entertainment-only package, the age group would extend to include four to early teens. One note of caution: since there is no way to defeat the educational function, which is really a plus, younger players may be stumped at the dragon's questions. Their only solution is to enter any number and accept the agony of a raspberry.

Speaking of agony, if you flub too many answers, the dragon becomes ill-mannered and devours our redheaded hero. Fortunately, teachers usually have more patience.

The more advanced questions include squaring and square root functions, so a calculator should be on hand. Although it's appropriate to call *Dungeon of the Algebra Dragons* an adventure game, which indeed it is, any game that requires a player to solve algebraic equations with a calculator is no ordinary fare.

Dungeon of the Algebra Dragons belongs at the head of its class. **C**

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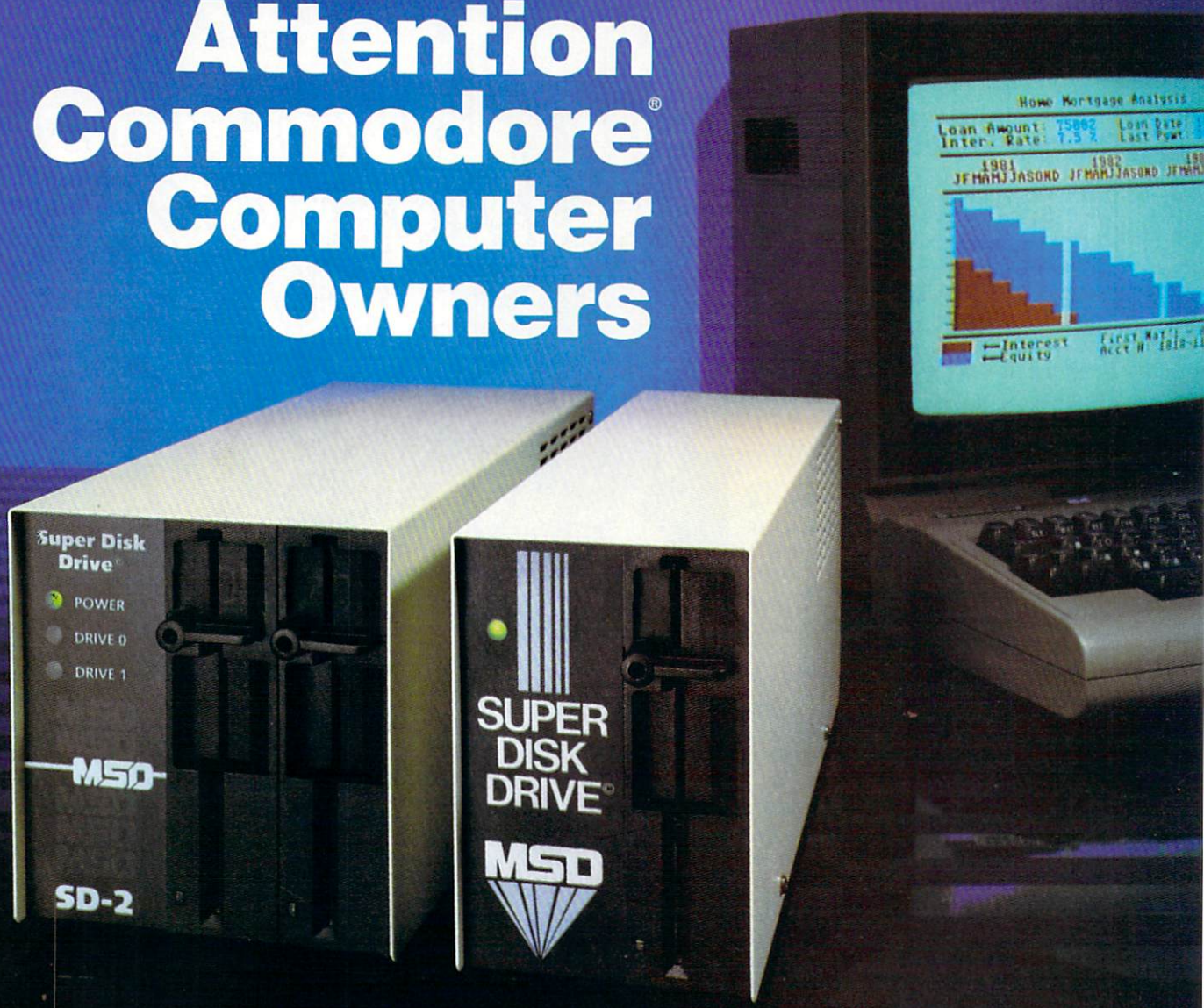

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Circle Reader Service No. 25

REVIEWED BY TED SALAMONE

Phone Boss

Computer: Commodore 64
Publisher: SoftPeople
2042 Marshall Avenue
St. Paul, MN 55104
Medium: Disk

Most people try to get by with *ad hoc* databases created on slips of paper so infinitesimal they make atoms look like apples.

If you're one of them, now's the time to step up in the world. Assert yourself and get organized. SoftPeople's *Phone Boss* can help. Intended primarily for home use, this specialized database for the 64 allows users to create their own phone directories.

However, *Phone Boss* boasts so many features and exhibits such outstanding flexibility that it can also be used by small businesses. (I use it to handle hundreds of names and numbers belonging to software houses, PR firms and magazines).

Completely menu driven, *Phone Boss* takes all of ten minutes to master. Reading the manual takes marginally longer, though doing so is still strongly recommended.

Phone Boss actually consists of two programs, "Phone" and "Copy". The former does the work, the latter allows computerists to make up to five program backups (for personal use).

All activities branch out from the main menu. Up to fifteen categories per directory are permissible; each entry can then go into as many of the classifications as desired.

Existing entries can be altered or erased with a few keystrokes. Listings can be output alphabetically (all 26 or a specified range only), by phone number, area code, category or name (first or last) to the screen or a printer. Output to a printer blanks the video, so don't panic.

Should a category be in need of a more descriptive title, the heading can be changed effortlessly. Classes can also be eliminated just as easily. Be warned though, *Phone Boss* won't do your thinking. That's up to you.

The custom directories can be saved to any disk having at least 40 free blocks, though saving to the program disk is not a good idea.

Naturally, what goes up (write) must come down (read). Pulling the file from disk storage is a simple routine made even easier by the "read directory" option. This helps forgetful people like me keep track of files without having to load the wedge or a similar utility to have a look.

Phone Boss even provides a memorable exit. Select option nine and the 64 returns to the opening screen while awaiting the next program. A warm start always does something for me.

Phone Boss is a pleasure to use, especially since it remembers the last main menu option selected. When you are doing a series of the same tasks, such as entering new numbers, hitting the RETURN key upon completion of each listing automatically re-engages the same function.

The program also contains handy touches like a programmable area code entered by simply hitting the RETURN key. Set to the most commonly occurring digits, this feature can greatly reduce the stroke count.

All entries (comments section included) hold up to 255 characters, though commas and colons aren't permitted. When editing a selection, only the incorrect areas have to be retyped. Pressing RETURN causes the corrected fields to be accepted as is. Constant users will love this feature.

Though it executes a bit slowly at times, SoftPeople's *Phone Boss* is a pleasant surprise. Reasonably priced, well done and nicely documented, it has what it takes to make the grade. **C**

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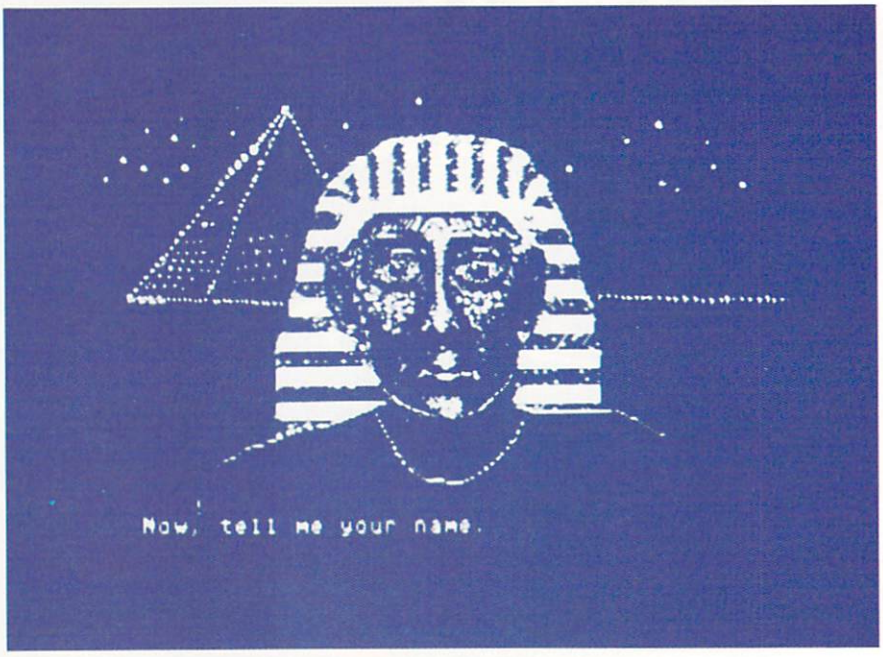
Circle Reader Service No. 41

REVIEWED BY TED SALAMONE

The Hypnotist

Computer: Commodore 64
Publisher: Psycom Software
2118 Forest Lake Drive
Cincinnati, OH 45244
Medium: Disk



Hypnosis is an induced state of inner awareness that is used today mainly to treat people wishing to break bad habits. (It's also used in police investigations, though not as dramatically as the press would have us believe.) Willing subjects can undergo hypnotic therapy quite successfully to lose weight, stop smoking, gain confidence, manage stress and the like.

If this sounds like something you could use, don't look in the phone book. Just switch the 64 on, load *The Hypnotist* and sit down for a spell.

The package includes software, a manual and a biofeedback device for monitoring your pulse. One end of this device is worn on a finger, the other is plugged into the 64. Boot up *The Hypnotist* and you're ready to enter the Habit Modification, Biofeedback, Regression or Superlearning routines.

Kurian, a pixellated ancient Egyptian priest is the tour guide. (Don't stare into his eyes for very long.) When you enter the program, he inquires (displayed text with moving lips soon to be a real voice) which routine you would like to run. The "Biofeedback" segment must be selected initially, because it provides the individual pulse rate information needed by the rest of the program.

Inputting a target pulse rate of 99 is recommended the first time around. From there, it's a matter of selecting lower and lower targets until the rate can't be reduced any further.

The manual describes progressive relaxation techniques as aids to help soothe rattled nerves. Letting the tension drain away by simultaneous reduction of mental stress is accomplished through controlled breathing. Don't worry, doing yoga, standing on your head or chanting mantras isn't a prerequisite.

At times, a picture of an ancient Egyptian woman facing a seated animal-headed, human-bodied god is displayed, while an original composition of peaceful music plays in the background. Participants are supposed to focus on any one area of the scene to enhance the trance induction process. However, the constant whirring of the disk drive does make it difficult to concentrate.

After a predetermined period of time with the art and audio, a purple pendulum appears onscreen. Swinging to a metronome-like beat, this dayglo trinket does its stuff. In step two, it careens wildly about the video display, just like a strobe.

In "Habit Modification", specific words are paired with habit names to help reinforce, alter or eradicate the habit. For instance, negative words like puke and scab might be paired with a habit you want to break. Effective? No doubt about it!

Perhaps the most unusual section is the one entitled "Regression." Kurian conjures up remembrances related to the time span selected for recall. A doodle called "Memory Fragments" dances across the screen. These random shapes are meant to aid the recall process as does the well known Rorschach inkblot, though they looked to me like an Etch-a-Sketch gone haywire.

Because "Superlearning" has premade and accepts user-made files, the list of topics is limitless. These video flash cards, which can be output to a printer, have many useful applications, including memory enhancement and rehearsing public speaking material.

Although *The Hypnotist* appears to have helped me beat deadline-associated stress, Psycom makes no guarantee about its use or effectiveness. After all, nothing's foolproof!

Although a proper evaluation can't be made without the correct scientific and statistical testing procedures and hardware, I can tell you that the stress reduction/pulse monitoring segment worked for me. So did the word association routine. Naturally, everyone is different, so other people will no doubt report different results. But it is on the strength of these two that I recommend *The Hypnotist*. **C**

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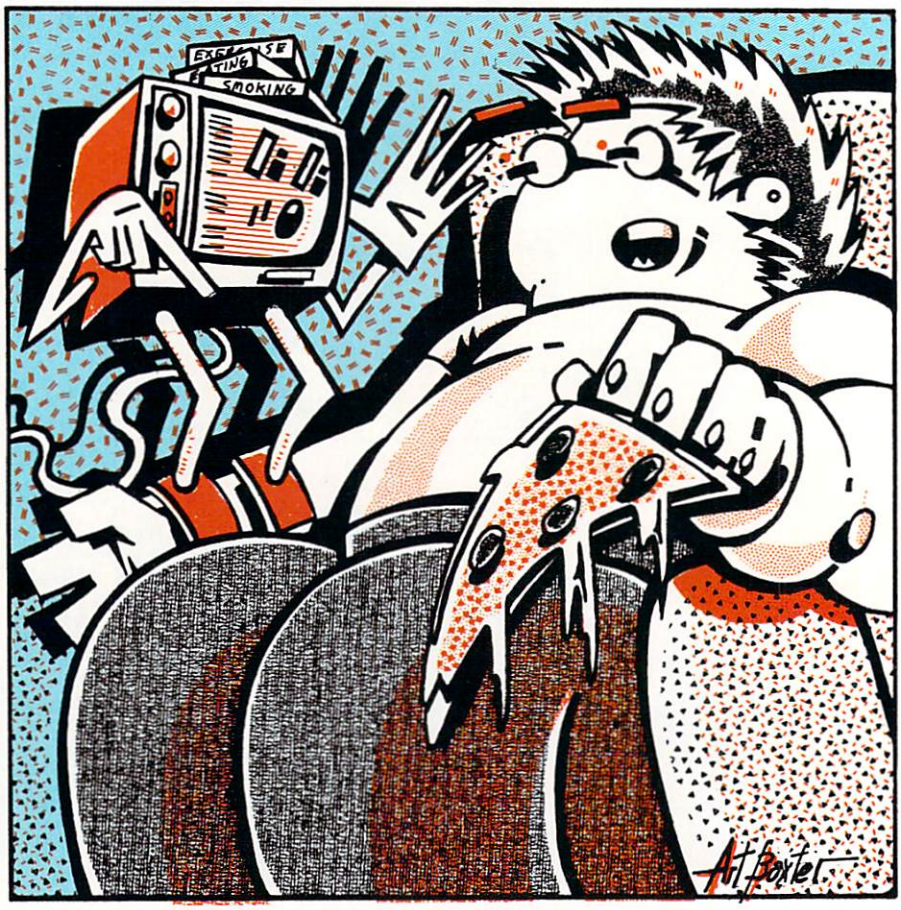
Circle Reader Service No. 26

REVIEWED BY ROB SKALSKI, COMMODORE CUSTOMER SUPPORT

Expando-Vision

Computer: Commodore 64, VIC
Publisher: Stimutech
3711 Plaza Drive
Ann Arbor, MI 48104
Medium: Disk/tape/cartridge



Most of us are aware that our subconscious mind—the part of us that is not accessible to conscious thought—has power in our lives, for better or worse. *Expando-Vision*, a subliminal message generator from Stimutech, is designed to draw on that power to help overcome bad habits and establish good ones.

Subliminal means "below the threshold of consciousness." Psychologists claim that positive subliminal messages, flashed on a screen so quickly that you do not consciously realize they are there, can help you develop more positive thought patterns. Your conscious mind doesn't know you are seeing the messages, but your subconscious retains the positive influence. (This effect, by the way, can also be created with audio messages transmitted at very low decibels, just below your ability to consciously hear them.)

The *Expando-Vision* package includes an interface between your computer and television set that allows messages to flash across the screen every two to three minutes while you are watching TV. The messages last about one-thirtieth of a second and are not perceived by your conscious mind. The multiplexing unit includes all the necessary cables and adapters needed to successfully (and easily) mix the *Expando-Vision* signal with a standard television antenna signal, a cable television signal or a VCR or video disk signal. There are detailed, step-by-step instructions with complete diagrams and a troubleshooting chart.

Installation is just slightly more involved than connecting your computer to your television set. The only difference is that the *Expando-Vision* interface goes in place of the computer/TV switchbox. There's nothing to it. All you need is a screwdriver. If you do run into some unforeseen difficulties, however, there is a customer service number provided in the instruction pamphlet through which you can receive prompt, courteous assistance.

Once the *Expando-Vision* unit is in place, you can choose either *Expando-Vision* with TV, TV only or computer only. It is a one-time installation that won't interfere with television viewing or computer usage.

A couple of points to be noted, though. Since your Commodore computer signal is received on only channel three or four, the *Expando-Vision* system is effective only while watching these two channels, whether it be antenna or cable television. VCR or video disk systems do not have this limitation.

There is also the possibility of that nasty little annoyance called RFI (radio frequency interference). Since *Expando-Vision* generates radio frequency waves, you may experience some interference. However, Stimutech lists suggestions for resolving this problem in the instruction pamphlet, and Stimutech will grant you a full refund if you are not satisfied with the product within the first thirty days after purchase.

The basic package sells for $89.95. However, this does not include any software. The software is sold separately in disk, cassette or cartridge form. Currently, there are eight different software packages available. Each is developed by, according to Stimutech, a team of qualified psychologists in a clinical environment using the most advanced behavior research data available. Each package is tailored to develop and discipline a different area of your personality. Areas include:

1) Weight Control/Exercise
2) Control Smoking/Calm Nerves
3) Stress Control/Positive Thinking
4) Control Drinking/Responsibility
5) Athletic Confidence/Golf
6) Study Habits/Memory Power
7) Career/Success Motivation
8) Sexual Confidence

Once the *Expando-Vision* interface is hooked up, flick on your computer and load the program into memory. After a welcome screen, there will be a menu screen. Each program package contains five subliminal message sets, and each set

Continued on p. 115

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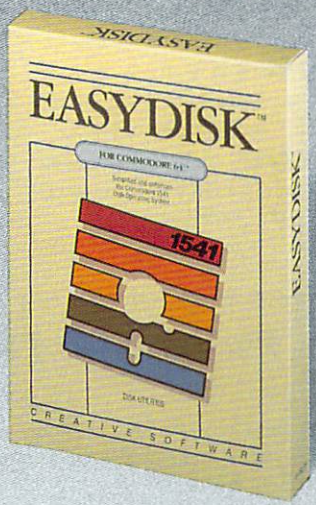

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230 East Caribbean Drive, Sunnyvale, CA 94089

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Circle Reader Service No. 11

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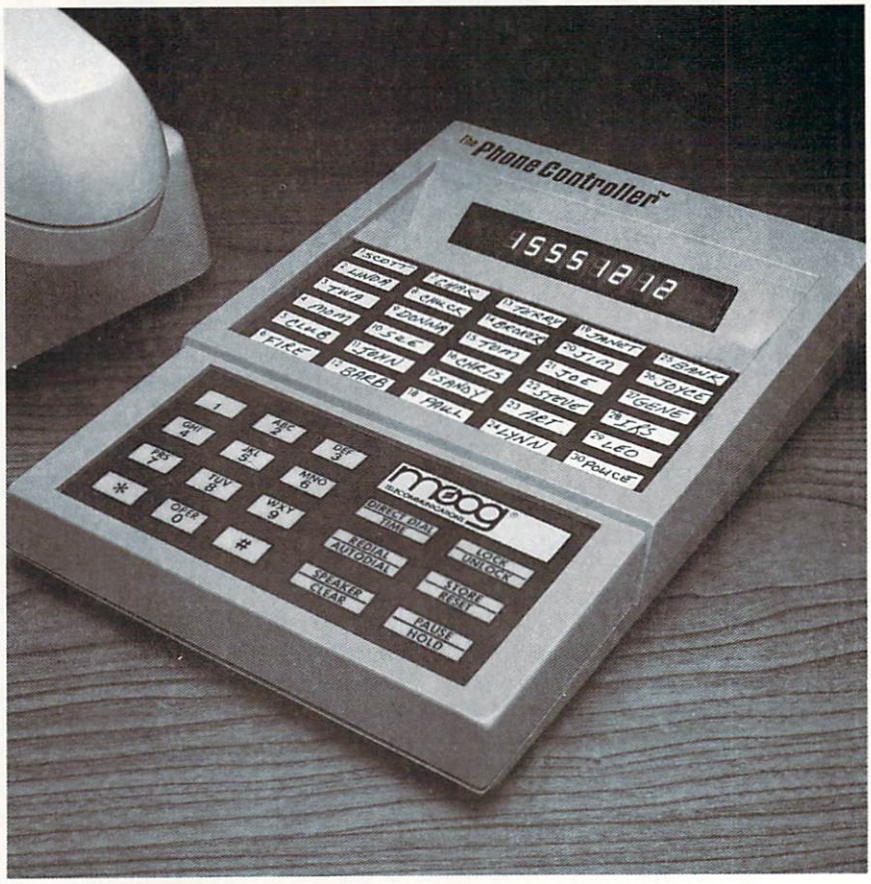
10. Error Eraser. Dial a single wrong number, no need to redial whole number. Push clear button, error is erased.



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REVIEWED BY KELLEY ESSOE

The Factory

Computer: Commodore 64
Publisher: HesWare
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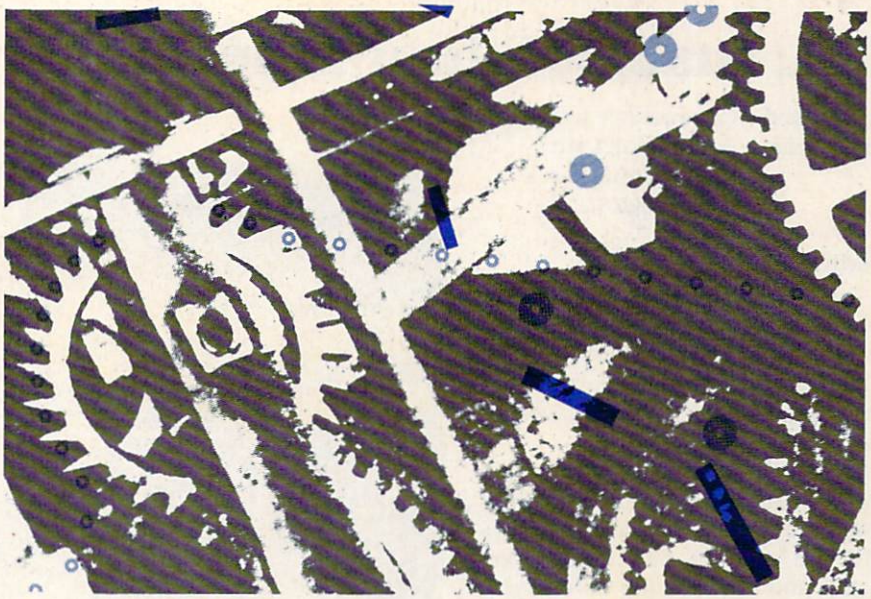
Suite 35
Brisbane, CA 94005
Medium: Disk



LESLIE SWAN

The package says "Think you can run a factory all by yourself? The machines are ready and waiting for you...for ages seven years and up."

Up to where? After having played with HesWare's *The Factory* for an embarrassing amount of time, I think that *any* brain, however aged and wrinkled, can benefit from the simple method that *The Factory* employs to teach, sharpen and exercise crucial problem-solving skills. I will even go so far as to propose that playing games like this one could very well hold off the debilitating onslaught of senility indefinitely.

I admit, at first glance, *The Factory* is not too impressive. But that's before you catch on to the fact that it was not *meant* to dazzle you with its graphics nor to raise your blood pressure with a multitude of brilliant auroral screens and feverish split-second action. This program was meant to stimulate you the old-fashioned way. This program was meant to make you think.

Remember thinking?

Playing *The Factory* awakens a child to basic problem-solving techniques and strengthens his or her grasp of fundamental logic as well as introducing simple mathematical concepts. If you told all of that to the kids, you'd never get 'em to even try it out. So just tell them the simple truth. Tell them it's fun. You can tell yourself the same thing.

In technical terms, *The Factory* employs both the users' right-brain perceptive/creative powers and left-brain logistic/analytical abilities. More importantly, it trains and coordinates these diverse hemispheres to work as a team to produce a beneficial end result. (I know, sounds pretty boring to me, too.)

Fortunately, all this coordinating and integrating of the old gray matter happens behind the scenes as sort of a beneficial side effect. All you or your kids will notice is that you are suddenly obsessed with meeting the challenge of *The Factory's* assembly line product creation.

In order to best illustrate how this program works, I will recount for you, blow by blow, my first experience with running a factory.

Once I load *The Factory*, I am presented with a five-choice menu, number five being "Exit." I choose number four, instructions, as I haven't really done any more than flip through the 16-page manual.

The instructions tell me that if I choose job number one, entitled "Test a Machine," I can see what each of *The Factory* machines does, how they work and what options are available for each of the three types of machines. If I choose job number two called "Build a Factory," I can choose up to eight machines, specifying their options, in order to create a product of my own invention, assembly-line style. With job number three, "Make a Product," the program will create a product and then challenge me to recreate it by choosing the correct sequence of machines in the assembly line. I can choose an easy, medium or hard challenge.

After picking job number one, I discover that my factory makes its end product out of a piece of raw material that looks to me like a flat square of thick sheet metal. The machines at my disposal are punch machines, rotation machines and stripe machines. The punch machines can make up to three punches, which can be either square or circular. The rotating machines turn the square of raw material counterclockwise at either a 45-, 90-, 135- or 180-degree rotation. The stripe machines paint stripes across the raw material according to your choice of thin, medium or thick stripes.

Armed with that knowledge, I immediately go to job number two in order to build my first factory. Eight empty modules in two rows of four take up the top half of the screen. Below them I am prompted with "Choose a Machine". I pick my first machine by moving a little blue box over to the word "stripe" using the "<" and ">" keys and pressing RETURN. The menu immediately changes and asks me how wide I want the stripes. I move the box over the word "thin." Ta-da! The first blank module has transformed into a cute green-stripe machine.

By the time I have created my assembly line, I have filled all eight modules with a random assortment of colorful machines. I've got a blue two-square-hole-punch machine, a 90-degree orange and yellow rotation, a one-circular-hole punch, a thick-striper, a 135-degree rotation, another two-square-holer and a final thin-striper.

Then they all go busily to work: drilling, turning and striping, moving parts, with sound effects and all, to make my product. How thrilling! I still don't have the faintest idea what it was that I created.

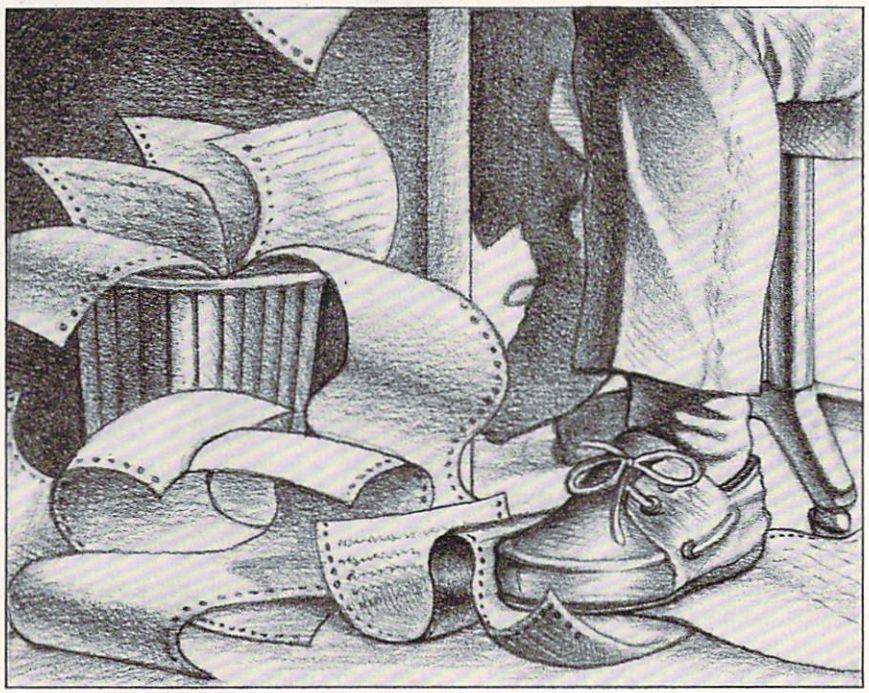
A note: plan the end product be-

Continued on page 114

REVIEWED BY STERLING AUGUSTINE

IEA: Instant Editor Assembler

Computer: Commodore 64
Publisher: Robin's Software
10349 Zinran Circle
Bloomington, MN
55138
Medium: Disk



STEPHEN EARLY

Instant Editor Assembler is a fast, versatile, editor/assembler for writing assembly language subroutines and programs for the Commodore 64.

The package contains three main programs and nineteen subprograms and files. The first main program, "IEA/SYS,"adds 15 new editor commands and nine pseudo op-codes to the built-in Commodore BASIC text editor. Using these new editor commands allows you to create assembly language source files. After assembling the source file, you must use the other programs supplied on the disk to finish writing your program.

Along with "IEA/SYS,"you also get "Monitor" and "Walk." "Monitor" is another name for the popular one-line assembler/disassembler "Micromon" which can be used to edit the mneumonic instructions or binary files, created when you assembled the source text using "IEA/SYS." "Walk,"on the other hand, is a special debugging program used to step or trace through your assembled programs.

One of the most impressive features of "IEA," is that all three main programs ("IEA/SYS," "Monitor" and "Walk") can reside in memory at the same time, each activated by a simple SYS command. And even with the three programs in memory, there is still plenty of room left for your own programs. You may revise, assemble and debug a program without having to access the disk. This feature can save you time between versions of your programs.

Another feature of *IEA* worth noting is its speed in assembling the completed source text. "IEA/SYS" is capable of assembling 17K bytes (17,408 bytes) of source text in less than four seconds. This incredible speed makes *IEA* one of the fastest assemblers on the market. There is nothing more frustrating than having to wait for a long program to finish being assembled and then having to go through the entire process again after discovering a mistake. When the assembly time is this fast, you don't get upset when you find a mistake.

Let's examine the features of each of the main programs in the *IEA*:

IEA/SYS

"IEA/SYS" adds 15 commands and nine pseudo op-codes to the BASIC editor and is very easy to use. Your assembly source files are stored in exactly the same format as BASIC source files, with both files using line numbers. All of the standard BASIC commands work normally with "IEA/SYS" while the BASIC and assembly source files reside in memory simultaneously. Either file may be edited at any time without interfering with the other.

There are, however, some limitations to having both BASIC and assembly source files in memory at the same time. The assembly source lines must have lower line numbers than the BASIC lines and the assembly source lines must end with the pseudo op-code .EN to signify the end of the assembly file. That way, when you assemble the source file, *IEA* will see where BASIC starts.

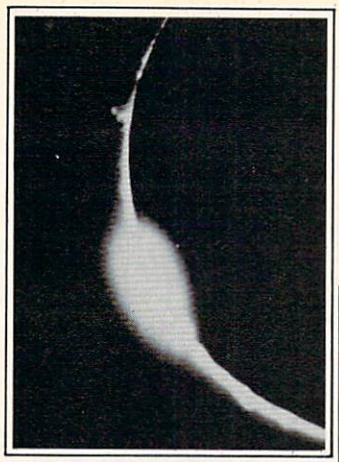
For first-time assembly language programmers, things can be very confusing, but some assembler editors, fortunately, are easier to learn than others. "IEA/SYS" is one of these. Labels (up to eight characters long) may be used to define the start of a subroutine or section of your program. Without labels, it can be very difficult to keep track of where each subroutine is located.

Monitor

"Monitor," as mentioned earlier, is actually the program "Micromon." It has 25 commands used to produce executible assembly language programs. In "IEA,"there are two versions of "Monitor" supplied on the disk. Both versions work exactly the same; only the location of the program storage is different. This approach allows you the flexibility to have your programs reside at either HEX $9000 or HEX $C000.

"Monitor" is a very impressive monitor program. Its many features are easy to learn and use. You will be able to generate well organized assembly language routines that will

Continued on page 115



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Commodore 64 Benchmark (Sieve of Eratosthenes)	PROMAL	BASIC	COMAL	FORTH	PASCAL	
Execution Time (secs.)	30	630	490	51	55	
Object Code Size (bytes)	128	255	329	181	415	
Program Load Time (secs.)	3.2	3.8	6.3	11.2	23.5	
Compile Time (secs.)	8.5	—	—	3.9	108	

As the benchmark results in the table show, PROMAL is much faster than any language tested. From 70% to 2000% faster! And it generates the most compact object code. The PROMAL compiler is so fast that it can compile a 100-line source program in 10 seconds or less. And, not only is it fast in compile and run time, it also reduces programming development time.

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- Procedures w/passed arguments
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- String search and replace
- Block copy, move, delete & write to/read from file
- Auto indent, undent support

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REVIEWED BY ELIZABETH DEAL

CalcResult

Computer: Commodore 64
Publisher: Handic Software
520 Fellowship Road
Mt. Laurel, NJ 08054
Medium: Disk/Cartridge

The writers of *CalcResult*, a spreadsheet for the Commodore 64, clearly understand Commodore computers. All keystroke sequences are natural and keys you would expect are the ones used for functions. Cursor keys are so named and used extensively. While I would have preferred the CTRL key instead of the F7 key to be used as a control key, I do find the overall setup easy to use.

The spreadsheet is built by entering data and formulas onto the screen. The program right-justifies the numbers and left-justifies the titles. Both can be overridden by the user. The data can be copied, deleted, inserted and moved into any position. Data is protected against accidental loss by requiring you to verify a command that is potentially damaging. This is fabulous, since you can abort a function before the damage is done.

Data in the spreadsheet can be saved on disk (tape is used in the Easy version only). However, the manual specifies that you can also save just a portion of a spreadsheet. This is true in the Advanced version, but not true in the Easy version, which always saves 66 blocks.

Data can be printed out in any format, including bar charts. You specify; it need not be the same as on the screen. The screen may have columns five characters wide, but there is nothing to stop you from printing the values ten characters wide.

In contrast to some inferior spreadsheet programs, *CalcResult* lets you obtain a printout of any portion. You can also do screen dumps (you can always cut and paste later if needed). My only objection to the dumps is that blank lines are output even when the screen contains only a few rows on top. But then, it permits alignment if you do cut and paste.

Last, but not least, the *raison d'etre* of the spreadsheet program: data manipulation. What if the interest rate is 11% instead of 12.5%? The salary in row two column B is increased by $100? I take depreciation on equipment this year instead of next? And more: take the smaller of the two numbers in rows 17 and 19, now take the smaller of that result or the number in chart A...does that sound like an income tax report?. You bet but why not? Fabulous stuff for universal applications.

In contrast to some spreadsheets,* CalcResult *lets you obtain a printout of any portion. You can also do screen dumps.

You don't really tell the computer to take the smaller of anything. You tell it in words the computer understands. At any coordinate where you want a result, you write: IF B5>B11 THEN 1*B5 ELSE D24. See that TRUE/FALSE THEN/ELSE clause? Many spreadsheets don't have that. Most useful! A most reasonable selection of arithmetic functions has been provided, including some statistical functions such as RND, mean, standard deviation and counts.

I can't emphasize enough the versatility of this spreadsheet. The beauty of the system is that instead of having on hand dozens of little programs written for specific applications (checkbook balance, income tax helper, property evaluation, spending charts, planning charts, etc.), you have an all-purpose program that can handle them all. However, you must learn the ropes and once you do, all the data is handled in the same way. You do not have to learn a dozen different approaches.

But don't kid yourself into thinking that you can begin using this thing immediately. I have never mastered *VisiCalc*, for instance, and almost gave up on the editing and setup features in *CalcResult*. Learning is rough. The manual is fairly good. I was unable to get correct arithmetic in a very simple 5X5 setup until the illustrious technical editor of this magazine steered me in the right direction with one sentence—which is missing in the *CalcResult* manual.

What the manual doesn't tell you very clearly (when it does, it's with no fanfare and much too late) is what impact the program has on the results of calculations, which may appear wrong depending on placement of formulas. All spreadsheet packages, apparently, work that way and one needs to learn the logic by trial and error. Once you come to grips with the correct placement of things or with the use of the recalculation feature, the rest is so simple that I'm ashamed to admit that I almost drowned in problems.

Another difficulty I encountered has to do with the typesetting. It is most confusing that F7 can stand for a coordinate and a Function-7 key. While the manual is crystal clear and consistent in using single quotes for function keys and double quotes for coordinates, I confused them, of course, while learning the examples in the manual. So a word of advice: take a magic marker to your manual. Now put a square around every group of letters that are in single quotes. That includes all functions keys (F7, F3, F5, etc.). You'll save yourself a lot of trouble later.

As I mentioned before, you enter your data onto the screen. You do the same with formulas. The formulas can be used both for calculating final results, as well as in data entry. No need to type a row of years: 1983, 1984, and 1985. A replicated formula (at A5 we place A4 + 1) does the trick

Continued on page 38

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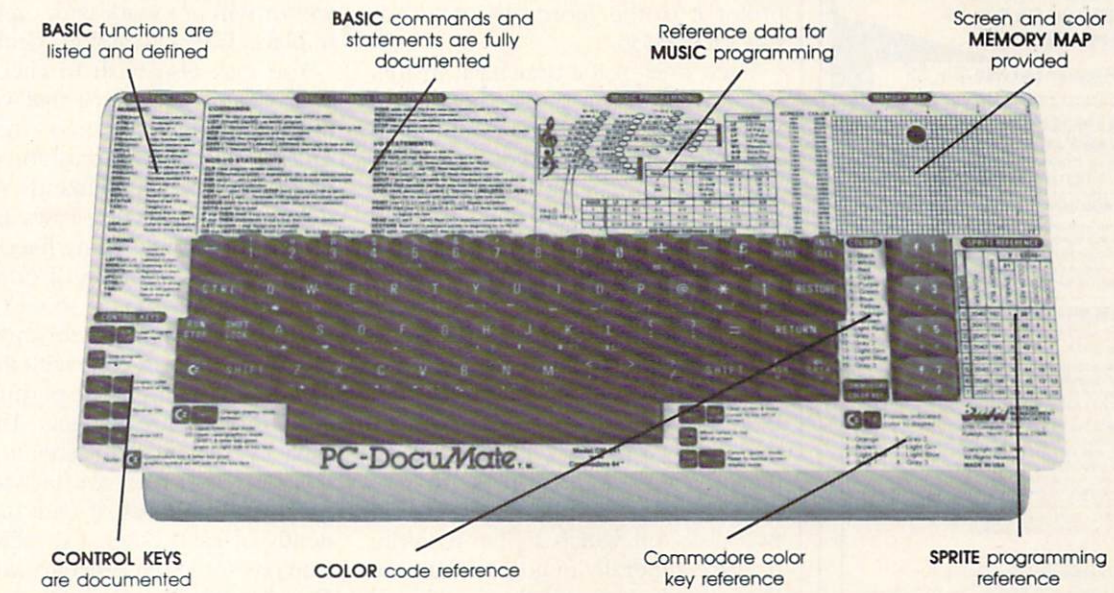

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SOFTWARE REVIEWS

for as many positions as you need. Once again, the manual fails to advise you that you must declare a format prior to formula repetition or otherwise you'll be struggling with wrong formats.

I only wish that the manual contained at least one example which uses all the features on one chart. Sometimes they teach you a trick, but they never tell you why you need it.

The Easy Version

The Easy version of the program is a cartridge and can store to either tape or disk. It can handle two-dimensional spreadsheets with values arranged in up to 254 rows and up to 64 columns—the total configuration being a maximum of 1,000 entries. It requires no program loading, hence the startup time is fast. All functions work well with the exception of disk handling. In my opinion, this version is the better choice. I prefer it to the more elaborate Advanced version.

I see one major drawback in this version: there are no disk commands. As a result there is no way to communicate with the error channel. You have no way of knowing what the error is nor can you take any corrective action. This is a real shocker! However, the incredible variety of data manipulations you can do with *CalcResult* overshadows the primitive disk handling.

Nevertheless, I am being careful. Before running *CalcResult*, I check the floppy directory to make sure that I have no asterisk files, there is enough room on the disk and the two disks on which I plan to write data are generally in good condition. Once that is done, it's clear sailing all the way. A pleasure to use.

The Advanced Version

The Advanced version consists of a cartridge and a 120-block program on disk that needs to be read into the computer (several minutes of waiting!). The floppy containing the 120-block program is required to be present at all times. Your data is stored on the program disk. You need to have three disks for safety. Making them is a time-consuming, difficult procedure. Making backups is equally time-consuming. To add insult to injury, all the disks are named Backup and all three have the same ID number. You have to rely on magic markers and envelope numbering to keep things straight.

I find this unsatisfactory. It invites corruption of data. At one point I had six disks, all the same name and all the same ID. There is no way of telling which is which! I learned a long time ago that you never, ever insert a disk of the same ID into the drive. Hence, this seems to be a totally unworkable solution.

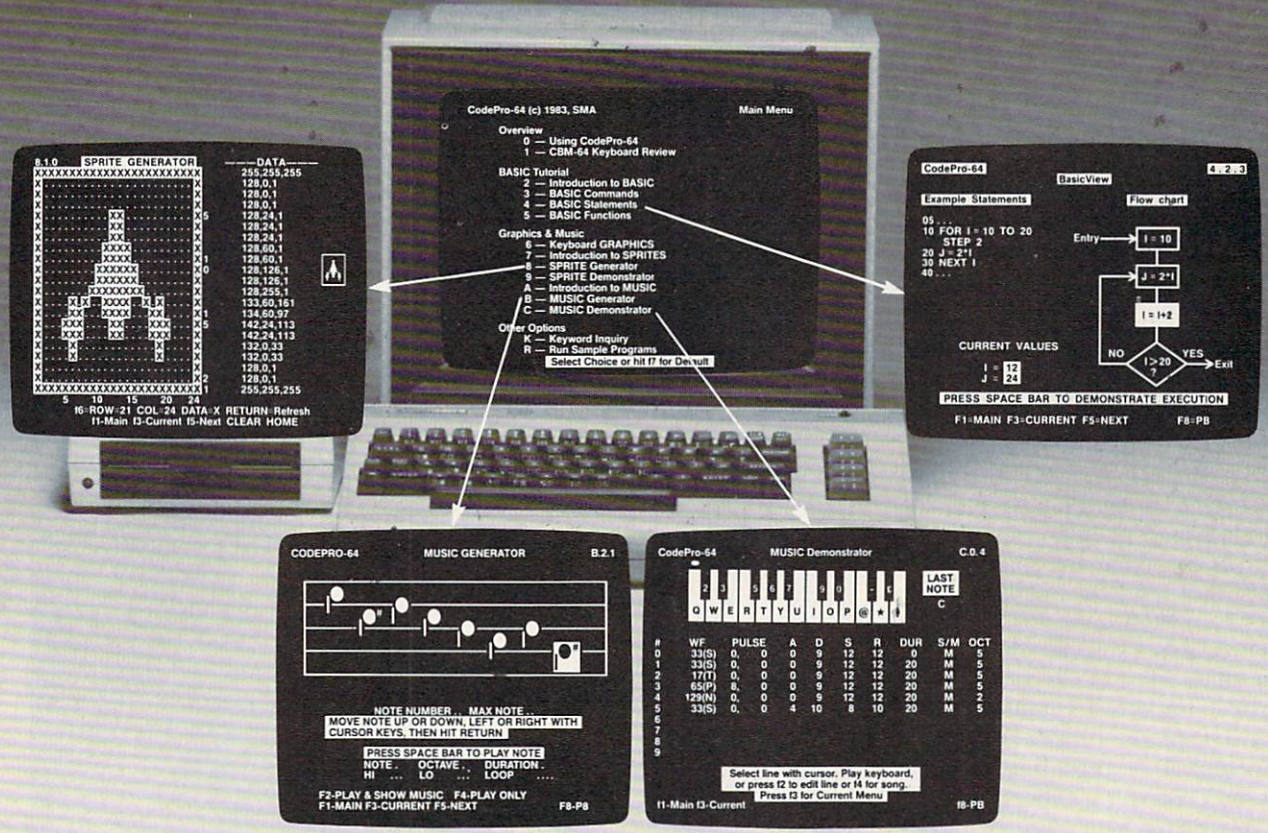
On the other hand, the dual disk version of this package should provide an adequate solution. You format your disk as you wish and it is kept separate from the program disk. It seems to me that the existing Advanced version can also be used to your advantage if you have a dual drive. However, I haven't tried that configuration. The manual is silent on their memory management. It is hard to predict which IEEE interfaces will or will not work with *CalcResult* in place. Check with your dealer.

You may also wish to check with your dealer to ensure that you are buying the newest version available. An early version will crash on several memory-moving commands, such as deleting and inserting rows and columns. This is now being fixed.

This newest version of *CalcResult* is more powerful and should be the preferred version for serious applications. If you can cope with the disk-handling jungle, it will permit three dimensional spreadsheets. The data capacity is larger than other versions. You can work with overlay windows and scroll sections of data independently of each other. (The Easy version has some reference to windows. The manual shows how to clear one, but not how to make one, so I don't know what we really have.)

You can output data in the DIF format (undocumented!) and you can pick the screen and character colors (once only). You also have HELP screens in one of eight languages. Frankly, I think the HELP screens are a waste of valuable memory; all they do is show onscreen the commands available to you at the moment. You still have to go to the manual to see how it can be used.

Overall evaluation: splendid product in spite of lapses. **C**



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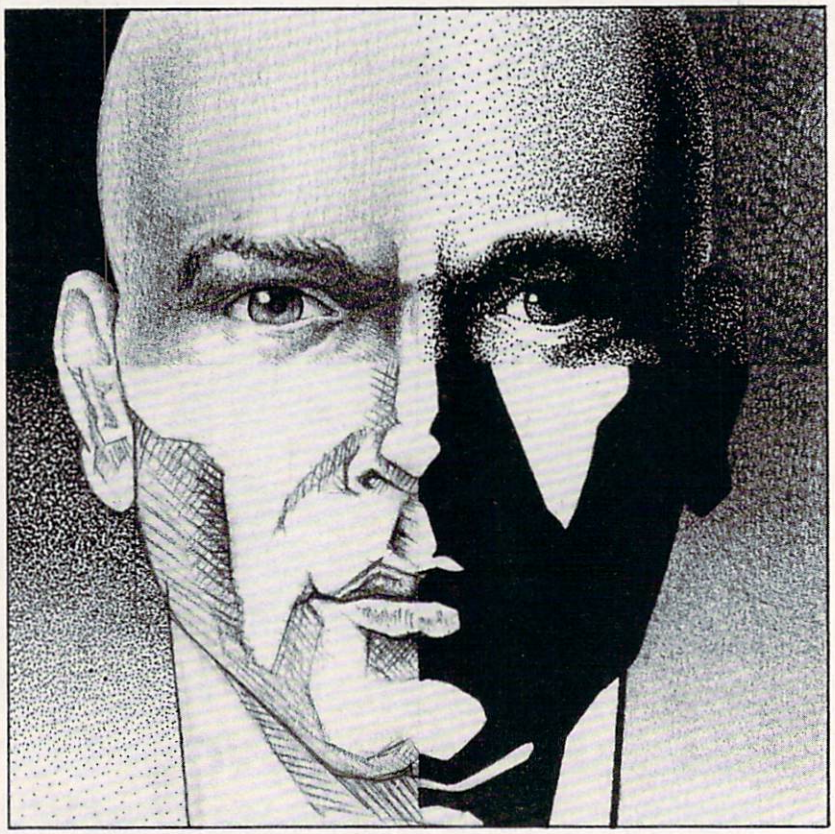
REVIEWED BY TED SALAMONE

Personality Analyzer

Computer: Commodore 64
Publisher: Psycom Software
2118 Forest Lake Drive
Cincinnati, OH 43244
Medium: Disk/Tape



STEPHEN EARLY

Based on Carl Jung's teachings and philosophy, *Personality Analyzer* digs deep into the cognitive and intuitive aspects of man's inner workings.

Personality Analyzer uses a multi-level electronic questionnaire that is similar to corporate and military psychoanalytical tests. By cross-tabulating replies to related questions, the program produces a surprisingly accurate personality outline of the participant.

Stock-in-trade are questions like, "Do you prefer the current or historic, the incidental or organized, the abstract or concrete?". Others include, "Do you prefer to analyze or evaluate?" and, "Are you more governed by whim or habit, intuition or experience?".

This approach has a way of making respondents willingly divulge the information needed for a true-to-life personality readout. Since *Personality Analyzer* accepts bipolar responses, it can fine tune its analysis. For example, in reply to the question, "Do you prefer to analyze or evaluate?" someone might contemplate various scenarios in which either answer would be true. Instead being forced to give merely a black or white answer, respondents can (via a joystick) split the reply proportionally along both lines.

It works like this: a histogram appears onscreen with the question. The right and left ends of the X axis are labelled as the two choices. Levels of commitment, ranging from zero to seven, are delineated horizontally along the axis.

Pulling the controller away from the screen activates the bipolar feature, allowing participants to split their ballot, so to speak. Moving the joystick then positions the "greater than" cursor over the selected position on the histogram. Hitting the firebutton inputs the answer as specified. Control options are provided, making it easy to either leave a question unanswered or to backtrack to the most recent entry for a change of heart. A changing pitch audio feedback feature lets respondents know where the cursor is on the scale. As a result, eye strain can be reduced or avoided because your eyes don't have to be glued to the screen.

Psycom does print a disclaimer about the *Personality Analyzer*. Sold as an entertainment program, it isn't meant to replace professional help. This is true, but it doesn't diminish the value of any insights gained from it.

Completed survey results are tabulated and displayed onscreen. Printer output is user selectable. (Take advantage of this feature if you can, for most guests guard their analyses like gold. It's interesting to watch people's reactions.)

The readout lists personality characteristics and assigns the resulting numerical values to different categories: extravertive, intuitive, thoughtful and judgmental. Additionally, introvert, sensation, feeling and perception classes are included as a balance. Categories with the highest totals determine the diagnosis of the person's personality type.

A main occupational classification (scientist, journalist and such) and a grouping of attributes and characteristics particular to the participant follow. Probable occupations and behavioral patterns are indicated. A most treasured item (independence, for example) and potential weaknesses (lack of emotional understanding, procrastination) are also highlighted.

Psycom's brainchild is at its best when working with honest answers. It can be extremely enlightening and entertaining. Just remember to take its output with a grain of salt as with all psychometric tools. This caveat is no indication of a poorly executed program though, since it produces specifics from a broad base of data that includes traits found in large segments of the population. Within these parameters, it does quite a remarkable job.

Personality Analyzer is a thought-provoking product that can teach users about human nature. In my book, that benefit alone makes it an interesting educational tool. **C**

For The C64

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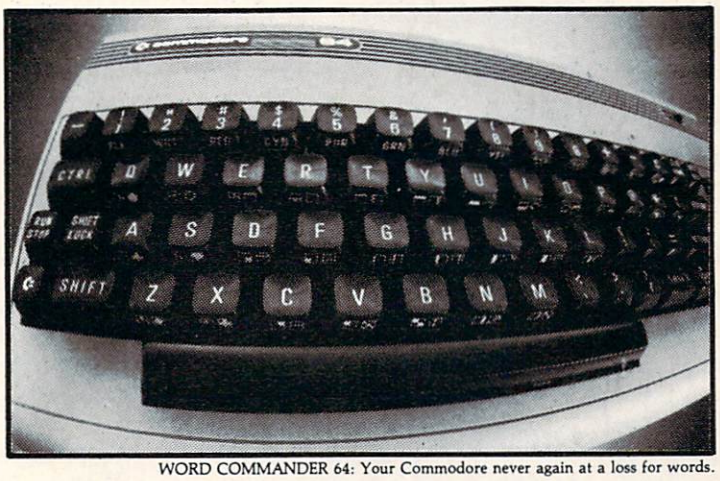

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BY DAVID R. BROOKS

An Introduction to BASIC List Sorting

You can write reasonable sorting procedures in BASIC, but your choice of techniques makes a substantial difference in the results. The most common method of sorting lists, for instance, which owes its popularity to the fact that it's short and easy to understand, is by far the most inefficient. In BASIC, and Commodore BASIC is no exception, the slowness of this simple approach may lead the beginning programmer to believe that sorting in BASIC is hopeless. The truth is that better techniques can help significantly.

Of course, choosing the "best" technique depends on the problem being addressed. With this in mind, let's take a look at some approaches to sorting lists. I'm going to discuss five different procedures, each accompanied by a corresponding BASIC program. For those of you with the inclination to look farther into the details of sorting, I recommend: Donald E. Knuth, *The Art of Computer Programming, Volume 3/Sorting and Searching*, Addison-Wesley, 1973. This classic work contains extensive discussions of much of what I'm going to show you, but usually not at a level that's accessible to the casual BASIC programmer.

The fact is that managing expenses and budgeting is a natural application for computers, but it's really not feasible to write your own programs without some understanding of sorting procedures.

The Bubble Sort

The Bubble Sort is the notoriously inefficient procedure I mentioned above, so *please* don't use it just because it's the one I mention first in my discussion!

Let's review what a sorting program (or subroutine, more probably) should do. We start with a list of numbers (or characters) in some arbitrary order. We'd like to put this list into a specific order. We have the choice of ascending or descending order for numbers and the equivalent in alphabetical order for characters. A Bubble Sort program for numbers is given in Listing 1.

Line 50 generates a random list of integers from one to N. Lines 70-90 sort the list in ascending order. Lines 60 and 100 read Commodore "jiffies" from the variable TI in order to time the sorting procedure. (One jiffy is 1/60 second.) The sorted array is printed in line 110. Note that the sorting procedure itself takes only three lines!

The arrangement of the Bubble Sort program will be shared by the other programs I'm going to discuss in this article. First, a specified number of items is generated in random order and printed. Then, just at the beginning and end of the sorting procedure itself, the computer time (in jiffies) is stored. Finally, the sorted list and sorting time is printed.

The Bubble Sort works by comparing each item in the list with the preceding one. If the item is smaller than the preceding one, then the items are exchanged. The exchange is performed by storing the value of item A(I) in the variable T, replacing A(I) with A(I-1) and finally giving A(I-1) the value stored in T.

Note that the original list is sorted "in place" without taking additional memory space for the sorted array. This is called a "replacement" sort.

After the first trip through the loop on I, from two to J (the second part of line 70), the largest element in the list will be at the top (because J = N). This is the source of the name Bubble Sort: the largest element appears to float to the top like a bubble.

On the second trip through the loop on I, the upper limit J is lowered to N-1 because the largest item has been moved to the Nth position and we don't have to worry about it anymore. You can observe this bubbling by replacing line 90 with:

```
90 NEXT:FOR K=1 TO N
   :PRINT A(K);:NEXT
   :PRINT:NEXT
```

There are two more things to notice about this program. First, you can put the list in descending order simply by replacing the "<" in line 80 with a ">." Second, you can sort characters just as easily as numbers by making use of the fact that each character is represented by a numerical (ASCII) code. (See pages 135 of the Commodore 64 user's guide, for example.) I'll have more to say about character sorting later.

At first glance, this simple program appears to be a solution to the sorting problem. But there's a catch. Let's look at the time required to sort lists of different lengths, as shown in Table 1. The time for the Bubble Sort to put a list of length N in ascending or descending order varies from one second for N = 10 to 117 seconds for N = 100. This time can be represented by the function: sorting time = aN seconds, where N is the number of items to be sorted and "a" is a constant determined simply by trying the Bubble Sort program. For my 64, I determined the value of a to be about 0.012. But no matter how small the value of a, the catch is that the time required to sort a list is proportional to the square of the number of items in the list. Thus, a list of 100 numbers takes 100 times as long to sort as a list of 10 numbers! And if the list has 1000 items it would take about 12,000 seconds, or 200 minutes, to sort with Bubble Sort! If you want to sort and organize lists like these, you might well conclude that a BASIC program will be too slow to be useful.

The first step toward speeding up the sorting procedure is to understand the source of the problem. Note that in the Bubble Sort, a large item on its way to the top of the list advances only one item at a time, by comparisons and exchanges. Now let's look at an algorithm that attempts to shorten this path.

The Shell-Metzner Sort

The Shell-Metzner Sort, shown in Listing 2, uses a different approach to produce exactly the same results as the Bubble Sort. There's no point pretending that this algorithm is as easy to understand as the Bubble Sort, but let's look at how it will start for a list of 20 items. Line 70 sets M to ten. Line 80 sets J to one and line 90 sets I to one. Line 100 sets L to $1+10=11$. Now, in line 100, the first item is compared with the eleventh item in the list and exchanged with it, if required, in line 110. This is the crucial step in the program. If the first item in the list is large, all the intermediate comparisons that would have been done by the Bubble Sort have been eliminated. It's not easy to follow what happens next, but the idea is that, on the average, the Shell-Metzner Sort will eliminate a lot of the step-by-step exchanges that the Bubble Sort goes through. The theory for optimizing this sorting operation is, as mathematicians like to say, "nontrivial."

The performance of the Shell-Metzner Sort is also shown in Table 1. The relationship between time and the number of items in the list is mathematically more complicated now; its exact form isn't important for our purposes. Suffice it to say that the Shell-Metzner Sort takes only about 25 times as long to sort a list of 100 numbers as it does 10, whereas the Bubble Sort takes 100 times as long. This is a significant improvement over the Bubble Sort, and it gets even better as the list gets longer. Sorting a list of 1,000 items should take only about six minutes instead of the 200 required by the Bubble Sort.

Can further improvements be made? Yes, and the key to understanding how is to note that both the Bubble Sort and the Shell-Metzner Sort operate on the entire list at once. The Bubble Sort is a "brute force" technique, whereas the Shell-Metzner Sort gains efficiency by trying to minimize the number of exchange operations performed.

Bubble Sort is a "brute force" technique; Shell-Metzner gains efficiency; and Heapsort and Quicksort subdivide a list to reduce the overall sorting time.

Heapsort and Quicksort

These two sorting procedures are much more difficult to understand than the first two. Both of them attempt to speed up the sorting of long lists by breaking the list into shorter pieces in particular ways.

To see how this works to our advantage, consider a simple sorting procedure like the Bubble Sort which takes N time units to sort a list of N items. A list of 100 items requires 10000 time units, but two lists of 50 items each will require only $2\times2500=5000$ time units. If the list could be further broken down into ten lists of ten items each, it would then require only $10\times100=1000$ time units to sort.

Heapsort and Quicksort spend some of their time subdividing the list to be sorted in order to reduce the overall time required to sort the list. Programs for Heapsort and Quicksort are given in Listing 3 and 4. Although they look harmless enough, a full analysis of both programs is really beyond the scope of this article. The proof that they work, and work well, is found in their performance, as shown in Table 1.

You can see that Quicksort is substantially faster than the Shell-Metzner Sort, taking only about 17 seconds to sort 100 numbers, whereas Heapsort is about the same as the Shell-Metzner Sort. I should point out, however, that the absolute and relative performance of each of the programs I've shown you depends somewhat on the length and initial order of the list to be stored. A random list is a good starting point for testing, but it's not necessarily a full or totally fair comparison of the procedures. For example, Quicksort's performance can be shown to deteriorate badly under certain conditions (it doesn't do very well with lists that are initally almost in order). On the other hand, it can be shown that Heapsort's worst performance is not much different from its average performance.

The Distribution Counting Sort

I'd like to look at just one more sorting technique. The programs I've shown you so far have at least one important thing in common: they are designed to work with any list of items. This ignores the fact that some lists have properties that lend themselves to a particular approach.

Let's take sorting alphabetical characters as an example. This task has one notable feature: no matter how many items there are in the list, there will never be more than 26 *different* items (the letters A-Z). The Distribution Counting Sort goes through a list of letters and counts the appearances of each letter. This list of categories is used to construct a sorted version of the original list of items. Because the original list of N items has to be processed only twice, once for counting and once for producing the new sorted list, sorting time for this procedure is proportional to N (instead of N^2, for example). A Distribution Counting Sort program is shown in Listing 5a.

As always, the ultimate test is performance, as indicated in Table 1. Sorting 100 alphabetical characters takes only about four seconds. You can sort 1000 characters in only 40 seconds! The advantage of the Distribution Counting Sort over Quicksort increases as the list gets longer. It's interesting to note that every list of length N takes exactly the same amount of time to sort. There are no worst cases for the Distribution Counting Sort!

The observant reader may notice a

possible hidden cost of the Distribution Counting Sort: it's not a replacement sort. The sorted list (S$ in the program) and the original list (A$) must coexist in memory. So, sorting a list of N letters requires array storage space of 2 × N, plus space for the distribution counting array (C$). Is this a problem? It depends on your application and equipment. The 64's memory, for example, may hold a much longer list than can be sorted in a "reasonable" length of time, whereas the VIC 20 might not have any memory to spare.

In any case, this method can be transformed into a replacement sort at the expense of (what else?) time. I've given such a version in Listing 5b. Except for the distribution counting array and a few variables for temporary storage (which are required for all replacement sorts), a list of N letters requires an array storage space of only N.

Applying Sorting Techniques to Real Problems

The different properties of these sorting techniques will become more significant as you apply them to real problems. Technique does make a difference. We've seen that, for a list of 1000 items, the sorting times have varied from four to 120 seconds, and for 1000 items the projected range (I haven't tried the worst case) is from 40 to 12000 seconds!

However, I haven't told you the bad news: nobody much cares about sorting lists of numbers or letters. The interesting problems are all a little more complicated than that.

Suppose, for example, you want to write a program for recording and analyzing household expenses. You'd like to be able to enter and store the expenses in any order. Then, at some later date, you'd like to be able to sort the expenses according to either type or date for the purpose of calculating subtotals.

Flexible list sorting is a requirement for such a program. Note that it won't be sufficient to sort expenses *only* by type *or* date. You need to be able to sort both ways to get an effective analysis.

At this point you may disagree with my formulation of this particular problem. However, I maintain that it is generally representative of problems you will face.

When the computer evaluates multi-character strings, the decisions it makes are the same ones you would make if you were alphabetizing words by hand.

Many lists you will want to sort will contain several variables (in the form of character fields) within each record (for example, the date, type of expense and amount), and any one of these several fields should be usable as the primary "key" for sorting. To decide how to write a suitable sorting program, let's make up a short list of household transactions:

Household transactions in random order

12/12/83 telephone	55.50
10/20/83 telephone	40.00
12/17/83 electricity	67.00
5/ 4/83 telephone	39.50
5/ 6/83 electricity	89.50

Using a household expense program, we'd like to be able to sort this list in two different ways: by expense category and by date.

The key to sorting these multiple-field records is to realize that BASIC includes the ability to compare character strings. The computer operating system performs the comparisons by looking at the ASCII codes of the characters. Hence "A" is "less than" "B" because, at least on Commodore machines, ASC("A") = 65 and ASC("B") = 66. Similarly, "&" is "less than" "9" because of the ASCII codes assigned to these characters. When the computer evaluates multi-character strings, the decisions it makes are the same ones you would make if you were alphabetizing words by hand, but extended to include the additional characters that the computer recognizes.

These character comparisons and logical decisions are performed in machine language as the result of simple BASIC commands, and they're certainly tremendously faster than programming character-by-character comparisons yourself using the BASIC string manipulation functions. You might think that long strings would take a lot longer to compare than short ones. However, because the time required to execute machine language instructions is small relative to the time needed to interpret BASIC instructions, this difference is almost negligible.

Armed with this knowledge, we're in a better position to attack the sorting problem for multi-field records. We may first have to rearrange the fields in each record so that a left-to-right evaluation will result in the list being "alphabetized" in the desired way.

Suppose we decide to sort the list by expense category. This could be accomplished by rearranging the records in the following way:

Household transactions rearranged for sorting by type

telephone	12/12/83	55.50
telephone	10/20/83	40.00
electricity	12/17/83	67.00
telephone	05/04/83	39.50
electricity	05/06/83	89.50

Note that blanks are important: "telephone " is greater than "telephone". Note also that "5/" would be greater than "12", so proper ordering by date requires that months and days with a value less than ten must include leading zeros or spaces: "05" is less than "12".

Now we're in a position to apply any of the sorting techniques I've discussed earlier. The Distribution Counting Sort is immediately attractive because of its speed, but in the present case the number of sorting categories is not small compared to the potential number of items in the list. If we require that "telephone 12/12/83" be greater than "telephone 10/20/83" (rather than being content to collect all "telephone" expenses, or even all expenses beginning with "t", in whatever order they happen to occur) then every day in the year for

each expense type constitutes a separate sorting category. This will mean, in general, that the number of possible categories will *exceed* the length of the original list of expenses. As a result, storing the counting array can be a real problem.

There are two directions we can take now. We can forget about the Distribution Counting Sort and use an alternate sorting technique, or we can combine the Distribution Counting Sort with another method. For the latter case, we could use the Distribution Counting Sort to sort the records by the primary key, either month or first letter of the type of expense, and then use another technique to sort the records within each primary category. This takes advantage of the fact that there are only 12 possible months, and we would assume that there are fewer expense categories than there are records.

Combining two different sorting techniques will require some extensive programming, so let's look at the simpler case first. Program Record Sort 1 in Listing 6 illustrates how to sort expense records by type or month using Quicksort. Here's an explanation of how it works.

Lines 130-320: Store a list of 20 expense records in data statements. In a real application, this information would be stored on an external file and there would be many more than 20 records!

Lines 330-350: Read the records and rearrange them in random order each time you run the program.

Line 360-390: Select the primary sorting key, either expense type or date. Read the current computer time (in variable TI). Select field boundaries for rearranging the records prior to sorting. (For the data as given, the rearranging could be eliminated for sorting by date because the records are already arranged properly.)

Lines 400-420: Rearrange the records.

Line 430: Calculate the computer time (in jiffies) required to rearrange the data. Read the current computer time.

Lines 430-570: Quicksort, as previously described in Listing 4.

Lines 580-620: Calculate computer time required to sort the list and print all the results. Note that what

Commodore uses dynamic memory allocation for string variables.

I've called rearranging time has to be counted in evaluating the total performance of this program. Record Sort 1 takes about four seconds to sort the list of 20 records.

At this point I'd like to introduce one more idea about sorting, which applies only when the list being sorted consists of multi-character records rather than single characters or numbers.

Commodore computers use what's known as dynamic memory allocation for string variables. This means, essentially, that you're never quite sure where the elements of A$ (in Record Sort 1) are going to be stored. For long lists of records, the operating system will sometimes have to tidy up its memory allocation, and this operation can be very time-consuming.

A way to avoid this problem is to sort, not the records themselves, but only pointers to the records. This is called Tag Sorting. Record Sort 1 can easily be converted to a Tag Sort, retaining the Quicksort procedure, by making these changes to Listing 6:

```
120 N=20:DIM A$(20),TG(20)
330 FOR I=1 TO N:READ A$(I)
    :TG(I)=I :NEXT
450 M$=A$(TG(INT((L+F)/2)))
    :I=F:J=L
460 IF A$(TG(I))<M$THEN
    I=I+1:GOTO 460
470 IF A$(TG(J))>M$THEN
    J=J-1:GOTO 470
500 T=TG(I):TG(I)=TG(J)
    :TG(J)=T
590 FOR I=1 TO N:PRINT A$
    (TG(I)):NEXT
```

These changes don't noticeably change the program performance; it still takes about four seconds to rearrange and sort 20 records. However, substantial time saving should result whenever the number of records is large enough to activate the operating system's memory allocation cleanup routine. Note that Tag Sorting requires an array of length N (20 in this case) to hold the tags. This might seem to double the storage requirements, but it doesn't because each element of the tag array takes much less space than each record of the data array.

Putting It All Together

Now we're ready for a program that ties together all the ideas I've discussed. It uses a combination of the Distribution Counting Sort and Quicksort, as well as the Tag Sorting concept. Don't fall into the trap of thinking that long, complicated code can't possibly be more efficient than a short, simple code. Especially for sorting, the structure of the procedures, not their length, determines program efficiency. The potential differences in performance are sufficiently large that we can tolerate quite a bit of programming overhead to arrive at an efficient sorting scheme.

Program Record Sort 2 is given in Listing 7. This program is an expansion of Record Sort 1 that uses a two-level sorting process. The first level is a Distribution Counting Sort applied to part of the primary field, either expense category or date. For sorting by category, the list is arranged according to the first letter of category description. For sorting by date, the list is arranged according to the numerical value of the two characters representing the month.

The Distribution Counting Sort uses a nonreplacement approach, but the new array that's generated is a list of pointers (tags) rather than a sorted copy of the original list of records. The second sorting level is a Quicksort applied to the items in each category. The result is that expenses within any category are always in chronological order.

The program is written without REMs to keep its operation as efficient as possible. Here's a discussion of how it works.

Lines 140-340: Dimension arrays and specify a set of 20 test records.

Lines 350-360: Shuffle the A$ array into random order at the start of each program run. This is done for program evaluation because the program performance depends somewhat on the original order of the records.

Lines 370-400: Decide to sort according to type or date. Start timing

the sorting process by reading the jiffy clock value in TI. For sorting by type, specify the location of the first character in the type description. The value SH allows the ASCII values of letters A-Z (65-90) to be shifted to numbers 1-26. Specify the number of categories (12 or 26) for each choice.

Lines 410-420: Generate the distribution counting arrays for sorting by expense category or date. If a list contains, for example, five words starting with A, three with B and six with C, then C(1)=5, C(2)=3 and C(3)=6. I've used a completely separate FOR . . . NEXT loop for each sort because this is more efficient than an IF . . . THEN test within a single loop.

Line 430: Convert the distribution counting array into a cumulative array. This means that each element in the array contains a number equal to the total number of entries corresponding to that element and all earlier ones. For the example above, the first three elements of C will become C(1)=5, C(2)=8 and C(3)=14. In a subsequent operation the C array will be destroyed, but its values will still be needed for the second level of sorting, so another array, C1, is defined which will preserve the values stored in C.

Lines 440-470: Do the Distribution Counting Sort for expense category date. Note that the new array produced during the sorting is a pointer array TG and not the sorted version of the original array. (See the discussion of Listing 5a.) Since the tag array will generally take much less space than the character fields, this is a more efficient approach. It's also easier to program, and executes faster than the replacement version of a Distribution Counting Sort. (See Listing 5b.)

Lines 480-640: Do a Quicksort on each category (from one to CT). Note that Quicksort is very easy to apply to any portion of a list. The first and last elements to be sorted appear directly only once, where they're assigned to variables F and L in line 500.

Lines 650-680: End the sort timing by reading the jiffy clock. Print the sorted array by using the TG array as an index. This should be suitable for most purposes, although you may be able to envision circumstances in which a tag sort such as this wouldn't be as convenient as literally reordering the original records. **C**

Table 1. Time for BASIC sorting of lists of length N.

Method	Number of items in list, N					
	10	20	40	60	80	100
Bubble Sort	1	4	18	41	75	117
Shell-Metzner Sort	1	3	7	12	19	25
Heapsort	2	3	8	13	18	24
Quicksort	1	3	6	9	13	17
Distribution Counting Sort	1	1	2	3	3	4
Distribution Counting Sort with Replacement	2	2	4	6	6	8

Listing 1. Bubble Sort

```
10 REM PROGRAM BUBBLESORT
20 REM DAVID R. BROOKS, MAR. 84
30 DIM A(100)
40 INPUT"HOW MANY ITEMS";N
50 FOR I=1 TO N:A(I)=1+INT(RND(0)*N)
   :PRINT A(I);:NEXT:PRINT
60 T1=TI
70 FOR J=N TO 2 STEP-1:FOR I=2 TO J
80 IF A(I)<A(I-1)THEN T=A(I)
   :A(I)=A(I-1):A(I-1)=T
90 NEXT:NEXT
100 PRINT"TIME UNITS ="TI-T1
110 FOR I=1 TO N:PRINT A(I);:NEXT
    :PRINT
120 STOP
```

Listing 2. Shell-Metzner

```
10 REM PROGRAM SHELL-METZNER
20 REM DAVID R. BROOKS, MAR. 84
30 DIM A(100)
40 INPUT"HOW MANY ITEMS";N
50 FOR I=1 TO N:A(I)=1+INT(RND(0)*N)
   :PRINT A(I);:NEXT:PRINT
60 T1=TI:M=N
70 M=INT(M/2):IF M=0 THEN 150
80 K=N-M:J=1
90 I=J
100 L=I+M:IF A(I)<=A(L)THEN 130
110 T=A(I):A(I)=A(L):A(L)=T:I=I-M
    :IF I>=1 GOTO 100
120 I=I-M:IF I>=1 GOTO 100
130 J=J+1:IF J>K THEN 70
140 GOTO 90
150 PRINT"TIME UNITS ="TI-T1
160 FOR I=1 TO N:PRINT A(I);:NEXT
    :PRINT
170 STOP
```

Listing 3. Heapsort

```
10 REM PROGRAM HEAPSORT
20 REM DAVID R. BROOKS, MAR. 84
30 DIM A(100)
40 INPUT"HOW MANY ITEMS";N
50 FOR I=1 TO N:A(I)=1+INT(RND(0)*N)
   :PRINT A(I);:NEXT:PRINT
60 T1=TI
70 M=N:FOR L=INT(N/2)TO 1 STEP-1
   :B=A(L):GOSUB 120:NEXT
80 L=1:FOR M=N-1 TO 1 STEP-1:B=A(M+1)
   :A(M+1)=A(1):GOSUB 120:NEXT
90 PRINT"TIME UNITS =";TI-T1
100 FOR I=1 TO N:PRINT A(I);:NEXT
    :PRINT
110 STOP
120 I=L
130 J=I+I
140 IF J>M THEN 190
150 IF J=M THEN 170
160 IF A(J+1)>A(J)THEN J=J+1
170 IF B>=A(J)THEN 190
180 A(I)=A(J):I=J:GOTO 130
190 A(I)=B
200 RETURN
```

Listing 4. Quicksort

```
10 REM PROGRAM QUICKSORT
20 REM DAVID R. BROOKS, MAR. 84
30 DIM A(100),F(15),L(15)
40 INPUT"HOW MANY ITEMS";N
50 FOR I=1 TO N:A(I)=1+INT(RND(0)*N)
   :PRINT A(I);:NEXT:PRINT
60 T1=TI
70 S=0:F=1:L=N
80 M=A(INT((L+F)/2)):I=F:J=L
90 IF A(I)<M THEN I=I+1:GOTO 90
100 IF A(J)>M THEN J=J-1:GOTO 100
110 IF I>J THEN 160
120 IF I=J THEN 140
130 T=A(I):A(I)=A(J):A(J)=T
140 I=I+1:J=J-1
150 IF I<=J THEN 90
160 IF I>=L THEN 180
170 F(S)=I:L(S)=L:S=S+1
180 L=J:IF F<L THEN 80
190 IF S=0 THEN 210
200 S=S-1:F=F(S):L=L(S):GOTO 80
210 PRINT"TIME UNITS ="TI-T1
220 FOR I=1 TO N:PRINT A(I);:NEXT
```

Listing 5a. Distribution Counting Sort

```
10 REM DISTRIBUTION COUNTING SORT
20 REM DAVID R. BROOKS, MAR. 84
30 DIM C(26),A$(100),S$(100)
40 INPUT"HOW MANY ITEMS";N
50 FOR I=1 TO N:A$(I)=CHR$(65+INT(RND
   (0)*26)):PRINT A$(I);:NEXT:PRINT
60 T1=TI
70 FOR I=1 TO N:T=ASC(A$(I))-64
   :C(T)=C(T)+1:NEXT:REM C(T)
   CONTAINS # ENTRIES FOR T
80 FOR K=1 TO 26:C(K)=C(K)+C(K-1):NEXT
90 FOR J=N TO 1 STEP-1:T=ASC(A$(J))-64
   :I=C(T):S$(I)=A$(J):C(T)=I-1:NEXT
100 PRINT"TIME"TI-T1
110 FOR I=1 TO N:PRINT S$(I);:NEXT
    :PRINT
120 STOP
```

Continued next page

Listing 5b. Distribution Replacement

```
10 REM DISTRIBUTION COUNTING SORT
20 REM REPLACEMENT VERSION
30 REM DAVID R. BROOKS, MAR. 84
40 DIM C(26),A$(100)
50 INPUT"HOW MANY ITEMS";N
60 FOR I=1 TO N:A$(I)=CHR$(65+INT(RND
   (0)*26)):PRINT A$(I);:NEXT:PRINT
70 T1=TI
80 FOR I=1 TO N:T=ASC(A$(I))-64
   :C(T)=C(T)+1:NEXT
90 FOR K=1 TO 26:C(K)=C(K)+C(K-1):NEXT
100 R=N
110 IF R=0 THEN 180
120 KR=ASC(A$(R))-64:IF C(KR)<R THEN
    R=R-1:GOTO 110
130 IF C(KR)=R THEN C(KR)=C(KR)-1
    :R=R-1:GOTO 110
140 R$=A$(R):KR=ASC(A$(R))-64:J=C(KR)
    :C(KR)=J-1
150 S$=A$(J):KJ=ASC(A$(J))-64:K=C(KJ)
    :C(KJ)=K-1:A$(J)=R$:R$=S$:J=K
160 IF J<>R THEN 150
170 A$(J)=R$:R=R-1:GOTO 110
180 PRINT"TIME"TI-T1:FOR I=1 TO N
    :PRINT A$(I);:NEXT:PRINT
```

Listing 6. Record Sort 1

```
100 REM RECORD SORT 1
110 REM DAVID R. BROOKS, MAR. 84
120 N=20:DIM A$(20)
130 DATA 10/15/83TELEPHONE        44.56
140 DATA 09/30/83HEATING OIL      99.99
150 DATA 01/11/83ELECTRICITY      16.50
160 DATA 01/01/83WATER            25.00
170 DATA 10/20/83WATER            33.33
180 DATA 02/22/83ELECTRICITY      67.89
190 DATA 03/23/83ELECTRICITY      78.52
200 DATA 08/15/83ELECTRICITY      44.44
210 DATA 04/21/83ELECTRICITY      45.00
220 DATA 09/15/83TELEPHONE        46.99
230 DATA 07/17/83TELEPHONE        77.77
240 DATA 12/06/83INSURANCE       160.77
250 DATA 06/12/83INSURANCE       250.88
260 DATA 05/18/83ELECTRICITY      60.00
270 DATA 12/12/83ELECTRICITY     100.01
280 DATA 11/21/83ELECTRICITY      90.00
290 DATA 10/22/83ELECTRICITY      88.88
300 DATA 06/24/83ELECTRICITY      77.77
310 DATA 07/29/83ELECTRICITY      66.66
320 DATA 09/25/83ELECTRICITY      55.55
330 FOR I=1 TO N:READ A$(I):NEXT
340 FOR I=N TO 2 STEP-1:J=RND(0)*I+1
    :T$=A$(J):A$(J)=A$(I):A$(I)=T$
    :PRINT A$(I):NEXT
350 PRINT
360 INPUT"SORT BY DATE(D) OR TYPE(T)";
    Z$
370 T1=TI
380 IF Z$="T"THEN S1=9:L1=14:S2=1:L2=8
    :S3=23:L3=6
390 IF Z$="D"THEN S1=1:L1=8:S2=9:L2=14
    :S3=23:L3=6
400 FOR I=1 TO N
410 A$(I)=MID$(A$(I),S1,
    L1)+MID$(A$(I),S2,L2)+MID$(A$(I),
    S3,L3)
420 NEXT
430 T0=TI-T1:T1=TI
440 S=0:F=1:L=N
450 M$=A$(INT((L+F)/2)):I=F:J=L
460 IF A$(I)<M$THEN I=I+1:GOTO 460
470 IF A$(J)>M$THEN J=J-1:GOTO 470
480 IF I>J THEN 530
490 IF I=J THEN 510
500 T$=A$(I):A$(I)=A$(J):A$(J)=T$
510 I=I+1:J=J-1
520 IF I<=J THEN 460
530 IF I>=L THEN 550
540 F(S)=I:L(S)=L:S=S+1
550 L=J:IF F<L THEN 450
560 IF S=0 THEN 580
570 S=S-1:F=F(S):L=L(S):GOTO 450
580 TT=TI-T1
590 FOR I=1 TO N:PRINT A$(I):NEXT
    :PRINT
600 PRINT"REARRANGING TIME"T0
610 PRINT"SORTING TIME"TT
620 STOP
```

Listing 7. Record Sort 2

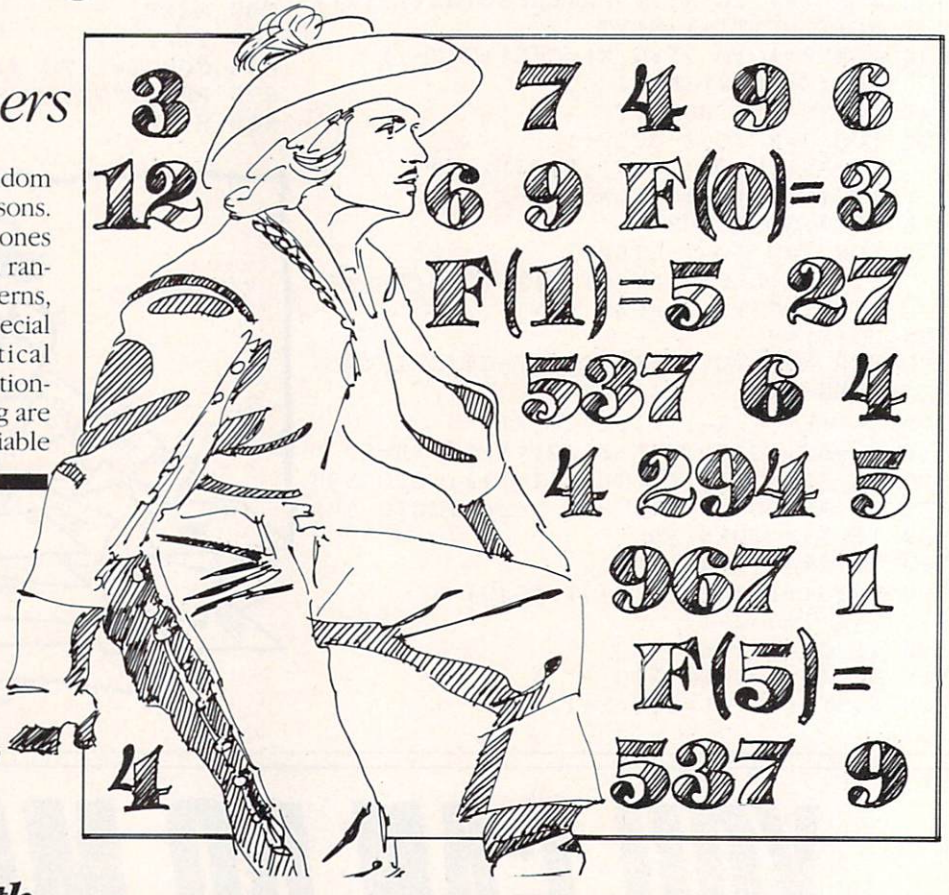
```
100 REM RECORD SORT 3
110 REM DAVID R. BROOKS, MAR. 84
120 REM DIST COUNT SORT PLUS QUICKSORT
130 REM TAGSORT VERSION
140 N=20:DIM A$(20),C(26),C1(26),
    TG(20)
150 DATA 10/15/83TELEPHONE        44.56
160 DATA 09/30/83HEATING OIL      99.99
170 DATA 01/11/83ELECTRICITY      16.50
180 DATA 01/01/83WATER            25.00
190 DATA 10/20/83WATER            33.33
200 DATA 02/22/83ELECTRICITY      67.89
210 DATA 03/23/83ELECTRICITY      78.52
220 DATA 08/15/83ELECTRICITY      44.44
230 DATA 04/21/83ELECTRICITY      45.00
240 DATA 09/15/83TELEPHONE        46.99
250 DATA 07/17/83TELEPHONE        77.77
260 DATA 12/06/83INSURANCE       160.77
270 DATA 06/12/83INSURANCE       250.88
280 DATA 05/18/83ELECTRICITY      60.00
290 DATA 12/12/83ELECTRICITY     100.01
300 DATA 11/21/83ELECTRICITY      90.00
310 DATA 10/22/83ELECTRICITY      88.88
320 DATA 06/24/83ELECTRICITY      77.77
330 DATA 07/29/83ELECTRICITY      66.66
340 DATA 09/25/83ELECTRICITY      55.55
350 FOR I=1 TO N:READ A$(I):NEXT
360 FOR I=N TO 2 STEP-1:J=RND(0)*I+1
    :T$=A$(J):A$(J)=A$(I):A$(I)=T$
    :PRINT A$(I):NEXT
370 PRINT:INPUT"SORT BY DATE(D) OR
    TYPE(T)";Z$
380 T1=TI
390 IF Z$="T"THEN S1=9:SH=64:CT=26
    :GOTO 410
```

```
400 IF Z$="D"THEN:CT=12:GOTO 420
410 FOR I=1 TO N:T=ASC(MID$(A$(I),S1,
    1))-SH:C(T)=C(T)+1:NEXT:GOTO 430
420 FOR I=1 TO N:T=VAL(LEFT$(A$(I),2))
    :C(T)=C(T)+1:NEXT
430 FOR K=1 TO 26:C(K)=C(K)+C(K-1)
    :C1(K)=C(K):NEXT
440 IF Z$="D"THEN 470
450 FOR J=N TO 1 STEP-1
    :T=ASC(MID$(A$(J),S1,1))-SH
    :TG(C(T))=J:C(T)=C(T)-1
460 NEXT:GOTO 480
470 FOR J=N TO 1 STEP-1
    :T=VAL(LEFT$(A$(J),2)):TG(C(T))=J
    :C(T)=C(T)-1:NEXT
480 C1(0)=0
490 FOR K=1 TO CT:IF C1(K)-C1(K-1)<2
    THEN 640
500 S=0:F=C1(K-1)+1:L=C1(K)
510 M$=A$(TG(INT((L+F)/2))):I=F:J=L
520 IF A$(TG(I))<M$THEN I=I+1:GOTO 520
530 IF A$(TG(J))>M$THEN J=J-1:GOTO 530
540 IF I>J THEN 590
550 IF I=J THEN 570
560 T=TG(I):TG(I)=TG(J):TG(J)=T
570 I=I+1:J=J-1
580 IF I<=J THEN 520
590 IF I>=L THEN 610
600 F(S)=I:L(S)=L:S=S+1
610 L=J:IF F<L THEN 510
620 IF S=0 THEN 640
630 S=S-1:F=F(S):L=L(S):GOTO 510
640 NEXT
650 TT=TI-T1
660 FOR I=1 TO N:PRINT A$(TG(I)):NEXT
670 PRINT"TOTAL SORT TIME"TT
680 STOP
```

BY MARK ZIMMERMANN

Random Thoughts

Factoring Fermat Numbers



This article fits into the "Random Thoughts" series for several reasons. First, the ideas are similar to ones that come up when dealing with random numbers: looking for patterns, breaking problems up into special cases and taking mathematical shortcuts when available. Additionally, number theory and factoring are essential to the design of reliable random number generators themselves. We'll take that up in future columns. Some factoring methods, in turn, depend on random numbers (though not the methods discussed here). In any case, this work is interesting, potentially useful and thinking "at random" is a good break from more "applied" computations.

Microcomputers can solve many problems in number theory, the branch of mathematics which deals with the properties of positive integers.

Primes and Factoring

Before plunging into the details of Fermat numbers, we need a little background on some terminology. A positive integer is called prime if it can't be divided by any other positive integer except itself and one. That is, seven is a prime because it is only divisible evenly by one and by seven. The number 91 is not a prime; it is divisible by one, seven, 13 and 91.

The numbers which can be divided into a nonprime are called its factors. Thus, 91 = 7*13 and so seven and 13 are the factors of 91. You can try to factor a number by dividing it by all the numbers bigger than one but less than the number itself; if all fail, then the number must be prime. In fact, you only need to try the potential factors between two and the square root of the number in question, since if the number has any factors, at least some must fall in that range.

To factor a bit more efficiently, you can skip the trial divisions by all the even numbers after two. You can also skip trial divisions by all numbers divisible by three after you've tried three itself. And so on . . . once you've tried any number, further multiples of that number won't divide the target.

Primes have many strange and marvelous properties. We'll see only a few of them here. For more information, you should look in any elementary number theory book.

Fermat Numbers

Pierre Fermat lived in the 17th century. He wasn't a professional mathematician, but was a highly talented amateur. The numbers which bear his name, the Fermat numbers are defined to be $F(n) = 1 + 2 \uparrow (2 \uparrow n)$ for n = 0, 1, 2 and so on.

The Fermat numbers grow very quickly because of the presence of all those exponentitation operations in the definition: F(0) = 3; F(1) = 5; F(2) = 17; F(3) = 257; F(4) = 65 537 and F(5) = 4 294 967 297. Fermat observed that F(0) through F(4) were prime numbers and speculated that F(n) was always a prime. Unfortunately for this theory, F(5) is divisible by 641. In fact, as far as is known today, all of the Fermat numbers beyond F(4) have factors and, thus, are not prime.

One reason that the Fermat numbers are important goes back to plane geometry. You may remember

that it's not hard to construct a regular triangle using a compass and straightedge; Euclid knew how, hundreds of years B.C. The Greeks also knew how to construct a regular pentagon, a five-sided figure. Notice that F(0)=3 and F(1)=5? That's no coincidence! Although the Greeks and geometers after them struggled for centuries to try to construct a regular heptagon (a seven-sided figure), they failed. It wasn't until the 18th century that Euler answered the question. He proved that only regular polygons with F(n) sides (or a multiple thereof) could be constructed (for prime F(n)). So a seven-sided figure is impossible to make with compass and straightedge, but a 17-sided one can be done.

In binary notation, F(n) looks like a string of zeros with a single one at each end. Thus, F(0)=11; F(1)=101; F(2)=10 001; F(3)=100 000 001 and so forth. No binary number like this can be a prime except for the F(n) numbers. That is, $1+2\uparrow m$ is never prime unless $m=2\uparrow k$ for some k.

Factoring Fermat Numbers

We could try to factor F(n) by trying as possible divisors all the primes less than SQR(F(n)), but that would take an inordinate amount of time. Two important ideas can help here.

First, not all primes have a chance to divide evenly into F(n). In fact, only one number in every $2\uparrow(n+2)$ can possibly be a factor! The full proof is a little tricky (and too long to include here), but mathematicians have shown that every factor p of F(n) can be written in the form

$$p=1+k*2^{n+2}$$

for some positive integer k. Only primes can succeed as factors, so even the list of candidates generated by substituting k=1,2,3, etc. into the above formula has some "non-starters." (Every third p we generate is divisible by three, for example, and could be skipped.) But even if non-prime candidates are kept, you can see that for a large n most of the primes can be skipped.

Thus, to take a specific example, when we try to factor F(5) we need only consider possible factors

Here Mark explains Fermat numbers, a little about factoring them and why it is important. He also provides a variety of programs in FORTH and in BASIC to enable you to factor Fermat numbers yourself.

k*128+1 for k=1,2,3, etc. We try 129, 257, 385 and 513 and they all fail, but when we get to k=5 and try 641, we find it divides F(5) so we have proved F(5) is not a prime! We have only needed to try one number in every 128. Note that as the value of n gets larger, the space between potential factors of F(n) gets larger too. This saves a lot of labor.

Secondly, notice that we don't actually care about the quotient when dividing trial factors into F(n); all we care about is the remainder of the division. If we want to see only the remainder, we don't need to carry a full length of $2\uparrow n$ binary digits in our arithmetic. By carefully organizing the calculation, all we need to handle is as many binary digits as are in the trial factor. To look for factors up to about four billion, for example, we need only use 32-bit arithmetic (four bytes). That will save more time and give our microcomputer more of an edge in the work.

The Factoring Algorithm

An algorithm is a detailed prescription for doing a calculation. Here, I will first give the algorithm for determining whether a given number divides evenly into F(n), expressed in words. Then, I'll present the method in BASIC.

Algorithm: To test a potential factor k of F(n) do the following:

1. Set x=1 and set $I=2\uparrow n$.
2. Double x.
3. If x>k, set x=x−k.
4. Set I=I−1.
5. If I>0, go to step two.
6. At this point, after $2\uparrow n$ repetitions of steps two through five, you are finished. If x=k−1 now, then k is a factor of F(n). If x is any other value, then k does not divide evenly into F(n).

This may sound mysterious, but to see that it's not, just get a piece of paper and work out F(5)/641 in binary. You'll find yourself doing exactly the equivalent of the algorithm in the previous paragraph. The algorithm probably is widely known; I haven't even seen it in print, though, and made up my version by myself. If any readers have improvements for it, please let me know!

The BASIC Program

In BASIC, the Fermat divisor test is easy to implement. The following program asks for your choice of n and then looks for factors of F(n):

```
100  REM PROGRAM TO FIND A
     FACTOR OF F(n)
120  INPUT "INPUT N"; N
140  T=1: FOR I=1 TO N:
     T=2*T: NEXT I: REM SET
     T=2↑N
160  REM NOW TRY FACTORS K
180  K=1: DK=2*T
200  K=K+DK: PRINT "TRYING"; K
220  X=1: FOR I=1 TO T:
     X=X+X: IF K<=X THEN
     X=X-K
240  NEXT I
260  IF X=K-1 THEN PRINT "SUC-
     CESS!": STOP
280  PRINT "FAILED": GOTO 200
```

That's all there is to it. The routine could probably be made a bit faster if more multiple statements were put on single lines. Note that I use X=X+X instead of the multiplication X=2*X in the inner loop (lines 220-240). There are two reasons for this: addition is faster than multiplication and adding X to itself avoids the need to convert a literal number ("2") from decimal to binary within the loop.

The FORTH Fermat Words

Listing 1 gives some FORTH words which should run on any standard FORTH system. The listings are fairly clear and well-structured. Here, I will just make some general comments on what is being done.

The keyword is defined in FORTH assembler. It's called D2*MOD and simply doubles the top double-precision number on the stack and performs a MOD function with the second double-precision number. If you don't want to use assembler, you can replace it with the definition:

```
: D2*MOD ( d1 d2 --- d1 2d2[mod d1] )

    2DUP D+  ( d1 2d2 )

    2OVER 2OVER D<  ( d1 2d2 f )

       IF 2OVER D- THEN

;
```

The FORTH word D2*MOD does just what the inner loop of the BASIC subroutine given above does. But FORTH is doing it in integer, double-precision arithmetic, so it should be quite a bit faster. It's also easy to see how to extend the FORTH words to higher-precision (more bits) arithmetic, especially once you understand the assembler definition of D2*MOD in Listing 1.

The remaining FORTH words call D2*MOD repeatedly to get the job done. FNTESTER tests F(n)'s divisibility by a particular potential factor and returns true or false, depending on the result. NEXTFAC finds the next potential factor to try and prints it on the screen. FERMAT, the capstone of it all, takes the number n from the stack (n<15), initializes and proceeds to seek factors of F(n).

Factoring Fermat Numbers Using FORTH

```
SCR # 49
  0 ( LOAD SCREEN FOR FNFACTOR )
  1
  2 50 LOAD 51 LOAD 52 LOAD 53 LOAD
  3 54 LOAD
  4           ;S
  5
  6 ( this screen loads all the words needed to factor )
  7 ( fermat numbers up to F[13]; say 49 LOAD to set up )
  8 ( and then 5 FERMAT [for example] to factor F[5] )
  9
 10 ( work by Mark Zimmermann, spring 1984 )
 11
 12
 13
 14
 15

SCR # 50
  0 ( D2*MOD - code to double d2 mod d1 )
  1 CODE D2*MOD  ( d1 d2 --- d1 2d2[mod d1] )
  2    ( d1 & d2 must be positive, < 2**15 )
  3    SEC ASL, SEC 1+ ROL, BOT ROL, BOT 1+ ROL,  ( d2 --- 2d2 )
  4    BOT 1+ LDA, BOT 5 + CMP, 0= ( begin with msb test d1<d2 )
  5    IF, BOT LDA, BOT 4 + CMP, 0=
  6       IF, SEC 1+ LDA, SEC 5 + CMP, 0=
  7          IF, SEC LDA, SEC 4 + CMP,
  8          THEN,
  9       THEN,
 10    THEN,
 11    CS IF, SEC LDA, SEC 4 + SBC, SEC STA, SEC 1+ LDA,
 12          SEC 5 + SBC, SEC 1+ STA, BOT LDA, BOT 4 + SBC,
 13          BOT STA, BOT 1+ LDA, BOT 5 + SBC, BOT 1+ STA,
 14       THEN,  NEXT JMP,
 15 END-CODE          ;S

SCR # 51
  0 ( D= FNTESTER - test a specific potential factor of Fn )
  1 : D=       ( d1 d2 --- f )
  2    ROT =
  3    ROT ROT =
  4    AND
  5 ;
  6 : FNTESTER  ( d 2**n --- f )
  7    ( see if d|Fn, n<15 )
  8    1. ROT  ( d 1[dp] 2**n )
  9    0 DO   ( repeat loop 2**n times )
 10       D2*MOD
 11     LOOP    ( now have d d'; success if d'+1=d )
 12    1. D+
 13    D=
 14 ;
 15           ;S
```

The Results

The FORTH word FERMAT factors F(5) in less than a second. In less than a minute, it finds a factor of F(6): 274 177. It fails to find a factor of F(7) or of F(8) in the tests I've run thus far. The factor 2 424 833 of F(9) only takes a couple of minutes to locate and factors 319 489 and 114 689 of F(11) and F(12) respectively only take a few seconds each. I haven't found any factors of F(10) or F(13) yet.

In case you don't appreciate the magnitude (pun intended) of these results, consider the fact that in binary F(12) is a one followed by 4095 zeroes and then another one. F(12) is over 1200 decimal digits long! It's an incomprehensibly huge number, much larger than the number of electrons in the observable universe. And yet, we've found another number that divides F(12) in only a few seconds of work.

Open Questions

Mathematicians have completely factored F(5), F(6), F(7) and F(8). The first factor of F(8) is 1 238 926 361 552 897, too big to be found using the unmodified routines given here. Only one prime factor of F(9), F(13) and F(15) through F(18) is known. Two prime factors are known for F(10), F(11) and F(19). Four factors are known for F(12), but the full factorization is still incomplete. The number F(14) is known not to be prime, but none of its factors are known. F(20) is completely unexplored territory; it isn't even known if it is prime or not.

The information above is current

```
SCR # 52
  0 ( 2**N 2**N+2 FNFAC )
  1
  2 0 VARIABLE 2**N
  3 0 VARIABLE 2**N+2 2 ALLOT
  4 0 VARIABLE FNFAC 2 ALLOT
  5
  6 ( define a few variables needed by FERMAT words )
  7           ;S
  8
  9
 10
 11
 12
 13
 14
 15

SCR # 53
  0 ( FNINIT NEXTFAC )
  1 : FNINIT ( n --- )
  2    ( initialize 2**N, 2**N+2, FNFAC )
  3    1 SWAP
  4    0 DO
  5           2 *
  6      LOOP
  7    DUP 2**N !
  8    4 * S->D 2**N+2 D!
  9    1 S->D FNFAC D!
 10 ;
 11 : NEXTFAC  ( --- d )
 12    ( get & print next potential factor to test; update FNFAC )
 13    FNFAC D@ 2**N+2 D@ D+
 14    2DUP D. CR 2DUP FNFAC D!
 15 ;          ;S

SCR # 54
  0 ( FNFACTOR  FERMAT  )
  1
  2 : FNFACTOR  ( --- )
  3    ( find a factor of Fn; must initialize everything first! )
  4    BEGIN
  5           NEXTFAC
  6           2**N @
  7           FNTESTER
  8           ?TERMINAL OR
  9    UNTIL
 10 ;
 11
 12 : FERMAT  ( n --- )
 13    FNINIT
 14    FNFACTOR
 15 ;          ;S
```

as of late 1983. The possible factors up to about 2 ↑ 47 have been tested as potential factors of most of these Fermat numbers. So, assuming the previous workers haven't missed anything, we need to begin working with numbers bigger than 2 ↑ 47 (approximately 10 ↑ 14). You'll need to extend the routines given here to cover the larger numbers. Finding a new factor of F(n) is a lot like finding a new planet. The odds are against us—but with enough microcomputers working in parallel, we might just make a discovery!

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C

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Home University

On Matrix Algebra and Computer Arrays

Matrix algebra allows us to express and manipulate complex mathematical formulations in a compact and coherent form.

This article serves two purposes: (1) to show the basics of using matrix algebra with the aid of the computer and (2) to teach array manipulations.

Because our goals here require programs that are easy to read—that is, whose operation is easy to follow—the programs are not optimal in their structure. Once you understand the logic, you may—and indeed should—modify the programs according to your needs.

Definitions

A matrix is defined here as a rectangular array with (m.n) elements arranged in m rows and n columns. The common mathematical symbol for a matrix is given in Equation 1.

Equation 1.

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1j} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2j} & \cdots & a_{2n} \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ a_{i1} & a_{i2} & \cdots & a_{ij} & \cdots & a_{in} \\ \cdots & \cdots & \cdots & \cdots & \cdots & \cdots \\ a_{m-1,1} & a_{m-1,2} & \cdots & a_{m-1,j} & \cdots & a_{m-1,n} \\ a_{m1} & a_{m2} & \cdots & a_{mj} & \cdots & a_{mn} \end{bmatrix}$$

(m rows; n columns)

Of course, we do not show all the elements of A; rather we skip lines by using rows of dots. As we can see, a_{ij} is the element located in the i-th row and j-th column, with $i = 1,2,...,m$; $j = 1,2,...,n$.

The elements of matrix A may consist of different mathematical expressions, but here we shall restrict our discussion to real numbers only. Before we proceed, it is worthwhile to realize that the definition in Equation 1 is in one-to-one correspondence with the following BASIC statement.

```
DIM A(M,N)
```

provided that M=m, N=n, and all elements A(I,J) (I=1,2,...,M; J=1,2,...,N) are defined (by input or in a program) as $A(I,J) = a_{ij}$. For example, given the matrix in Equation 2, the following program will assign the values of a_{ij} to the corresponding elements of a 3×3 array A.

Equation 2.

$$A = \begin{bmatrix} 0 & 1 & 2 \\ -1 & 0 & 1 \\ -2 & -1 & 0 \end{bmatrix}$$

```
10 DIM A(3,3)
20 A(1,1)=0:A(1,2)=1:
  A(1,3)=2
   :    REM FIRST ROW
30 A(2,1)=-1:A(2,2)=0:
  A(2,3)=1
   : REM SECOND ROW
40 A(3,1)=-2:A(3,2)=-1:
  A(3,3)=0
   : REM THIRD ROW
50 END
```

We can write a more general program where the dimensions of the matrix and its elements are input.

```
10 INPUT "DIMENSION OF
   ARRAY A - M,N";M,N
20 DIM A(M,N)
30 FOR I=1 TO M
40 FOR J=1 TO N
50 INPUT A(I,J)
60 NEXT J
70 NEXT I
80 END
```

Note that here we have used Commodore's option for dynamic allocation of arrays. That is, we define A(M,N) according to the actual dimensions and we conserve memory. We could, however, define A(10,10) if we know that both M and N will not exceed 10. There is an advantage to this approach, especially when the program needs to be run repeatedly with different arrays. If we try to use the DIM statement more than once for the same array we get the error message "REDIM'D ARRAY."

A third possibility for the case of matrix A as shown in Equation 2 is the following program.

```
10 DIM A(3,3)
20 FOR I=1 TO 3
30 FOR J=1 TO 3
40 A(I,J)=J-I
50 NEXT J:NEXT I
60 END
```

It is left as an exercise for the reader to verify that indeed $a_{ij} = j-1$.

Matrix Algebra

Now we may proceed with the definitions of matrix addition, subtraction and multiplication.

Two matrices, A and B, can be added to each other, resulting in matrix C, provided that A and B are of the same order. That is, both are m×n. (Note: we cannot add an m×n matrix to an n×m matrix. The operation

$$\underset{m\times n}{A} + \underset{m\times n}{B} = \underset{m\times n}{C}$$

is defined as the matrix C with elements $c_{ij} = a_{ij} + b_{ij}$. For example:

$$A = \begin{bmatrix} 1 & 6 \\ 3 & 4 \end{bmatrix} \quad B = \begin{bmatrix} 5 & 2 \\ 7 & 8 \end{bmatrix}$$

$c_{11} = 1+5 = 6$, $c_{12} = 6+2 = 8$,
$c_{21} = 3+7 = 10$, $c_{22} = 4+8 = 12$

$$c = A+B = \begin{bmatrix} 6 & 8 \\ 10 & 12 \end{bmatrix}$$

We can also show that A + B = B + A.

Subtraction is defined as follows:

$$\underset{m\times n}{A} - \underset{m\times n}{B} = \underset{m\times n}{D}$$

$$d_{ij} = a_{ij} - b_{ij}$$

For the same matrices A and B as above, we get:

$d_{11} = 1-5 = -4,\ d_{12} = 6-2 = 4,$
$d_{21} = 3-7 = -4,\ d_{22} = 4-8 = -4$

$$D = A - B = \begin{bmatrix} -4 & -4 \\ -4 & -4 \end{bmatrix}$$

Addition (or subtraction) of more than two matrices is done according to the following rules, which are demonstrated on three matrices, A, B, and C:

A + B + C = (A + B) + C =
A + (B + C) = (B + C) + A =
B + (C + A), etc.

The program in Listing 1 computes (A+B) and (A−B) and stores the results in arrays C and D, respectively.

When you are multiplying by a constant, the matrix B = kA, with k real, is defined by $b_{ij} = ka_{ij}$.

The program in Listing 2 computes B = kA.

Let us assume that we do not need matrix A; that is, only B=kA is required. We could save the space allocated for B by storing kA in array A. In Listing 2 introduce the changes shown in Listing 2a.

Table 1.

```
M = 2, P = 3, N = 2
line 200  I=1
line 210  J=1
line 220  K=1  C(1,1)= 0+A(1,1)*B(1,1)= 0+1(-1)= -1
          K=2  C(1,1)= -1+A(1,2)*B(2,1)= -1+2(-4)= -9
          K=3  C(1,1)= -9+A(1,3)*B(3,1)= -9+3(-7)= -30

line 210  J=2
line 220  K=1  C(1,2)= 0+A(1,1)*B(1,2)= 0+1(-2)= -2
          K=2  C(1,2)= -2+A(1,2)*B(2,2)= -2+2(-5)= -12
          K=3  C(1,2)= -12+A(1,3)*B(3,2)= -12+3(-8)= -36

line 200  I=2
line 210  J=1
line 220  K=1  C(2,1)= 0+A(2,1)*B(1,1)= 0+4(-1)= -4
          K=2  C(2,1)= -4+A(2,2)*B(2,1)= -4+5(-4)= -24
          K=3  C(2,1)= -24+A(2,3)*B(3,1)= -24^6(-7)= -66

line 210  J=2
line 220  K=1  C(2,2)= 0+A(2,1)*B(1,2)= 0+4(-2)= -8
          K=2  C(2,2)= -8+A(2,2)*B(2,2)= -8+5(-5)= -33
          K=3  C(2,2)= -33+A(2,3)*B(3,2)= -33+6(-8)= -81
```

In multiplication of two matrices, the operation A B = C is defined for two matrices A (m × p) and B (p × n). That is, the number of columns in A matrices are square and of the same order (say, m × m), B A is undefined. The result of the multiplication is matrix C with elements shown in Equation 3. Also see Equation 4. Eventually, we obtain matrix C:

$$C = \begin{bmatrix} -30 & -36 \\ -66 & -81 \end{bmatrix}$$

It is important to note that each element c_{ij} is obtained by multiplying a row matrix by a column matrix. That is, c_{ij} is obtained by multiplying a (1 × p) matrix, consisting of the i-th row of A by a (p × 1) column matrix, consisting of the j-th column of B, as shown in Equation 5.

Equation 3.

$$E_{ij} = \sum_{k=i}^{P} a_{ik}b_{kj}\ (i = 1,2\ldots,m;\ j = 1,2,\ldots,n)$$
$$= a_{i1}b_{ij} + a_{i2}b_{2j} + \ldots + a_{ik}b_{kj} + \ldots + a_{ip}\,b_{pi}$$

Equation 4.

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \quad B = \begin{bmatrix} -1 & -2 \\ -4 & -5 \\ -7 & -8 \end{bmatrix}$$

$$c_{11} = a_{11}\,b_{11} + a_{12}\,b_{21} + a_{13}\,b_{31} = \sum_{K=1}^{3} a_{1K}\,b_{K1}$$
$$= 1(-1) + 2(-4) + 3(-7) = -30$$

$$c_{12} = a_{11}\,b_{12} + a_{12}\,b_{22} + a_{13}\,b_{32} = \sum_{K=1}^{3} a_{1K}\,b_{K2}$$
$$= 1(-2) + 2(-5) + 3(-8) = -36$$

$$c_{21} = a_{21}\,b_{11} + a_{22}\,b_{21} + a_{23}\,b_{31} = \sum_{K=1}^{3} a_{2K}\,b_{K1}$$
$$= 4(-1) + 5(-4) + 6(-7) = -66$$

$$c_{22} = a_{21}\,b_{12} + a_{22}\,b_{22} + a_{23}\,b_{32} = \sum_{k=1}^{3} a_{2K}\,b_{K2}$$
$$= 4(-2) + 5(-5) + 8(-8) = -81$$

Equation 5.

$$c_{ij} = [a_{ij}\ a_{i2}\ \ldots\ a_{ik}\ \ldots\ a_{ip}] \begin{bmatrix} b_{ij} \\ b_{2j} \\ \cdot \\ \cdot \\ b_{kj} \\ \cdot \\ \cdot \\ b_{pj} \end{bmatrix}$$

The arrays in Equation 5 are often referred to as vectors, and the multiplication of two such vectors is called a scalar or "dot" product, since the result is a 1 × 1 matrix, c_{ij}. This product is important in computer graphics and related mathematical topics. The program in Listing 3 computes the product C = A B.

In Listing 3, note that initially all

elements of array C are zeros. In line 230 we accumulate the products of Equation 3 and store the results in C(I,J). For example, if we run the case of Equation 4, the process shown in Table 1 takes place:

As an exercise, write a program for the product of two *square* matrices, A and B, and store the resulting matrix in either A or B. Hints: You can modify MATRIX/PRODUCT to perform the calculations (M=P=N). Assuming that the product will be stored in A, you need a temporary storage array (vector) for each row of A currently being processed.

References

Ayres, F., Jr. *Matrices*. Schaum's Outline Series, McGraw-Hill: 1962. Excellent for the novice. Contains many examples.

Fox, L. *An Introduction to Numerical Linear Algebra*. Oxford University Press: 1964. Excellent for the more advanced reader.

Ralston, A. and Rabinowitz, P. *A First Course in Numerical Analysis*. McGraw-Hill: 1978. Chapter nine deals with systems of linear equations. This excellent book discusses many other topics of importance to the computer hobbyist, as well as the professional. **C**

Listing 1. Addition and Subtraction of Matrices

```
1 REM ************************
2 REM * PROGRAM MATRIX/ADDSUB,
   VERSION I,  BY SHLOMO GINSBURG,
   MAY 1984
3 REM * THIS PROGRAM ADDS AND
  SUBSTRACTS TWO (MXN) MATRICES [A]+
  [B] & [A]-[B]
4 REM * RESULTS ARE STORED IN
  MATRICES [C] AND [D], RESPECTIVELY
5 REM ************************
10 POKE 53280,11:POKE 53281,0
20 PRINT"[CLEAR,RVS,GREEN,SPACE4]
   MATRIX ADDITION AND SUBSTRACTION
   [SPACE4]"
30 INPUT "[DOWN,YELLOW]
    DIMENSION OF MATRICES - [RED]M,
   [BLUE]N [YELLOW]";M,N
40 DIM A(M,N),B(M,N),C(M,N),D(M,N)
50 PRINT"[DOWN] ELEMENTS OF MATRIX
   [PURPLE]A[YELLOW] - BY ROW"
60 FOR I=1 TO M
70 FOR J=1 TO N
80 PRINT"[SPACE2]A(";I",";J")";
90 INPUT A(I,J)
100 NEXT J:NEXT I
110 PRINT"[DOWN] ELEMENTS OF MATRIX
    [PURPLE]B[YELLOW] - BY ROW"
120 FOR I=1 TO M
130 FOR J=1 TO N
140 PRINT"[SPACE2]B(";I",";J")";
150 INPUT B(I,J)
160 C(I,J)=A(I,J)+B(I,J)
170 D(I,J)=A(I,J)-B(I,J)
180 NEXT J:NEXT I
190 PRINT"[DOWN] ELEMENTS OF MATRIX
    [GREEN]C[YELLOW] - BY ROW"
200 FOR I=1 TO M
210 FOR J=1 TO N
220 PRINT"[SPACE2]C(";I",";J") =";C(I,
    J)
230 PRINT"[DOWN,SPACE2]
    FOR NEXT ELEMENT TOUCH ANY KEY"
240 GET A$:IF A$="" THEN 240
250 NEXT J:NEXT I
260 PRINT"[DOWN,SPACE2,RVS,RED]
    NO MORE ELEMENTS IN[RVOFF] [GREEN]
    C[YELLOW]"
270 PRINT"[DOWN] ELEMENTS OF MATRIX
    [GREEN]D[YELLOW] - BY ROW"
280 FOR I=1 TO M
290 FOR J=1 TO N
300 PRINT"[DOWN,SPACE2]D(";I",";
    J") =";D(I,J)
310 PRINT"[DOWN,SPACE2]
    FOR NEXT ELEMENT TOUCH ANY KEY"
320 GET A$:IF A$="" THEN 320
330 NEXT J:NEXT I
340 PRINT"[DOWN,SPACE2,RVS,RED]
    NO MORE ELEMENTS IN[RVOFF] [GREEN]
    D"
350 PRINT"[DOWN2,RVS,BLUE,SPACE16]
    GOOD BYE[SPACE16]"
360 END
```

Listing 2. Multiplication by a Constant

```
1 REM ************************
2 REM * PROGRAM MATRIX/SCALAR1,
   VERSION I,  BY SHLOMO GINSBURG,
   MAY 1984
3 REM * THIS PROGRAM MULTIPLIES A
  MATRIX [A] BY THE SCALAR(CONSTANT) K
4 REM * RESULTS ARE STORED IN MATRIX
  [B]
5 REM ************************
10 POKE 53280,11:POKE 53281,0
20 PRINT"[CLEAR,RVS,GREEN,SPACE4]
   MATRIX MULTIPLICATION BY A SCALAR
   [SPACE3]";
30 PRINT"[RVS,SPACE14][B] = K*[A]
   [SPACE15]"
40 INPUT "[DOWN,YELLOW]
    DIMENSION OF MATRIX - [RED]M,
   [BLUE]N [YELLOW]";M,N
50 DIM A(M,N),B(M,N)
60 INPUT "[DOWN,YELLOW]
    SCALAR MULTIPLIER - [CYAN]K
   [YELLOW]";K
70 PRINT"[DOWN] [PURPLE]INPUT THE A(I,
   J) - BY ROW"
80 PRINT" [GREEN]YOU GET[SPACE2]B(I,
   J)=K*A(I,J)[DOWN]"
90 FOR I=1 TO M
100 FOR J=1 TO N
110 PRINT"[SPACE2,PURPLE,SPACE6]A(";
    I",";J") =[YELLOW]";
120 INPUT A(I,J)
130 B(I,J)=K*A(I,J)
140 PRINT"[SPACE2,GREEN,SPACE6]B(";I",
    ";J") = [YELLOW]";B(I,J)
```

```
150 NEXT J:NEXT I
160 PRINT"[DOWN2,RVS,BLUE,SPACE15]
    GOOD BYE[SPACE17]"
170 END
```

Listing 2a. Changes to Listing 2

```
1 REM **********************
2 REM * PROGRAM MATRIX/SCALAR2,
   VERSION II, BY SHLOMO GINSBURG,
   MAY 1984
3 REM * THIS PROGRAM MULTIPLIES A
  MATRIX [A] BY THE SCALAR(CONSTANT) K
4 REM * RESULTS ARE STORED IN MATRIX
  [A]
5 REM **********************
10 POKE 53280,11:POKE 53281,0
20 PRINT"[CLEAR,RVS,GREEN,SPACE4]
   MATRIX MULTIPLICATION BY A SCALAR
   [SPACE3]";
30 PRINT"[RVS,SPACE14][A] = K*[A]
   [SPACE15]"
40 INPUT "[DOWN,YELLOW]
    DIMENSION OF MATRIX - [RED]M,
   [BLUE]N [YELLOW]";M,N
50 DIM A(M,N)
60 INPUT "[DOWN,YELLOW]
    SCALAR MULTIPLIER - [CYAN]K
   [YELLOW]";K
70 PRINT"[DOWN] [PURPLE]INPUT THE A(I,
   J) - BY ROW"
80 PRINT" [GREEN]YOU GET THE
   CORRESPONDING K*A(I,J)[DOWN]"
90 FOR I=1 TO M
100 FOR J=1 TO N
110 PRINT"[SPACE2,PURPLE,SPACE6]A(";
    I",";J") =[YELLOW]";
120 INPUT A(I,J)
130 A(I,J)=K*A(I,J)
140 PRINT"[SPACE2,GREEN,SPACE6]A(";I",
    ";J") = [YELLOW]";A(I,J)
150 NEXT J:NEXT I
160 PRINT"[DOWN2,RVS,BLUE,SPACE15]
    GOOD BYE[SPACE17]"
170 END
```

Listing 3. Computing C=AB

```
1 REM ****************************
2 REM * PROGRAM MATRIX/PRODUCT,
   VERSION I,  BY SHLOMO GINSBURG,
   MAY 1984
3 REM * THIS PROGRAM COMPUTES THE
  MATRIX PRODUCT [A][B]
4 REM * WHERE [A] IS (MXP) AND [B]
   IS (PXN) - COMPATIBLE MATRICES
5 REM * RESULTS ARE STORED IN MATRIX
  [C] (MXN)
6 REM ****************************
10 POKE 53280,11:POKE 53281,0
20 PRINT"[CLEAR,RVS,GREEN,SPACE3]
   MATRIX MULTIPLICATION [C] = [A][B]
```

Continued on page 58

```
   [SPACE3]";
30 PRINT"[RVS,SPACE3][A] (MXP)[SPACE2]
   [B] (PXN) --> [C] (MXN)[SPACE3]"
40 INPUT "[DOWN,PURPLE]
    ORDER OF MATRIX A - [RED]M,[BLUE]
   P [YELLOW]";M,P
50 INPUT "[DOWN,GREEN] ORDER OF
   MATRIX B - [BLUE]P,[CYAN]N [YELLOW]
   ";P1,N
60 IF P1=P THEN 90
70 PRINT "[DOWN2,RVS,RED,SPACE9]
   INCOMPATIBLE MATRICES ![SPACE8]"
80 GOTO 40
90 DIM A(M,P),B(P,N),C(M,N)
100 FOR I=1 TO M
110 FOR J=1 TO P
120 PRINT"[DOWN,SPACE2,PURPLE,SPACE6]
    A(";I",";J") = [YELLOW]";
130 INPUT A(I,J)
140 NEXT J:NEXT I
150 FOR I=1 TO P
160 FOR J=1 TO N
170 PRINT"[DOWN,SPACE2,GREEN,SPACE6]
    B(";I",";J") = [YELLOW]";
180 INPUT B(I,J)
190 NEXT J:NEXT I
200 FOR I=1 TO M
210 FOR J=1 TO N
220 FOR K=1 TO P
230 C(I,J)=C(I,J)+A(I,K)*B(K,J)
240 NEXT K:NEXT J:NEXT I
250 PRINT"[DOWN,YELLOW,RVS,SPACE7]
    TOUCH ANY KEY FOR RESULTS[SPACE8]"
260 GET A$:IF A$="" THEN 260
270 PRINT"[CLEAR,RVS,L. RED,SPACE17]
    RESULTS[SPACE16]"
280 FOR I=1 TO M
290 FOR J=1 TO N
300 PRINT"[DOWN,L. RED,SPACE8]C("I",
    "J") = ";C(I,J)

310 PRINT"[DOWN,YELLOW,SPACE2]
    TOUCH ANY KEY TO CONTINUE[GRAY2]"
320 GET A$:IF A$="" THEN 320
330 NEXT J:NEXT I
340 PRINT"[DOWN2,RVS,BLUE,SPACE16]
    GOOD[SPACE2]BYE[SPACE15]"
350 END
```

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BY CRAIG HESSEL

Time

We can measure units of time objectively, with mechanical devices like the grandfather clock that counts the swings of its pendulum. But to measure very small bits of time, we need more sophisticated clocks. However, whether simple or complex, clocks have two features in common: they need a source of events evenly spaced in time (like earth rotations, pendulum swings or crystal vibrations) and they need a way to count those events.

Manipulate the jiffy and TOD (time-of-day) clocks on your Commodore 64 for increased accuracy. Then type and save "Big Ben", a program that lets your 64 act like the famed Westminster timekeeper.

Creating a Primitive Clock for the 64

Pretend for a moment that we do not know about the special variables TIME and TIME$ or about the 6526 chip and its timers and TOD clock. How can we construct a clock for the Commodore 64? First, we need a stream of events to count. The obvious choice for an event will be program loop. Loop repetitions can be counted with a variable inside the loop. So our first stab at creating a clock might look like this:

```
100 N=N+1:PRINT"[UP]"N:
    GOTO 100
```

This "clock" counts time in intervals of about 1/70 second. By experimenting a little with "do nothing" operations (like adding or subtracting zero or multiplying or dividing by one), we can stretch out the time interval to about 1/50 second, which is an easier figure to work with. Then incrementing by two instead of one forces the time display into more convenient 1/100 second units. Both these changes can be incorporated by replacing N=N+1, with N=N+2*1/1 (North American 64's only . . . European models run at a slightly different speed).

The resulting timer is the kind suitable for handheld programmable calculators. It is not an ideal clock, though, since the length of the time interval is not uniform. After six minutes, this clock is running about two seconds fast, but by the fifteen-minute mark it is about two seconds slow. The addition operation varies in duration with the value for N, and the PRINT time depends on the number of digits in N. Moreover, if any keys are depressed, the whole program slows down, since the interrupt service routine has to work harder. Fortunately, Commodore has better ways to keep track of time.

Using the Jiffy Clock

The easiest way is through the Commodore "jiffy" clock, which is available on PET/CBM, VIC and 64 machines. About 60 times a second, the variable TIME is automatically increased by one. This occurs whether you have a program running or not, since the updating is done by the interrupt service routine. This background routine runs periodically in order to do housekeeping chores such as updating the jiffy clock, scanning the keyboard, flashing the cursor, and the like.

While TIME keeps track of jiffies, TIME$ translates them into hours, minutes and seconds. TIME$ is a six-digit string in the format HHMMSS, where HH ranges from 00 to 23 and both MM and SS range from 00 to 59. TIME$ can either be looked at to check the current time or can be assigned a legal six-digit string to change the time. TIME can only be looked at, but its value will change to reflect any new value assigned to TIME$. It is common to see TI$="000000" in programs, since this zeroes the jiffy clock in preparation for a timing sequence.

The following direct mode command displays TIME until the RUN/STOP key is pressed. This is a 1/60 second interval stopwatch.

```
PRINT:TI$="000000":FOR
      I=0 TO 1
STEP 0:PRINT"[UP]"TI:NEXT
```

After a halt, divide the result by 60 to get the elapsed time in seconds.

I'm not sure how you feel, but I was never very happy with the base 60 number system left to us by the ancient Babylonians. It's too late to do anything about the number of seconds in a minute or the number of minutes in an hour, but I draw the line with fractions of a second. There is a way to trick the jiffy clock into running faster, so that TIME is incremented, say, 100 times per second instead of the usual 60 times. Just try these pokes (North American 64's).

```
POKE 56324,242:POKE
     56325,39
```

You'll probably first notice that your cursor blinks a little faster. If you now go back and try the jiffy stopwatch again, it's very easy to see the seconds tick by. When you halt the timer, divide by 100 to get the elapsed time. Although you're now getting a readout to a hundredth of a second, you don't yet have quite that amount of accuracy. The reason is that the timer loops a little less than 100 times per second. So, occasionally the display jumps two ticks instead of one. Here is a slightly more accurate fast-jiffy stopwatch.

```
TI$="000000":WAIT 198,1:
    PRINT TI
```

This one does not repeatedly display the time, but instead waits for a keystroke (other than RUN/STOP, SHIFT, CTRL or COMMODRE) before showing the elapsed time. This may

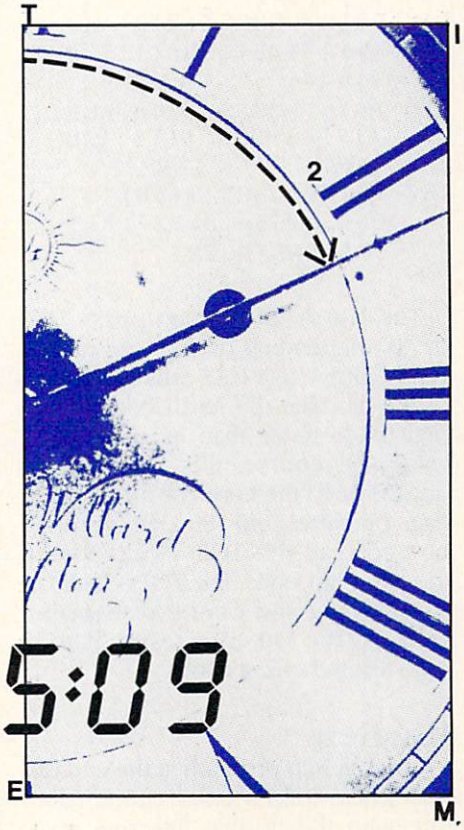
be preferable, although it would be nicer to see the time tick by. In any case, to return the jiffy clock to normal speed, press the RUN/STOP and RESTORE keys.

Why does this trick work? Locations 56324-5 (low-high) form timer A of one of the two 6526 chips on your 64. Roughly a million times a second, this two-byte timer is decreased by one. Whenever it cycles down to zero (which normally happens 60 times a second), an interrupt is generated and two latch values are reloaded into the timer.

The clock that governs this timer is the same master clock that, for example, determines both the speed of machine language instructions and the oscillator frequencies of the SID (sound) chip. Getting an accurate fix on the clock frequency from the *Commodore 64 Programmer's Reference Guide* takes a bit of detective work. The schematic diagram inside the book's cover gives 1.02 MHz as the frequency for North American machines (0.98 MHz for Europe). "MHz" stands for "MegaHertz", which is one million Hertz, or one million cycles per second. However, page 450 of the manual indicates that the frequency is one-eighth the video input clock frequency, which is apparently called the DOT CLOCK in the diagram. This frequency is listed as 8.18 MHz on one side of the schematic and as 8.1818 MHz on the reverse side. If we assume the latter figure to be accurately rounded, then that pins down the master clock frequency to the range 1.022719-1.022731 MHz.

Another clue appears on page 462, where a formula is given for the sound frequency output from the SID chip. This formula was used to derive the table on pages 384-6. If the oscillator frequencies in the table are truncated values, the master clock frequency should be 1.022729 MHz.

A final clue can be discovered by disassembling the ROM code for a system reset (vector: $FFFC-D). On North American machines, the interrupt timer is given latch values of 149 and 66. This means that an interrupt is generated every 150+256*66= 17046 clock cycles. If we suppose that the latch values were chosen to space interrupts as close to 1/60 second as possible, then this puts the master clock frequency in the range 1.02273-1.2279 MHz. While these values are not in complete agreement, they are close and it appears that



1.02273 MHz is a good figure for the frequency.

Getting back to the original problem, we now know that the master clock ticks about 1022730 times per second. So it ticks about 10227 times every 1/100 second. And latch values of 242 and 39 will have the desired effect of speeding up the jiffy clock to 100 ticks per second (243+256*39= 10227). Note that every 60 ticks of the normal jiffy clock take 60*17046= 1022760 clock cycles, so the jiffy clock usually runs just a tad slow. Every 100 ticks of the fast jiffy clock take 100*10227=1022700 master clock cycles, so this modified version of the clock runs a bit fast. (TIME$ will be way off, of course. But we're just considering TIME here.)

You might wonder if we could make the jiffy clock run even faster to get a more accurate stopwatch. We can, but only up to a certain point. At 60 interrupts per second, the interrupt service routine takes up about ten percent of the 64's time when the keyboard is in use. (When no keys are depressed, this figure improves considerably.) We have to allow the interrupt service routine enough time to finish its job before the next interrupt is generated, plus we need a little time to spare so BASIC can operate. Five hundred interrupts per second, with a key depressed, should monopolize over eighty percent of the processor time. So this is about as fast as we can accurately go, and we'd have to use the WAIT stopwatch.

To see where the ten percent figure came from, time the following loop with a wristwatch.

```
POKE 56333,1:FOR N=1 TO
     100000:NEXT:POKE
     56333,129
```

The first poke prevents Timer A interrupts and the second poke allows them again. This should take about 129 seconds. Next, repeat the test without the pokes while holding down the RETURN key. About 144 seconds should elapse. We could have timed the last test with the jiffy clock, but the first test disables it.

The Time-of-Day Clock

It is still possible to use the 64 itself for the timing, however. This brings us to the subject of the TOD (time-of-day) clock. There are two such clocks in your machine, since the 64 contains two 6526 chips. We'll be dealing here with the first chip (which also holds the interrupt timer discussed above). Add 256 to each of the relevant poke addresses that follow if you want to access the second TOD clock, which is identical in all other respects to the first clock.

The advantage of the TOD clock over the jiffy clock is twofold. First, once you set it running, it stays that way until you or your software decide otherwise. The jiffy clock, on the other hand, is occasionally suspended by the operating system for I/O operations. Second, the TOD clock has an alarm facility. That is, you can have an interrupt triggered at a pre-specified time. This nifty feature is a little trickier to use, since it requires modifying the interrupt service routine beforehand. The disadvantage of the TOD clock is that reading and setting the time is slightly more complicated than with the jiffy clock.

The clock itself consists of four registers (hours, minutes, seconds

and tenths, with an AM/PM flag included in the hours register). Reading (peeking at) the time should always start with the hours register, since that freezes the remaining registers until the tenths are read. The clock continues running "underneath" with the correct time in spite of the freeze. Setting (poking) the time should also start with the hours register (this stops the clock in case it is running) and end with the tenths register (this restarts the clock). The time is stored in what is called binary-coded-decimal format; that is, each half-byte contains zero to nine (aside from the flag in the most significant bit of the hours register).

To get a feel for the way the clock works, let's walk through a short program that times the loop that could not be timed previously with the jiffy clock.

```
100 CL=56331:IC=56333:BC
    =56335'DXDC
```

CL(ock) is the location of the hours register. The other three TOD registers immediately precede CL. IC is the control register for the jiffy interrupts. Do not add 256 to IC if you are timing with the second TOD clock (just change CL and BC). BC is the timer B control register, containing a control bit for the TOD clock.

```
110 POKE BC,PEEK(BC) AND
    127'DKPA
```

Clearing the lead bit of this control register readies the clock for a write. Unless you have previously fiddled with the TOD alarm, this bit is already clear.

```
120 FOR I=0 TO 3:POKE
    CL-I,0:NEXT'GKNC
```

Line 120 zeros out the clock and set it running with the final poke. This is analogous to TI$="000000".

```
130 POKE IC,1:FOR I=1 TO
    100000:NEXT:POKE IC,
    129'GVNG
140 H=PEEK(CL):M=PEEK
    (CL-1):S=PEEK(CL-2)
    :T=PEEK(CL-3)'LBIM
```

These lines read the time when finished looping. Note that hours are read first to temporarily freeze the remaining registers.

The rest of the program converts the four values into a time display:

```
150 PRINT"TIME = "CHR$
    ((16 AND H)/16+48)CHR$
    ((15 AND H)+48)"
    :";'IVPL
160 PRINT CHR$((240 AND
    M)/16+48)CHR$((15 AND
    M)+48)":";'IWVL
170 PRINT CHR$((240 AND S)
    /16+48)CHR$((15 AND
    S)+48)".";'IWVM
180 PRINT CHR$(T+48)" "
    CHR$ (65-(H>127)*15)
    "M":END'ISCM
```

The last CHR$ function prints "A" or "P", depending on the lead bit of H. The previous CHR$ calls make use of the fact that the ASCII code for a digit is 48 more than its numerical value. Of course, this timing test doesn't need the hours or the AM/PM flag. But lines 140-180 demonstrate how to read the TOD clock. When the program ends, the TOD clock is still running and can be read again with GOTO 140. The result of the time test is 129.2 seconds.

Big Ben

The Big Ben program at the end of this article links a clock chime routine with the normal interrupt service routine. By using the TOD clock #2 and its alarm, the routine generates very realistic grandfather clock chimes every quarter hour, with the usual gongs to mark the hour. Once Big Ben has gotten things going, you can go about business as usual with the clock chimes running in the background. Some game programs and machine language programs (like *Easy Script* which I'm using at the moment) will interfere with the chimes either by using the sound chip at the same time as the chime routine or by changing the interrupt vector. And occasionally a program may fiddle with the TOD clock. But most BASIC programs and many machine language programs will work fine with the chimes as background.

When you run Big Ben, you are asked to input the time as a six-digit string in the same format as TIME$. Try 115959 first (one second before noon). A 16-note chime sequence followed by 12-hour gongs will begin immediately. The chimes follow the standard Westminster chime sequence. Run the program again to set the actual time. Since the chimes are interrupt driven, Big Ben is no longer needed. A rest (RUN/STOP and RESTORE) will silence the chimes; SYS50000 will turn them back on. Meanwhile, the clock will continue running.

I won't go into detail on the inner workings of the service routine, except to say that the TOD alarm initiates the chimes, a jiffy count times their length and ring modulation produces the bell sounds. See the reference guide for information on the TOD alarm and on ring modulation. The machine code in the data statements requires just under a page of memory and may be stashed in any safe location. Line 110 puts it at location 50000 (easy to remember), but you may change that if you have some other piece of software occupying the area. An additional 64 bytes of memory is needed for parameters and variables. These are permanently assigned to the top of the 4K block of free RAM above the BASIC interpreter. The area is left alone by most programs, since the top 1K is usually reserved for the DOS wedge. But there is enough free space above the wedge for use here.

Beginning at line 200 of the BASIC program is a subroutine that illustrates one way to set the TOD time. Note that the clock is started in line 270 with a time 0.3 seconds later than the time specified by the user in line 210. The 0.3 seconds accounts for the time elapsed between the input statement and the final poke. The fraction of a second is unimportant here, but that is not the case with every application. And adding in the elapsed time eliminates the need for an additional user keystroke to signal a clock start.

A Short Quiz

With that we come to the end of a "timely" discussion. To see who has been paying attention, let's close with a multiple choice question:

Time

a) is relative according to Einstein.
b) was a hit song by the Chambers Brothers about 15 years ago.
c) can be measured in many ways on the Commodore 64.

Of course, all three answers are correct. But if you picked c), then chalk yourself up one brownie point. **C**

Program on page 64

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Big Ben

```
100 PRINT:PRINT"*** COMMODORE 64
    WESTMINSTER CHIMES ***":PRINT'DCQH
110 S=50000:REM START OF ML CODE...S
    MAY BE CHANGED (SEE LINE 170)'CXNJ
120 GOSUB 300:SUM=0:FOR I=0 TO 249
    :READ X:SUM=SUM+X:POKE S+I,X
    :NEXT'LFLL
130 IF SUM<>36332 THEN PRINT"CHECKSUM
    ERROR IN ML CODE DATA":END'GJRL
140 C=52*1024-64:REM START OF
    CONSTANTS & VARIABLES...DO NOT
    CHANGE C'EBQP
150 SUM=0:FOR I=0 TO 57:READ X
    :SUM=SUM+X:POKE C+I,X:NEXT'KAFN
160 IF SUM<>2392 THEN PRINT"CHECKSUM
    ERROR IN CONSTANT DATA":END'GIOP
170 POKE C+1,(S+103)/256
    :POKE C,S+103-256*PEEK(C+1)
    :REM RELOCATE ADJUSTMENT'LUAU
180 GOSUB 200:SYS S:REM SET TIME AND
    ENABLE CHIMES'DDVM
190 PRINT:PRINT" THIS PROGRAM IS NO
    LONGER NEEDED.":END'DCLP
200 REM CLOCK SETTING ROUTINE'BTMC
210 INPUT" ENTER 24-HOUR TIME
    (HHMMSS)";T$:IF LEN(T$)<>6 THEN
    210'GMWK
220 FOR I=1 TO 3:T(I)=10*VAL(MID$(T$,
    I+I-1,1))+VAL(MID$(T$,I+I,1))
    :NEXT'OJLO
230 T(4)=3:IF T(1)>23 OR T(2)>59 OR
    T(3)>59 THEN 210:REM T(4) FOR .3
    SECOND LAG'JVLP
240 F=0:IF T(1)>11 THEN F=128
    :T(1)=T(1)-12:REM ADJUST FOR
    AM/PM'IONO
250 FOR I=1 TO 3:H=INT(T(I)/10)
    :L=T(I)-10*H:T(I)=16*H+L:NEXT
    :T(1)=T(1)OR F'PRJU
260 C=56587:POKE C+4,PEEK(C+4) AND 127
    :REM READY TOD CLOCK #2 FOR
    WRITE'HQVQ
270 FOR I=0 TO 3:POKE C-I,T(I+1):NEXT
    :RETURN:REM SET AND START
    CLOCK'JGIQ
300 REM PROGRAM DESCRIPTION
    ROUTINE'BARF
310 PRINT" THIS PROGRAM SETS UP A
    BACKGROUND"'BABH
320 PRINT" ROUTINE TO CHIME THE
    QUARTER HOURS."'BAFJ
330 PRINT" MOST PROGRAMS WILL BE
    UNDISTURBED."'BAIK
340 PRINT" THE CHIMES MAY BE AFFECTED
    BY PROGRAMS"'BAQL
350 PRINT" THAT TAMPER WITH THE
    INTERRUPT SERVICE"'BAKN
360 PRINT" VECTOR, CHANGE TIME-OF-DAY
    CLOCK #2,"'BAFM
370 PRINT" OR USE THE SOUND CHIP.
    [SPACE2]PRESS RUN/STOP"'BAXO
380 PRINT" AND RESTORE TO DISABLE THE
    CHIMES."'BADO
390 PRINT" SYS"S"WILL ENABLE THEM
    AGAIN.":PRINT:RETURN'DDIP
1000 REM ML CODE (250 BYTES)'BQCW
1010 DATA 120,173,192,207,141,20,3,
     173,193,207,141,21,3,24,8,
     173'BESE
1020 DATA 15,221,9,128,141,15,221,173,
     11,221,10,8,74,72,201,16'BCLF
1030 DATA 144,2,233,6,168,173,10,221,
     174,8,221,162,3,221,214,207'BERG
1040 DATA 144,3,202,208,248,104,144,
     19,248,105,0,216,201,18,144,
     11'BGII
1050 DATA 208,7,40,176,9,169,146,144,
     5,169,1,10,40,106,141,11'BBFI
1060 DATA 221,189,214,207,141,10,221,
     169,0,141,9,221,141,8,221,40'BFFK
1070 DATA 176,15,141,250,207,88,96,
     173,13,221,41,4,240,44,56,
     176'BESK
1080 DATA 157,224,3,240,1,168,140,253,
     207,188,222,207,140,252,207,
     188'BJDM
1090 DATA 226,207,140,255,207,162,24,
     157,0,212,202,16,250,142,250,
     207'BJFN
1100 DATA 141,251,207,169,15,141,24,
     212,208,23,173,250,207,240,88,
     206'BJUF
1110 DATA 254,207,208,83,169,20,141,4,
     212,173,251,207,208,63,238,
     252'BIGG
1120 DATA 207,172,252,207,204,255,207,
     240,49,190,230,207,189,204,207,
     141'BMUI
1130 DATA 1,212,189,209,207,141,0,212,
     189,194,207,141,15,212,189,
     199'BINI
1140 DATA 207,141,14,212,174,251,207,
     189,218,207,141,254,207,189,220,
     207'BMXK
1150 DATA 141,5,212,169,21,141,4,212,
     208,13,238,251,207,162,4,206'BFKK
1160 DATA 253,207,16,200,238,250,207,
     76,49,234'BLWH
2000 REM TABLES OF CONSTANTS (58
     BYTES)'BBYB
2010 DATA 103,192,12,16,18,21,8,143,
     195,209,31,97,59,79,89,100'BCEF
2020 DATA 39,167,158,96,83,20,0,59,48,
     21,60,120,9,11,8,0'BVAF
2030 DATA 16,0,20,8,20,16,1,3,2,0,1,2,
     3,1,3,1,2,0,0,2,3,1,3,2,1,0'BFRH
3000 REM NO DATA NEEDED FOR VARIABLES
     (6 BYTES)'BHUE
3010 REM CONSTANTS & VARIABLES WILL
     BE SAFELY TUCKED ABOVE DOS
     WEDGE'BANL
3020 REM ML CODE (LESS THAN PAGE) CAN
     BE PLACED IN ANY SAFE
     LOCATION'BXML
```

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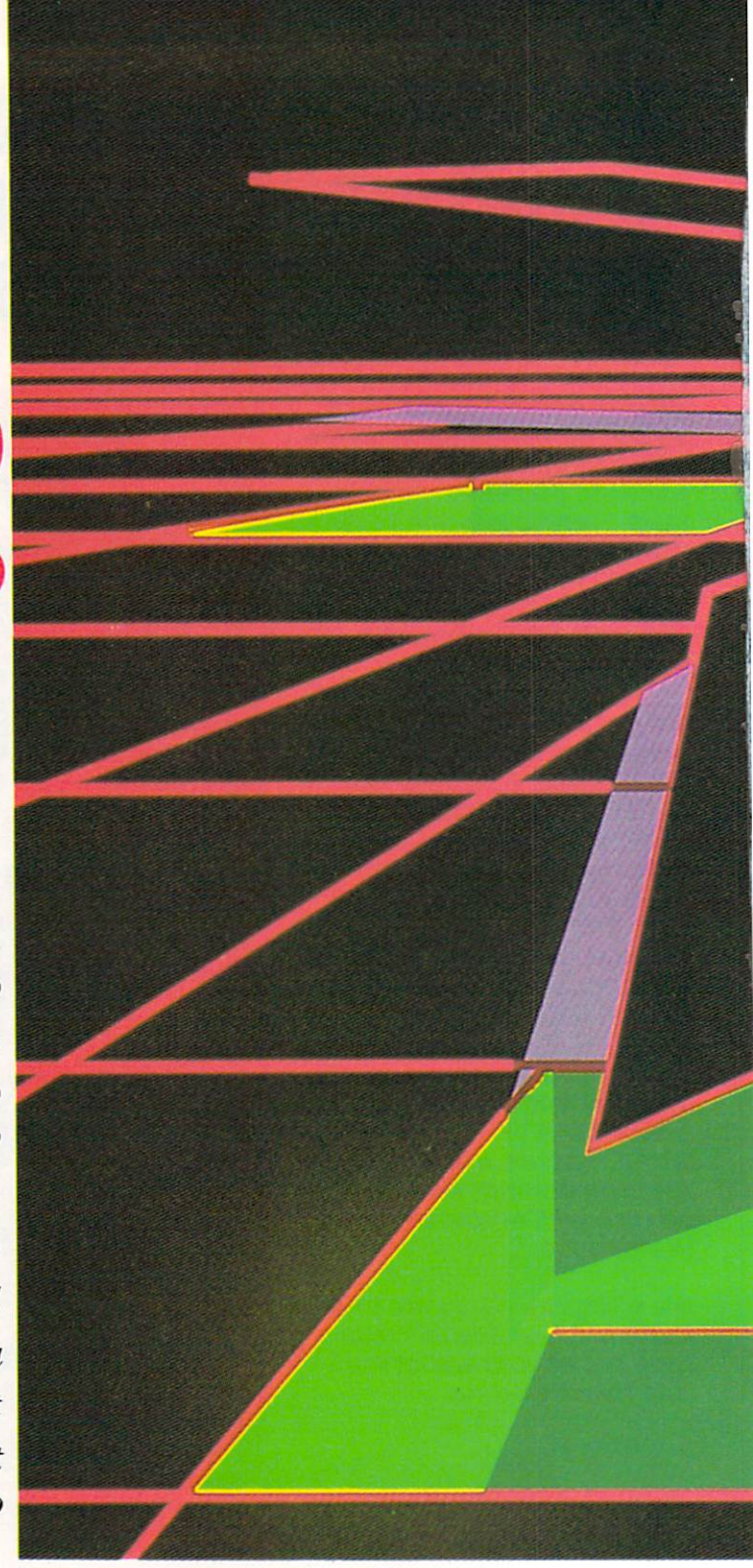


Computer-generated design by Steve Delaney

BY STEPHEN S. LEVEN

Home. Home is where the heart is. Home is where you hang your hat. And for many of us, home is where the computer is!

Let's take a look at a typical home computer user named, for the sake of argument, Charlie. Charlie has a computer because he wanted one. Or because Mr. Jones next door has one. Or because he got one for Christmas. Or because he thinks it's "important" for the kids. Charlie doesn't know how the computer works. He doesn't know how to program—in BASIC, LOGO, or anything. He doesn't want to learn to program. He can't even type! What can Charlie do with his computer that will help his family, ease his lifestyle, and provide some entertainment?

In addition to teaching Charlie to type, the home computer has many applications that either ease the burden of running a household or make possible decisions and activities that were not possible, or were at least impractical, without the computer.

Let's look at a few.

Word Processing

One of the first serious uses of a home computer for most people is as a word processor. What is a word processor? In simple terms, it is an electronic typewriter with added features that allow you to maintain your text in memory, display it before printing, make corrections before printing, change the printed format, copy blocks of text from one part of the document to another and sometimes between documents, and store your document on tape or disk for reference or future use. Why do you need all that capability? Ask Charlie!

After he learned to type, using a computer typing tutor, Charlie wrote a letter to his Aunt Tillie a few weeks ago, using his computer with a word processing program. In the letter he asked her a couple of questions. Monday he got a reply from her. In her letter she said, "In answer to your question, Charlie, I think next Tuesday will be fine." What did she mean? Charlie used his word proces-

sor to look at the electronic copy of the letter he had sent Aunt Tillie and found that the question she was answering was, "Let us know when you can come for a visit and we'll pick you up at the airport." And when Charlie met Aunt Tillie at the airport the next day, she greeted him with, "Charlie! I really enjoyed your last letter. I used to have so much trouble reading your handwriting!"

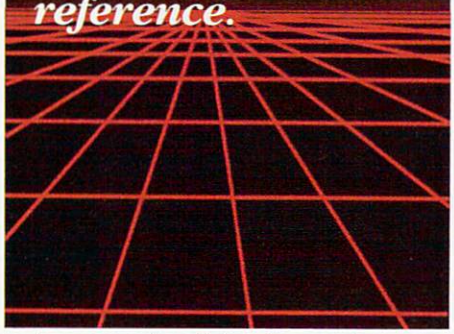
Have you ever written a business letter to your insurance company, then spent the better part of an afternoon running from post office to post office looking for a copy machine that worked? Or have you needed another copy of a complaint letter to send to the main office or Better Business Bureau? Or have you wanted to send an almost identical letter to 15 credit card companies telling them you've lost your card or that you've changed your address? If so, word processing is for you.

Besides using a word processor for letters, it can be used for reports, charts, memos, lists of things to do, newsletters or anything that needs to be written, typed, corrected, and/or stored for future reference. Many word processors even have a spelling checker available, which greatly eases the task of proofreading your own work. The manuscript for this article was written, revised, revised, checked and revised again using a word processing program (Commodore's *Easy Script*) on the Commodore 64. You can even create a mailing list with a word processor program and use the search feature to quickly find a listing.

The Data Base

Mailing lists, however, are better kept in a database program. Just as a word processor is an electronic typewriter, a data base is an electronic index card file. The database program allows you to keep any kinds of related records in a file, and helps you find information from those records quickly. For example, you can keep a mailing list in a data base, noting the person's name, address, phone number, birthday, anniversary and whether the person is a friend/family/business associate. You then can have the database program list all those who have birthdays in March, for example, or all your business associates, or have it print mailing labels sorted in order by zip code.

A word processor can be used for anything that needs to be written, typed, corrected and/or stored for future reference.



Charlie's wife, Charlene, set up a data base for recipes, and entered most of her favorites. Now, when a quick check of the refrigerator indicates that all she has left for tonight's dinner is liver and spaghetti sauce, she has the computer list for her all the recipes that use only those two ingredients. When she goes shopping, the data base will even help her draw up a grocery list.

Charlie likes to keep up with medical developments. In fact, he reads nine monthly medical journals, but he often can't remember where he read about a certain medication or disease. Charlie set up a data base to index the articles in all of his magazines, and every time he reads one, he enters into the data base the magazine name and date, the article title and author, the page number, and the keywords describing the contents of the article. Now, when anyone in Charlie's family comes down with strange symptoms, he can have the database program display the pertinent information about all the articles on the subject. No more thumbing through back issues.

Charlie's son Clark has a stamp collection. Guess where he keeps all the information on which stamps he has, what their condition is, how much he paid for them and what their present values are? A simple command in the database program will even add up Clark's total investment as well as the total current value of the collection. Clark also keeps a spare disk containing all his stamp data in Charlie's safe deposit box at the bank, in case there is a theft or fire at the house. Clark is trying to convince Charlie to set up a similar data base for all the items in the house—a home inventory.

As you can see, a database program can be put to many uses around the house. And most of these uses enable you to do something that either was almost impossible before (such as calculating the current value or original cost of a collection) or that was extremely tedious to do (like updating a home inventory or quickly finding magazine articles on subjects you are interested in). You can even keep monthly budget information in a data base, listing each expense item on a separate record. But budget and financial data are more ideally suited to . . .

The Spreadsheet

The electronic spreadsheet is sometimes more difficult for the home computerist to comprehend than the other applications we've discussed here. However, the concept is pretty simple. Imagine a chart on a sheet of paper, listing your monthly budget items down the left column and the months of the year across the top. As you fill in each column with the actual budget data items for each month, the chart becomes filled with numbers. Some of the numbers, like total expenses at the bottom of the chart, are really sums of some of the other numbers in the column. On paper, you have to add up all the numbers yourself. If you want to make a change to something in the chart, such as how much you want to add to your savings account, that item must be erased and changed,

and new totals must be calculated.

The electronic spreadsheet performs the same functions as this chart, except that all the calculations are performed effortlessly by the computer. You still must set up the chart, labelling all the rows and columns. Then, for each block in the form, you have the choice of entering either actual numbers (March's mortgage payment, for example), arithmetic formulas (such as a formula which indicates a sum of certain rows of the column) or text. Any time you change a number anywhere in the chart, the computer automatically calculates all the formulas and displays the new numbers.

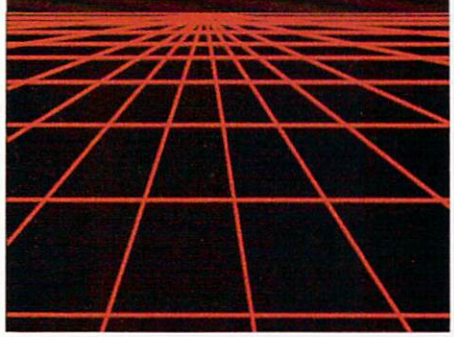
Since the screen of most computers is much smaller than the size of most spreadsheets, the computer acts as a "window" moving around to different parts of the chart and displaying the information under the "window" on that part of the chart, all at your command.

Of course, Charlie uses a spreadsheet to manage his monthly household expenses. In fact, besides the columns for actual monthly expenses, Charlie's spreadsheet includes columns for his planned, or estimated, budget for each month and for the difference between the planned budget and actual expenses. And he has a column for totals for the year. That way, Charlie can keep tabs on how well his family is doing in their financial planning during the year. If any category of expense starts to show more spending than planned, Charlie can determine if he needs to revise his estimates or if someone in the family is spending more than necessary.

Charlie won some money in the state lottery, and is thinking of investing in rental properties. But he has some questions in his own mind. What effect will the price he has to pay for the property have on its profitability? What if he has to pay a higher interest rate than expected? What if repair bills are higher than anticipated? What rent does he need to charge to make the property profitable? And will his investment pay more than a comparable investment in the stock market?

Instead of puzzling over these questions, Charlie set up a spreadsheet that lists the monthly expenses and income he anticipates for the property. Now, he can adjust numbers in the chart and the computer instantly shows him the effect on his investment.

You can have a data base list all those who have birthdays in March, or have it print mailing labels sorted by zip code.



Education

Perhaps the most often used "excuse" (or is it "reason") for purchasing a home computer is, "The kids really need to know how to use a computer to get along in the world they will inherit. I'm really getting it for them!" While this usually isn't the entire reason for the purchase of a home computer, it certainly is a consideration.

I have already noticed how familiarity with computers affected my seven year-old son, Jonathan. His first-grade class spent one afternoon in the "computer room" where several educational programs were running on a series of popular, inexpensive home computers. From his description of the afternoon, it was apparent that those children who had experience with computers at home spent their time actually using the programs, answering the questions and playing the games, while those who had no such experience spent most of the time trying to figure out how to make the computers work, looking to see where the keys were located and staring at the screen, which was staring back at them waiting for them to push RETURN!

Aside from letting the kids fiddle with the computer to become familiar with it, what educational value does the home computer really have? Just look at the software shelves at your Commodore dealer or check out the ads in the back of most computer magazines. There are literally hundreds of educational programs to choose from. Some, of course, have little or no real educational value, while others are excellent. As with the use of television, it is up to the parent to select the right programs for the child. Let's take a brief look at some of the categories of educational programs. (A complete discussion of educational computer programs would fill a book!)

First, there are the "drill and practice" programs that characterized the earliest educational software. These, in their simplest form, present addition, subtraction, multiplication, and division problems, for instance, one after the other, for the student to solve. Usually rewards are small—a simple tune, flashing colors or a new high score. Many computer education "experts" scoff at these rudimentary programs, but they have their place in education. My son Jonathan has greatly improved his speed and accuracy in arithmetic and improved his school grade in math from C to B, for example, by practicing using Commodore's *Speed/Bingo Math*.

One step up from the plain "drill and practice" programs are the programs that make a game out of learning. A plane flies by with "2+5—?" printed on it, and the child can shoot it down only by pressing the "7." This adds a measure of fun to education, and the parent is less likely to have to forcibly drag a child to the computer for an evening of learning. Included in this group are the games that require the child to answer some historical or geographic question correctly in order to move farther along on a journey.

Higher levels of educational programming use sophisticated methods for teaching complex subjects, usually through computer simulation

Continued on page 116

The Electronic University

Brings The Classroom Into Your Home

BY BILL WEAVER, COMMODORE SOFTWARE

With all of the great advances in telecommunications, there has never been a way to take classes, right in your own home... until now.

The people at TeleLearning Systems Inc. have introduced an extraordinary new concept in computer learning called the Electronic University. In existence for about a year, the on-line college allows people to receive accredited college classes and degrees via their computer. The system allows you to connect your Commodore 64 with the computer of an instructor using standard telephone lines. Simply plug the TeleLearning Knowledge Modem or your Commodore modem into your telephone and Commodore 64, sit back in the comfort of your home and prepare for "class".

Enrolling in the Electronic University allows you to take classes at over 1800 colleges and universities in the United States and abroad. Wherever you live, there is likely to be a school nearby that offers courses to suit your particular educational needs. Courses begin with an introduction followed by a series of lessons. Once you register, the course materials, including course disk and text, are sent to you through the mail. Each lesson includes class notes, a reading assignment and/or other outside activity, an electronic worksheet, and a periodic progress evaluation. The progress evaluation is an assignment which you complete, much like a quiz, and send to your instructor through the electronic mail. Your instructor will then make comments and return the evaluation to you via your electronic mailbox. Your instructor is also readily available to answer any questions you might have on the material presented in class. Simply send the questions to your instructor's mailbox and wait for a response. When you're ready, just retrieve the information and proceed to the next lesson.

To go along with the courses, the Electronic University also provides seminars and lectures, counseling services and an electronic library. Imagine "listening" from hundreds of miles away to a recognized authority give a lecture. Prior to each lecture or seminar, all enrolled students receive the lecture material in their electronic mailbox as a preview. If you have a question on the material being discussed, simply tune in to the lecturer at a certain time, send your questions via your Commodore 64 and wait for an answer. You'll even get to see the questions and answers of other electronic students like yourself. And you don't have to take class notes! Just print out the lecture and keep it for future reference.

Included in your enrollment in the Electronic University is a lifetime membership in the Electronic Library. This is definitely worth the price of your membership even if you never take a course. It's quite a convenience to have 8,000,000 books, a complete encyclopedia, political news reports, environmental information, abstracts from the *Harvard Business Review*, articles on any subject of your choice and more, right at your fingertips. And unlike your local or college library, it's

DAVID CHRISTIANA

open any time of the day or night. Presently this service is available only for those who have a VISA or MasterCard, because communication-time charges are billed directly to your credit card.

Probably one of the most important services offered by the Electronic University is the counseling service. The folks at TeleLearning place special emphasis on their counseling program and are there to assist you with your questions. When you first enroll in the program, you will undoubtedly have many questions about what courses and schools you should attend to best meet your educational or career goals. Simply send your questions to the on-line counselors and they will provide helpful, knowledgeable responses.

Although the Electronic University concept has great potential, at the moment the selection of courses is somewhat limited. The classes that were offered in the "courses for credit" section of the course book I reviewed included only one marketing course, one accounting course, and one science course among the 21 various offerings. In addition, some of the courses offered were worth only one credit, compared to most college courses, which are three or four credits. However, the University also offers, in addition to the "courses for credit," personal improvement and professional skill-strengthening courses. I feel that these courses may be the real future of the Electronic University and, according to your individual needs, could prove to be a real bargain.

The initial cost of the Electronic University, normally $150, is for a limited time just $49.95. This is the cost for a lifetime membership and does not include the cost of the courses or seminars themselves. If you do not have a Commodore modem and wish to purchase the TeleLearning Knowledge Modem, there is an additional fee of about $100. Courses and seminars are billed at a standard fee, ranging from $12 to $145, not including the price of any books or materials. There is no additional charge for use of the library or counseling service. The time that is spent on the system is also an additional charge and varies between 17¢ and 34¢ per minute.

Although there are a few things about the system I think need improvement, this is true of any new venture. The overall structure seems to have a bright future. Telecommunications as a whole is still in its infancy, and once it begins to catch on, you may very well begin to see other companies with similar ideas. Who knows, in ten or twenty years we may be able to take any class through our computer and become more educated in the process.

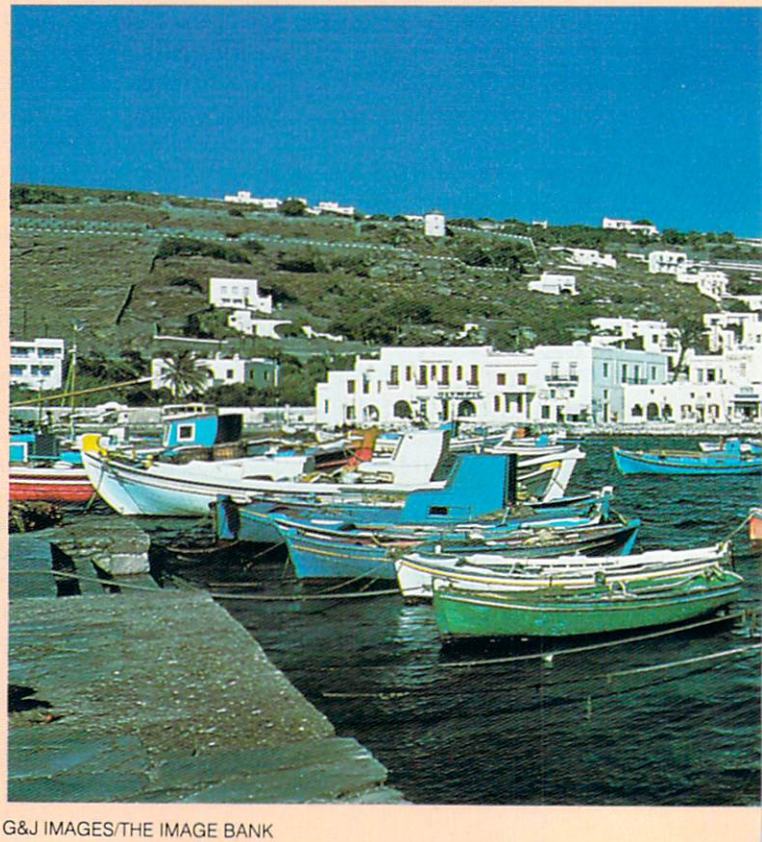
If you are interested in obtaining more information on the Electronic University, you can call or write:

TeleLearning Systems, Inc.
505 Beach Street
San Francisco, CA 94133
(415) 928-2800

Be Your Own Travel Agent

BY LIZ HOFFMAN

Planning a holiday in Mykonos and need weather information so you know what to pack? Do you know if your favorite hotel in Nicaragua is still standing? Get complete, up-to-date travel information or make your own reservations without leaving your home—just use your computer and modem to access the travel networks now available on-line.



G&J IMAGES/THE IMAGE BANK

If you're simply hopping a plane to Chicago, your travel arrangements are pretty straightforward and the consequences of getting erroneous information are usually not too horrible. But if you need to make arrangements for a trip of any complexity—particularly a trip abroad—you need more than just a ticket. You need solid information about visas, inoculations, weather, accommodations, currency, public transportation . . . all the things that will affect your comfort and safety.

However, the fact is that not many travel agencies are able to keep up with the constant changes. And extracting the information from a government agency is, to be kind, a slow process. But if you don't have the most up-to-date information when you plan your trip, you could end up stranded and unable to speak the language, having discovered that your hotel burned down six months before and your driver's license isn't valid.

As a test, try asking your local travel agent how long you can be in Hong Kong without a visa. This could be a crucial issue in planning an Asian tour, yet chances are that you may not be able to get updated information. A more difficult question, "What would I need if I decided to attend a university in Hong Kong?" might provoke an agent to refer you to other sources.

You can, however, get quick, accurate answers to your questions by using an on-line travel information source. As an example, let's take a look at DOSTA (Department of State Travel Advisory), available on the CompuServe Information Service. CompuServe is one of several national telecommunications networks that you can access via your telephone, using your computer and modem.

The DOSTA service provides a continuously updated bulletin board for American travelers going abroad. It also issues advisories and warnings concerning warfare, political unrest, accommodation shortages, currency and other situations of importance to travelers.

Indexing Hong Kong travel information on the DOSTA service, you might find the following information:

American citizens may enter Hong Kong for tourism or business without a visa. Initial permit to stay is usually one month. This may be extended to about three months by application for a visitor visa. Permits to stay for business purposes can be extended as long as Hong Kong immigration is satisfied that the primary base for business is outside of Hong Kong (i.e., that the traveler is not gainfully employed in Hong Kong).

It is illegal to work in Hong Kong if you have only a visitor visa and adjustment of status from vistor to worker is virtually impossible. If an American finds work while visiting Hong Kong, he or she will be asked to leave and to process the employment visa at any British embassy/consulate.

Americans traveling to Hong Kong for purposes of gainful employment or for study at a local university must apply at a British consulate or embassy for the appropriate visa. The visas normally take two months to process and require an employer or academic sponsor. Men bringing their families may apply for visas for members at the same time that they apply for their own employment visa. Women, however, cannot sponsor dependent visas for their husbands. Accompanying husbands must apply for visas in their own right.

Americans arriving in Hong Kong by air will see representatives from the Hong Kong Tourist Association (HKTA) in the airport terminal offering packets of information useful to tourists. This information is free and reliable. HKTA also has offices in San Francisco, Chicago and New York, where tourists may obtain information

before departure.

As of June 1, 1983, all persons departing by air have been required to pay an airport tax and service charge totalling about $18 in U.S. currency ($120 in Hong Kong dollars). There is no departure tax for persons leaving by water or land.

Another service available on CompuServe, Travel Fax carries travel information about other specifics. Travel Fax provides a description of the country, including the climate, how to travel within the country, currency exchanges, business hours, helpful tips, national holidays and other useful facts.

Here is some of the information I found when indexing Greece through the Travel Fax service.

Country Description: Greece is located in southeastern Europe, forming the southern tip of the Balkan Peninsula, which extends into the Mediterranean Sea. Greece is bordered by the Ionian Sea on the west, and the Aegean Sea on the East, making no part of Greece more than 85 miles from the sea. The mainland is bordered by Albania, Yugoslavia, Bulgaria, and Turkey to the North. The Greek peninsula consists of mainland Greece (Attica, the Peloponnese, Central Greece, Thessaly, Epirus, Macedonia, and Thrace) and the islands (Zante, Ithaca, Corfu, Cepallonnia, Kithira, Levkas, and Paxi) which form a chain off Greece's western shores to the Ionian Sea. Greece is a republic, and has been so since Greek voters chose it over a monarchy in 1974. The country is governed by a prime minister and a cabinet which serves a five-year term. Modern Greek is the official language. English and French are widely spoken. Athens, with a population of about three million, is the capital city. The national population of Greece is about 9.5 million. The GNP per capita is approximately $3,720 in U.S. dollars. Principal industries include motor vehicle assembly, textiles, chemicals and food processing.

Primary imports include practically all raw materials, luxury goods and industrial products. Exports include fruit, vegetables, textile products, iron, steel, nickel, aluminum, petroleum products, and ships.

Average high temperature degrees (F) in Athens:

January	54	July	90
February	55	August	90
March	60	September	83
April	67	October	74
May	77	November	64
June	85	December	57

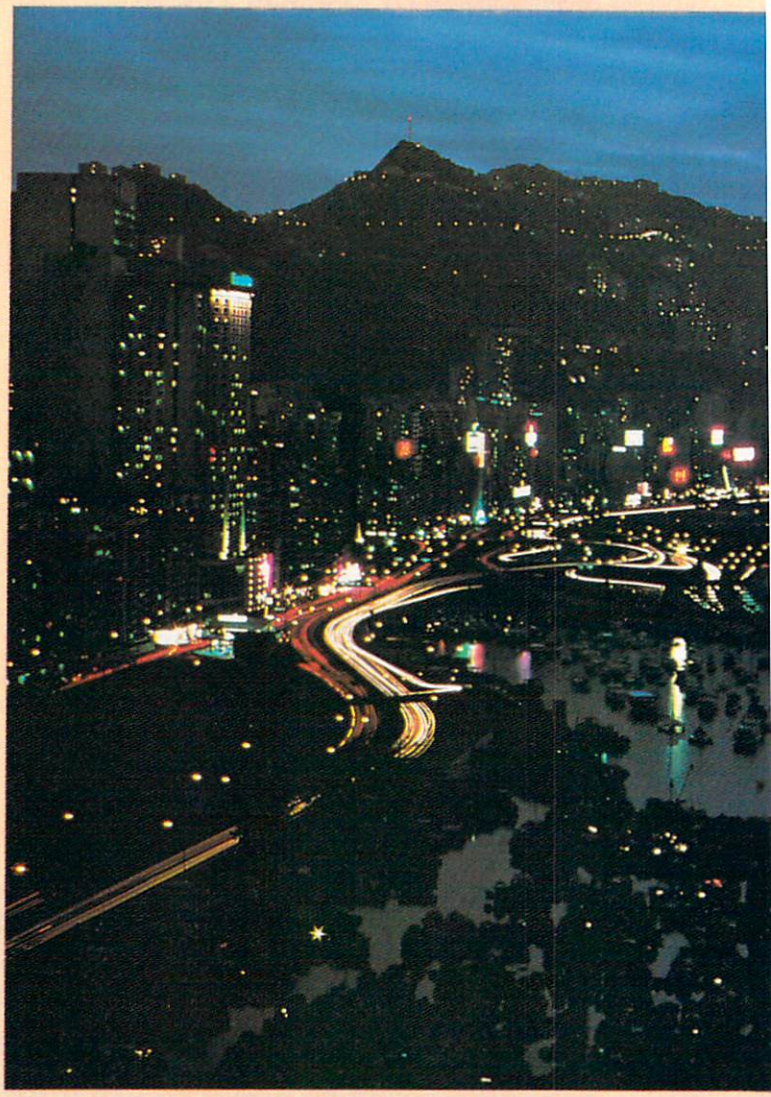
Conditions of Entry: U.S. citizens entering Greece must have a valid passport. A visa is not required for a stay under three months. No vaccination or inoculations are required for entry from the U.S. providing you have not visited a country for which they are required.

Domestic Travel: There are extensive networks of air, rail, bus and sea routes throughout Greece. Public transportation is inexpensive. Rental cars are available throughout Greece. A valid international driving license is required.

Currency/Exchange Rate: The Greek unit of currency is the drachma, divided into lepta. Notes are issued in the values of 1,000, 500, 100, and 50 drachmas. Coins are issued in the values of 20, 10, 5, 2, and 1 drachma, as well as 50, 20, and 10 lepta. The exchange rate may fluctuate daily but the U.S. dollar is equivalent to approximately 52 drachmas. Traveler's cheques and international credit cards are widely accepted throughout Greece, but rely on cash for dining out.

Time Difference: Time in Athens, Greece is Eastern Standard Time plus seven hours.

Airport Location: Hellinikon Airport is about six miles from downtown Athens. Frequently scheduled bus transportation is available.



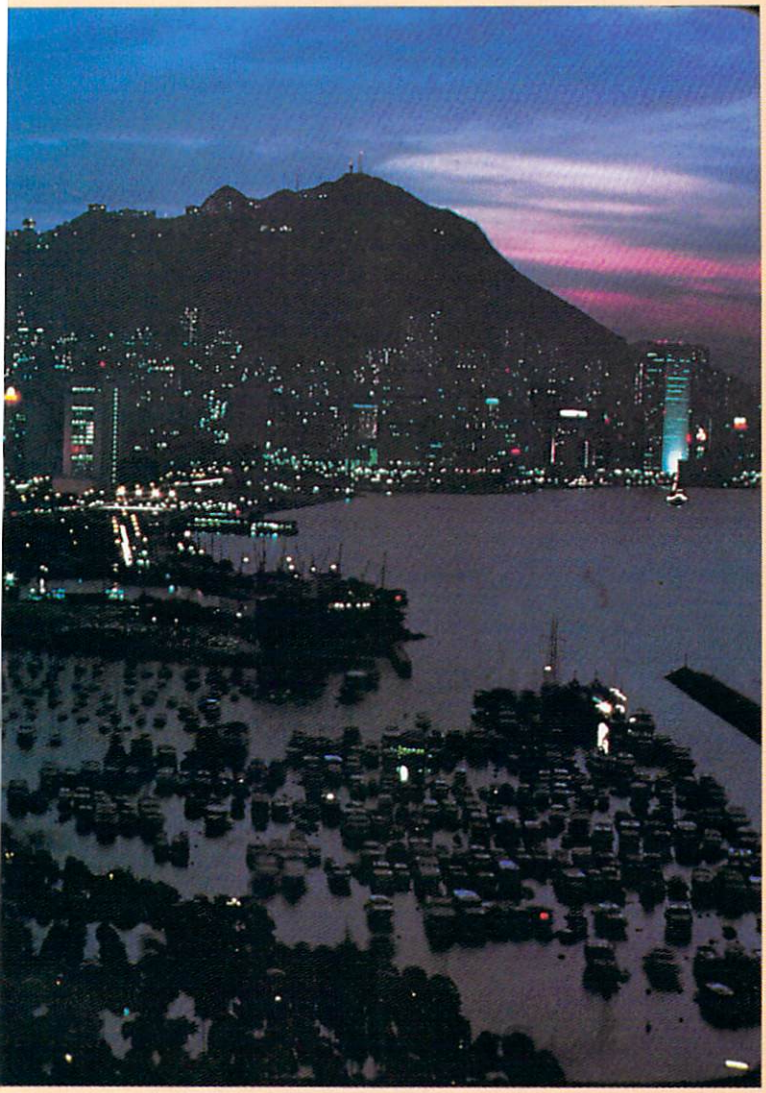
Hong Kong is alluring. But do you know what kind of visa you need to stay there?

By accessing DOSTA and Travel Fax, we have learned a great deal about those foreign destinations. Now to make the necessary traveling arrangements, you can access the OAGEE (Official Airline Guide Electronic Edition), which lists all 650 airline carriers and the 105,000 cities they serve. OAGEE provides the updated information that has been necessary since the Airline Deregulation Act of 1978. You may also access fares for all North American flights. According to OAGEE employee Nancy Meyer, fares for international flights will be available on this network within the first quarter of 1985. Any inquiries will be answered through Email.

You needn't have any prior experience in order to interpret scheduling or to figure fares on the OAGEE service, because the OAGEE data base prompts you with questions and you simply supply the information that applies to your arrangements. This dialog method is

much simpler for the laymen to use than the OAG books, which can be confusing at best.

OAGEE, however, doesn't make reservations. But First World Travel agency, also accessible Via CompuServe, is available 24 hours, seven days a week and does make travel reservations. First World Travel lists tour and cruise packages, car rentals and accommodations. Like OAGEE,



SUND/THE IMAGE BANK

You don't need prior experience to interpret schedules or to figure fares on CompuServe's OAGEE service because the data base prompts you with questions and you simply supply the information.

First World Travel uses the dialog method for obtaining information. For example, the system might ask you the following kinds of questions:

Personal Information

1. Enter your full name:
2. Enter the names of persons traveling with you:
3. Do you wish tickets mailed or delivered to airport?
4. Departing City/Airport:
5. Destination City/Airport:
6. Flight number: (if you wish us to choose your flight please enter time of desired departure)
7. Date of Departure:
8. Date of Return:
9. Return flight number or preferred time:

Car Rental

1. Do you wish a rental car?

Hotel

1. Do you wish hotel reservations?
2. Special Services: [In the "Special Services" area, you may request a special diet such as a non-sodium meal or a service such as a wheelchair.]

For information when planning a trip within the U.S., Canada and/or Mexico by automobile, Travel Vision Services are well worth investigating. There are guided tour cassette tapes to take along with you. In addition to the cassettes, you can also purchase maps, atlases and global catalogs from Travel Vision Services, by writing them at the address provided.

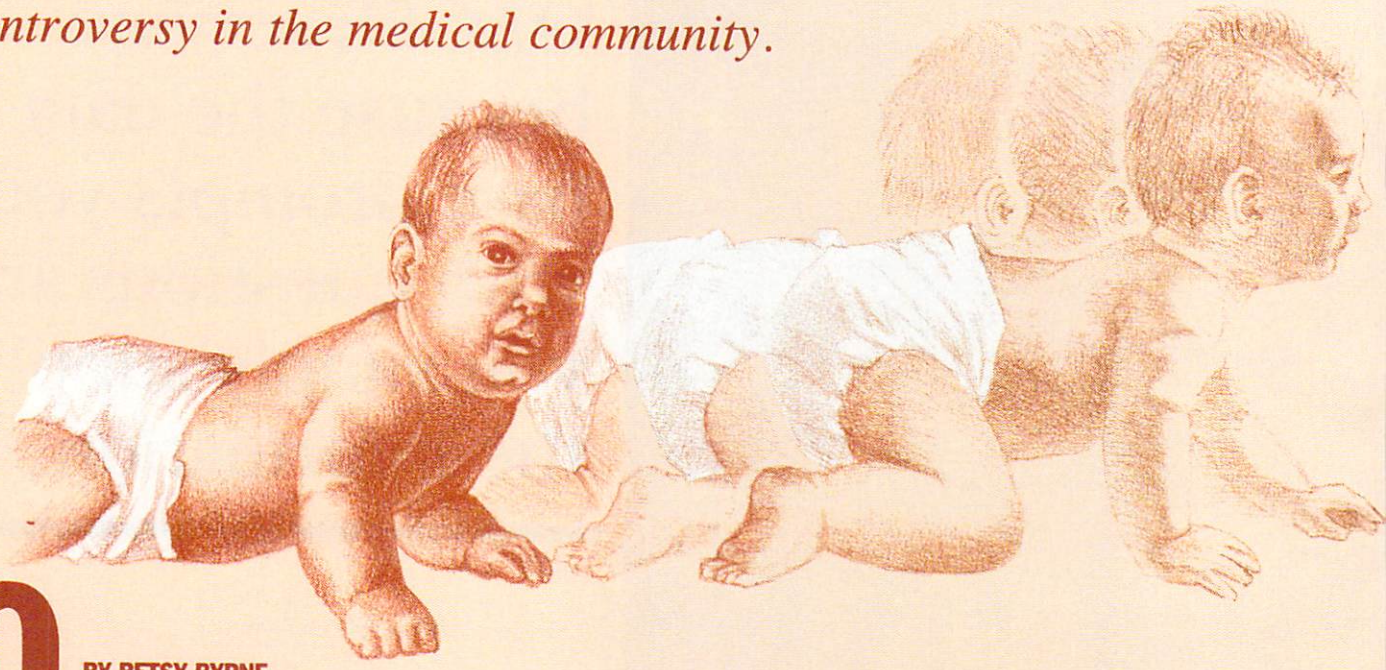
There are many other services in addition to those listed above on the CompuServe Information Service. They offer information to the traveler or to anyone curious about their own location or their neighbor's.

Bon Voyage.

The CompuServe Information Service is a consumer telecommunications network headquartered at 5000 Arlington Blvd., Columbus, Ohio 43220. Phone 614-457-8600. **C**

New Software Just What the Doctor Ordered—Or Is It?

Do-it-yourself home therapy and medical testing software can be helpful. But you've got to use it with common sense to avoid potential hazards. One such package, Childpace, *has set off a controversy in the medical community.*



BY BETSY BYRNE

Over the past several months, software for biofeedback and stress reduction, developmental testing and employee-employer relationship counseling has been offered for sale alongside the latest shoot-em-up games, word processors and telecommunications programs. This new "self-help" software has been causing quite a stir not only among buyers, but among members of the medical profession as well.

For instance, *Childpace*, published by Computerose, is software that allows parents to administer the Denver Developmental Screening Test (DDST) to their children aged three months to five years. The DDST is a test used routinely by pediatricians to assess their young patients, but has not previously been available to the general public. Another product, *Relax* from Synapse, provides the user with biofeedback hardware and software, and information on stress reduction techniques—equipment and information previously available mainly from therapists. Other home self-help products include titles like *Calmpute* (HesWare), *The Hypnotist* (Psycomp) and *Total Health* (Computer Software Associates), to name just a few.

The question in the minds of some medical doctors and psychologists seems to be whether these products and other medical/therapeutic programs like them really belong in the home market. Using *Childpace* as an example, let's look at what lay people and professionals have to say.

The Denver Developmental Screening Test used by *Childpace* measures a child's development in gross and fine motor control, language and personal and social skills. It does not, however, measure I.Q. A pediatrician administering the DDST in the office makes observations on such things as when an infant can first sit up unaided, hold up his head, follow an object from left to right or respond to a human face. As infants become toddlers, they are asked to pile up blocks, identify pictures of cats and dogs and name the different parts of a doll's body. Older children may take the test upon entering school, where they are asked to do things like draw two parallel lines, repeat strings of numbers in sequence, hop on one foot or describe a set of objects.

The *Childpace* package includes a set of eight blocks, a ball of yarn, a small container to be used with rai-

sins, several record books that are used with the drawing and sight identification parts of the test, an instruction manual and the program diskette. The program itself gives a comprehensive explanation of its goals, offers help menus and even provides graphic illustration of each step of the test (a small sprite jumps up and down, hops on one foot, etc.).

The documentation walks parents step by step through administering the tests, compares the findings with developmental norms (based on findings published in the *Journal of Pediatrics*) and displays the results on the screen. There is also a printer option so parents can obtain a hard copy. Results are stored in a data bank on the disk and can easily be recalled to the screen. In addition, the manual cautions sternly that children develop at different paces and that test results serve only as a guideline for professional decisions.

Childpace was written by professionals (Ronald Neman, Ph.D. and his wife, Catherine Neman, M.Ed.) and is marketed by medical professionals (Sam Barklis, M.D., chairman of Computerose, and his wife Allison Barklis, R.N.). There seems to be little doubt that the program performs the task it was designed for — helping concerned parents keep tabs on the development of their children.

So what's the beef? The objections of people like Dr. Pat Dickson, a psychologist at the University of Wisconsin and frequent contributor to *Family Computing* magazine, center around the possible misuse of software products like *Childpace*.

"A product like *Childpace* can focus the parent unduly on criteria over which they probably have very little control, in a context in which at least some percentage of the parents are going to have their fears aroused unnecessarily and inject stress into their relationship with their child," Dr. Dickson maintains.

Although the manual reassures parents about overreacting to negative results, this could be a very real concern because, as Dr. Linda Grilli points out, "Not every computer owner faithfully reads every word of every software manual."

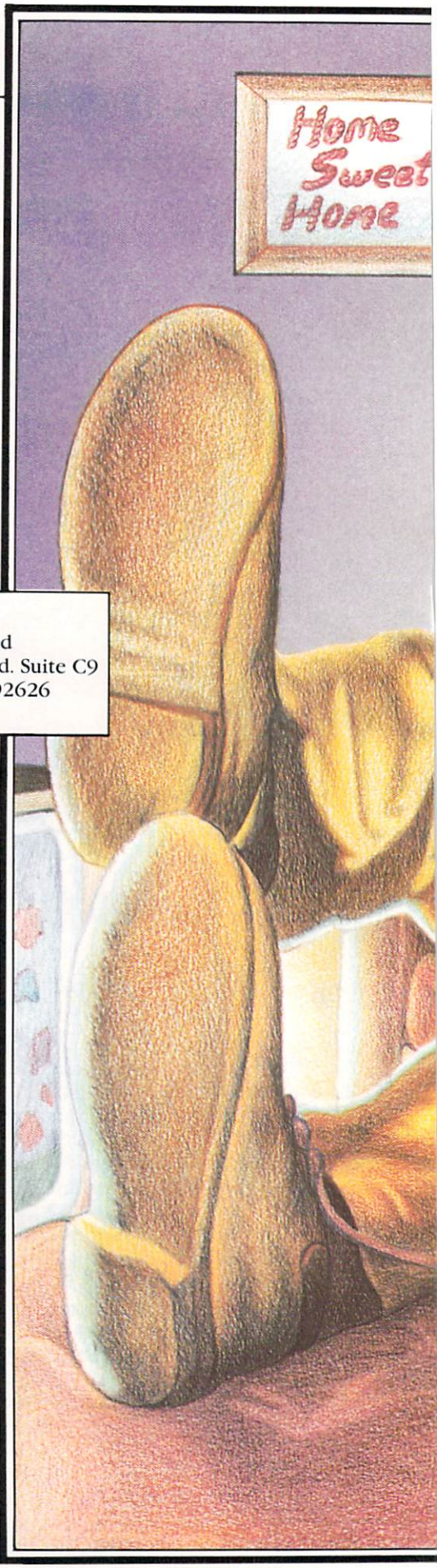
Dr. Grilli, a psychologist in private practice in Cedar Crest, New Mexico, seems happy with the *Childpace* concept as a whole, however.

"I don't think ignorance is ever a solution," she asserts. "I don't think

Continued on page 118

GET ORGANIZED!

Do you have too much stuff? You can always buy a bigger house, build a warehouse in the backyard, have a huge garage sale or (heaven forbid) throw some of that wonderful stuff away. Or you can do what I did: I got Batteries Included's* Home Organizer *series.



Computer: Commodore 64
Publisher: Batteries Included
3303 Harbor Blvd. Suite C9
Costa Mesa, CA 92626
Medium: Disk

No, the *Home Organizers* are not the latest development in robotics technology or a band of labor-loving elves who enjoy engaging in magical midnight cleaning sessions. Nor are they some ingeniously contrived marketing gimmick to profitably dispose of a stockpile of used cardboard boxes (lids are extra).

The *Home Organizers* are a series of eight programs for the Commodore 64. Based on their powerful *Consultant,* a professional database manager, Batteries Included created the *Home Organizer* series for those of us who want the same power that a larger program offers but without the headaches.

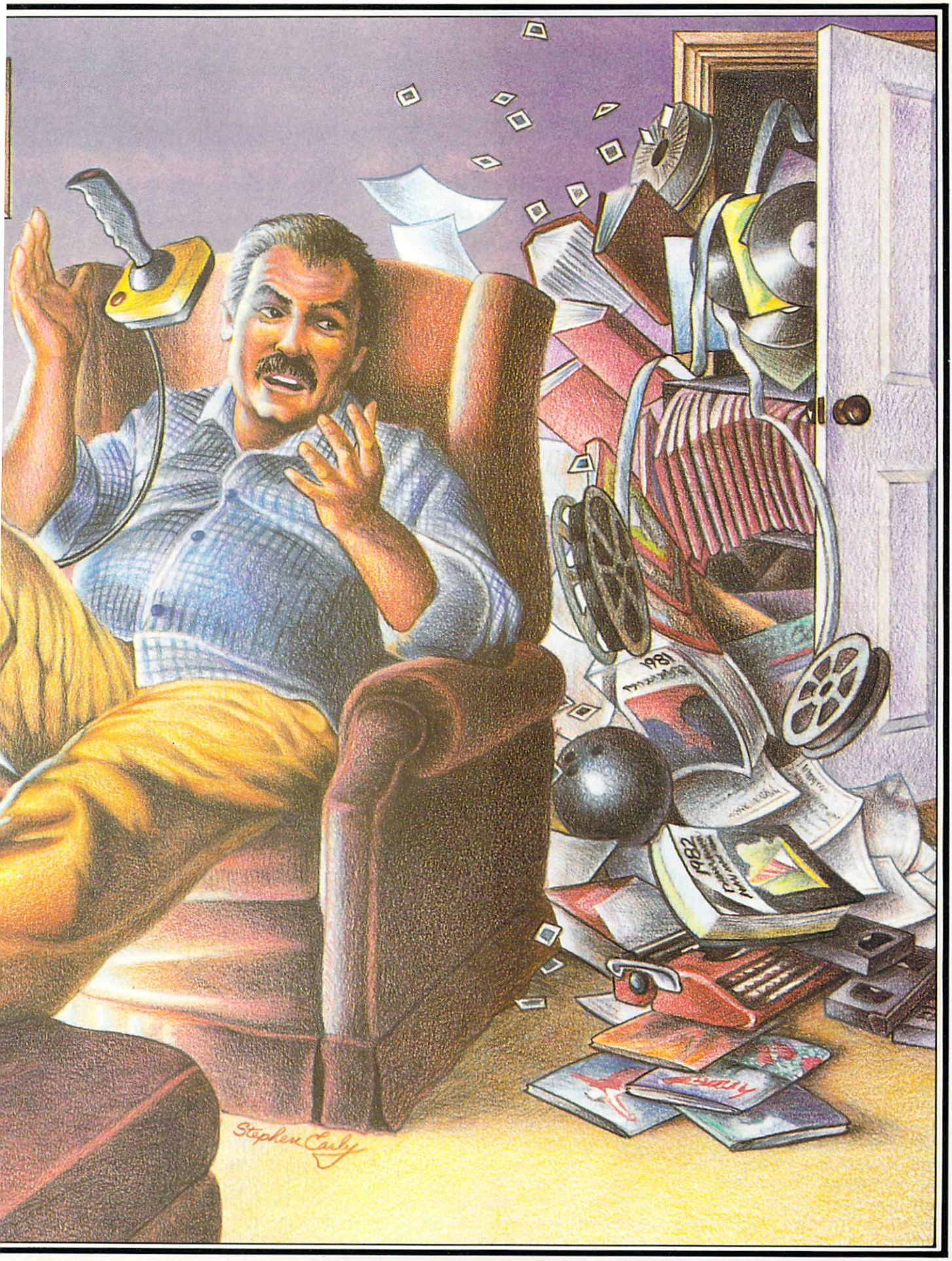
No tedium here. Your *Home Organizer* takes care of all the nasty and time-consuming little details of data base construction. Each of these dedicated programs has the data fields, screens and formatted printer reports already set up for you. All YOU have to do is enter the information about your stuff. And there is a program for just about every category of stuff you might happen to have stuffed into your poor overstuffed house.

For example, there is a program for stamp collections, which organizes and keeps track of all pertinent information such as the country, denomination, size, collection set number(s), shape, condition, color, value and any additional remarks for every stamp in your collection. I am not a stamp collector myself, but my oldest son is and he tells me that this particular program is quite thorough.

Home Organizer's "Audio Video Catalog" can forever do away with the usually hopeless and always infuriatingly prolonged search for a particular album or a specific film from within a large music and videotape library. This program gives you speedy access to everything in your collection by title, author or artist, label or maker, type, category, play time, counter position (for cassettes and videotapes), producer, personal remarks and more. It does not, however, keep track of whose turn it is to choose the evening's entertainment.

For anyone who ever wondered when a particular photograph or home movie was shot, who took it or even what the ?#$%! it is anyway, "Photographs, Slides and Home

BY KELLEY ESSOE


Stephen Early

Movies" will forever solve the riddle of the beheaded body and disembodied head. Description of scene, film make and type, exposure, print size, paper type, frame type, date, photographer, catalog number and additional notes can be entered for every photograph or home movie. Never again will you have to wonder who the genius was who took three pictures of his own feet or ponder over what city and on what vacation the picture of the whole family looking tired, hot and hostile in front of a Holiday Inn was taken.

The "Address Book" program lets you know who and where your current friends, enemies and business acquaintances are and the "Mail List" program not only keeps track of the people you know, but makes it easier to send them those invitations, moving notices, thank you notes, Christmas cards or chain letters. Both programs keep records of names, addresses and phone numbers as well as allowing for a short remark or additional note. Probably intended for adding information such as other family members' names, birth dates, anniversaries or the like, I have found another, less conventional use for this space. I cannot use a genuine entry to illustrate this therapeutic application because many of my additional notes and short remarks are unprintable at best, but using the entry "All work and no pay..." for an employer-might give you the idea.

The electronic "Checkbook" allows you to classify, calculate and review your finances. Checks are entered by issuance name, check number and date, then placed into one of seven categories: mortgage/rent, food, clothing, automobile, leisure, utilities or other. Total monetary expenditures by either time period or category can be printed out as solid proof that there are still a few dollars left in the monthly budget to buy more stuff.

Kitchen detail is made easier with the "Recipes" program. With this module of *Home Organizer*, you can classify meals by any number of categories or groupings, then recall recipes by name, category or type, ingredient, calorie content, cooking time, cooking temperature or quantity of servings. Recipes will even help you to plan out special diet menus or write your weekly shopping lists.

With "Home Inventory" and one three-day weekend I managed to put into order what had taken me years to arrange into the random chaos my family wryly referred to as home.

The last program in the series, as it now stands, is the first program I used. "Home Inventory" was just what the doctor ordered: it helped turn my (ware)house back into a home. It also put me back in control.

With "Home Inventory" and one three-day weekend, I managed to put into impeccable order what had taken me years to arrange into the total random chaos that my family so wryly referred to as home. Keep in mind that neither I nor Batteries Included ever once claimed that there wasn't going to be *some* work involved. The programs will organize your stuff, but first you've got to tell it what your stuff is!

To the country sound of Waylon and Willie, I loaded and ran "Home Inventory," chose the screen border, background and cursor colors with the function keys, followed the instructions to format a data disk and then pressed "1" from the menu to take me to the data entry screen.

The preset fields in "Home Inventory" consist of the item description or name, the serial number, color, location, purchase price, current value, insurance coverage and manufacturer. There is also a field for noting what system, collection or grouping the item belongs to, if any, and a remarks field where any other bit of information you care to add about the item can be typed in.

At the bottom of the screen is the command line where you choose to (E)xit, (A)dd or (U)pdate a record. Since this was the first time I had used the program and therefore didn't have anything to update, I pressed "A" to add data. The prompt line immediately changed to read "Enter Record Data—press (left arrow key) to finish" and the cursor blinked merrily on the first field waiting for me to give a name to my first piece.

I typed in "Commodore 64." Might as well start where my fingers are. I pressed <RETURN> and the cursor jumped to the beginning of the next field. I entered the serial number, pressed <RETURN> and continued in this manner until all the fields contained the specified information. Then with a touch of the left arrow key, the disk drive came to life and my completed first record was written onto the data disk.

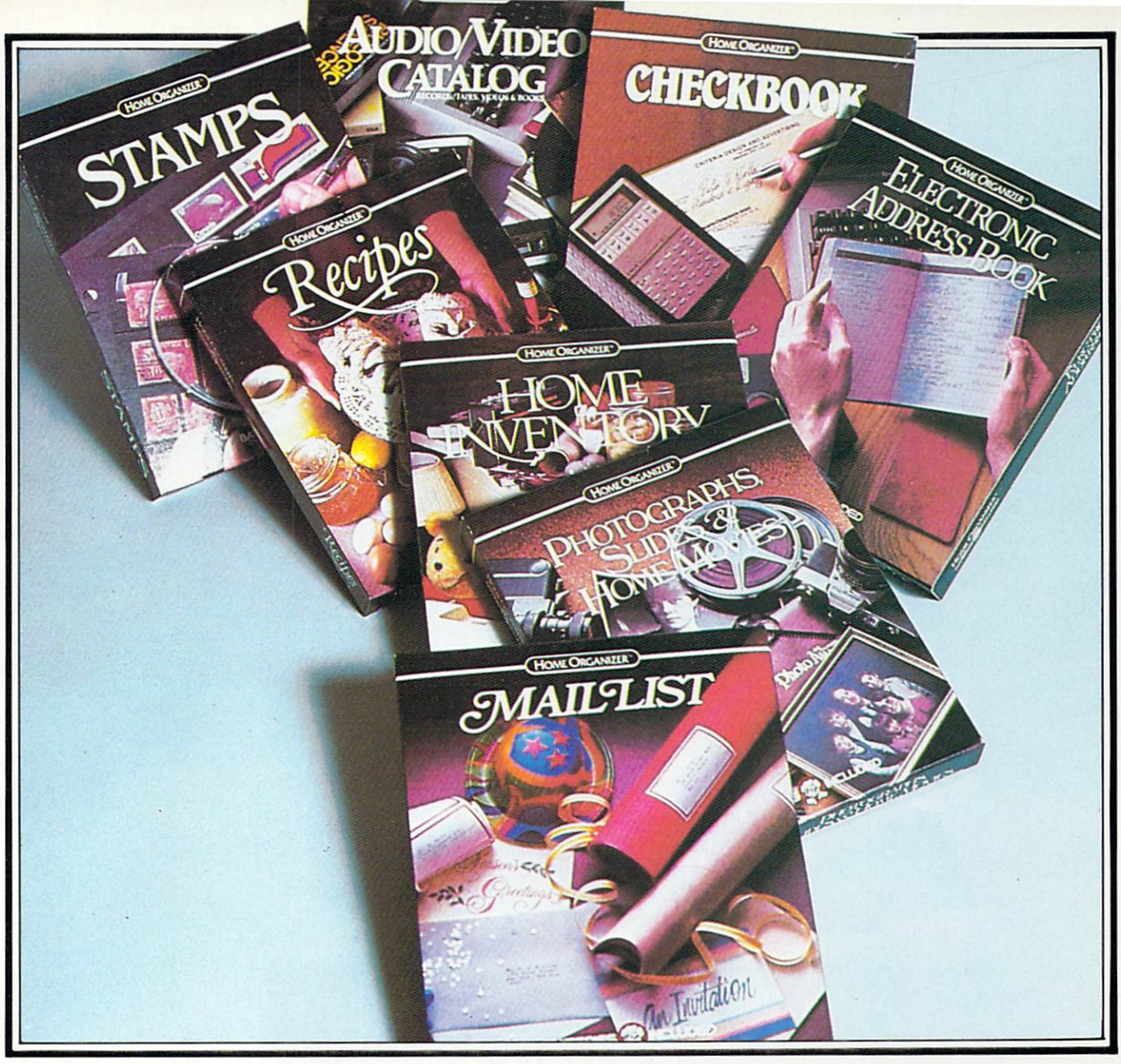
All through the day, like Sir Edmond Hillary, I slowly but resolutely scaled our ominous and towering Everest of stuff. At first the going was rough, but by late afternoon I knew I would make it. I had drafted the rest of my family to act as the emissary, research, validation, detective, dispersal and task force of the expedition. In other words, they did the manual labor.

That evening, our house was almost unrecognizable. More than half of our agglomeration of stuff was recorded on disk and stored away, set up or rearranged according to its purpose and/or frequency of use.

After dinner I felt it was time to test the system.

The most useful and powerful feature of a data base lies in the user's ability to specify any particular field of information, such as "item name: table saw", "location: hall closet," "serial number: 1567B82" or "part of: stereo system" and have the computer rifle through the file and find the record or records that match the search string data.

Conversely, let's say that that heavy green and pink ceramic serving bowl your mother-in-law gave you only gets dusted off and put into use when she comes into town for a visit at Christmas time each year. Let's also say it's December first ... and you can't remember where you put it. So, you enter "ugly serving bowl" into the name/description field as the search string data. Lo and behold, up comes the file card, and as you can see in the location field, you've been



keeping it stored as Roxanne's dog food bowl on the back porch.

A wild-card search enables you to search for a specific field of information without specifying all the characters in the search string. For example, if you want to search for all the items in your "Home Inventory" file whose color field has an "e" as the second character, you would describe the string by typing "?e". The question mark is the wild card symbol and can stand for any character. The computer would then come up with all the stuff on file that is either red, yellow, beige, neutral or any other color which is spelled with an "e" as the second letter.

A match-anywhere search will look for the occurrence of a string anywhere in the given field. You can use this type of search, for example, to find all items whose location is specified as being some room, as opposed to a shelf, a cupboard or the back porch. To perform this search you would enter a "!" at the location field and then type "room." The exclamation point stands for the match anywhere order.

With the press of a key you can find where you've stored that ugly pink and green serving bowl your mother-in-law gave you.

The not-equal search lets you search for any records that do not match the previous criteria. Say you happen to be partial to products made by a certain manufacturer—we'll call the company "Neverbreaks"—and just about every household appliance in your possession is made by them. If you wanted to see the file cards on everything you owned that was not made by Neverbreaks, then you would first press CTRL/9 (or RVS ON) and enter Neverbreaks into the manufacturer field. Now you know exactly what you have that always breaks.

Three other types of searches are supported by these programs: un-

Continued on p. 120

IT'S NOT HOW LITTLE IT COSTS, IT'S HOW MUCH YOU GET.

We have a surprise for all those people who think that in order to get more you have to pay more.

The Commodore 64.™

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COMMODORE 64

IT'S NOT HOW LITTLE IT COSTS,
IT'S HOW MUCH YOU GET.

BY BETSY BYRNE

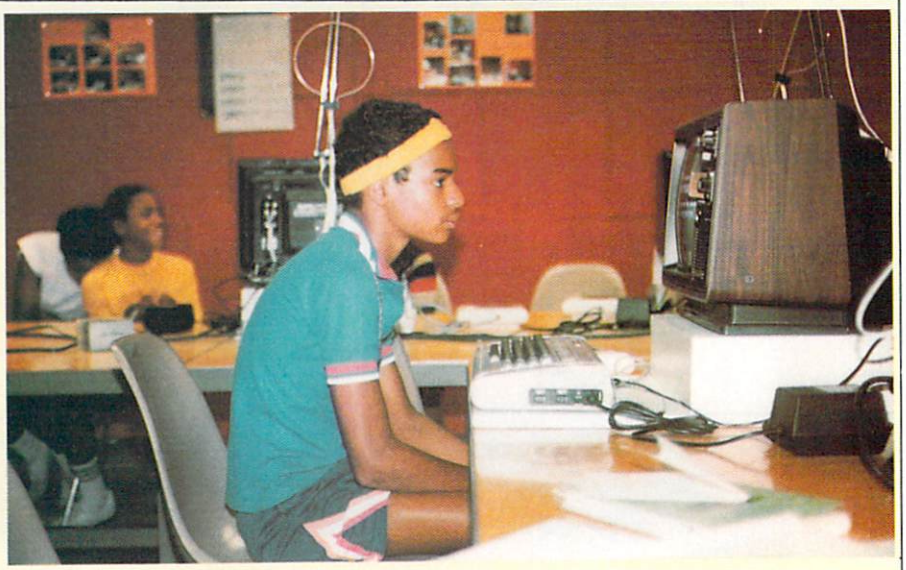
Two Schools Win Commodore Matching Grants

What kinds of schools receive Commodore Matching Grants? I found that there really is no typical school, but in the quest for computer education, all schools are experiencing the same kinds of difficulties and enjoying the same rewards.

Two educational facilities I talked to couldn't have appeared more different, at first glance. Hill House Association's Computer Center is funded by United Way and is located in a low-income area of Pittsburgh, Pennsylvania. Champlain College, in Burlington, Vermont, is a 100 year-old business college, with dorms housed in stately Victorian mansions, overlooking Lake Champlain and the Adirondack Mountains.

Hill House's Jane Willis told me that they initiated computer training only last year, while Barry Genzlinger, Educational Director of Champlain's Computer Resource and Training Center, proudly claimed that Champlain has been teaching computers and data processing (in some form) for almost 30 years! And yet, in spite of the differences in economic resources and experience, they had many concerns in common. First, they both seemed to agree that the biggest problem facing their programs is money. And, second, they both were excited about and committed to computer education.

Hill House Center

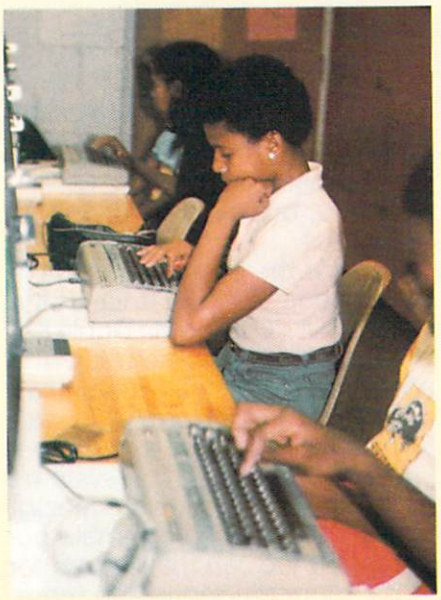


"We're trying to give kids a head start," says Jane Willis, who recently took over direction of the Hill House Computer center. "These youngsters are generally the ones who test the lowest in the schools. Because of economic, social and cultural conditions, these kids are often behind."

I asked Jane how kids were enlisted in Hill House's programs and she replied, "Occasionally we get referrals from schools, but usually the way we recruit is by making flyers and taking them to all the schools. There are times when we take the computers to the schools, giving kids hands-on experience to stimulate their interest. We also have relationships with individual teachers, most often science and math teachers, and support them in encouraging their students.

"Many parents in this community kind of shy away from the school system, possibly because of professional jargon," she added. "Many are not highly educated themselves and they feel a bit apprehensive in their relationship with the schools, so sometimes we feel we have to work through the schools to get the youngsters motivated."

Willis explained that their center is located right in the middle of three large housing projects and speculated that a median income figure might be about $7,000 per year.



In fall and winter, Hill House offers classes for both children and their parents. Classes for kids are scheduled for after school and adult classes are held in the evening to avoid conflicts. One of Hill House's objectives is to work with the entire family. They have found that the children and parents go home after the computer classes, talk about their new experiences and help each other gain understanding of the new technology.

Some families, after learning the basics at Hill House, have purchased computers for their children to use at home, realizing that owning a home computer might help increase their own job opportunities as well as their offspring's school performance— no small thing in an area where 25% of the residents are unemployed. *Continued above right*

The center also serves as a resource for these folks and other neighborhood computer owners, according to Willis. Hill House personnel often find themselves answering questions and giving advice on educational software, services badly needed in any community.

The Hill House program began last summer, starting with just six Commodore 64 computers and datassettes, purchased with a grant from the Alcoa Foundation. They offered courses in BASIC, held open house evenings for the community and visited local schools to give computer presentations. After two volunteer consultants recommended that they begin teaching LOGO, the agency decided to find funds to purchase more computers, monitors and most importantly, 1541 disk drives to allow access to LOGO. They applied to Commodore under the Matching Grant Program and now boast a total of 18 Commodore workstations.

But computer programming is not the only subject taught at the center, by any means. Kappa fraternity and Gamma sorority provide volunteers for a cultural enrichment program at Hill House and some of these volunteers who are studying computer-related subjects share their expertise with kids in the center's computer labs. The center and their consultants are currently engaged in selecting new software to augment the math, spelling and reading software they currently use.

This program is coordinated closely with local schools, interfacing computer-aided instruction materials with each child's individual curriculum whenever possible. Hill House Computer Center's long term computer objectives are to stimulate community interest in microcomputers as an educational tool. They are looking for ways to integrate their computers into other, more traditional center activities, such as music and art classes.

Champlain College

By Hill House standards, Champlain College might appear to have been rolling in computers when they applied for their Commodore Matching Grant, but they had a very special project in mind when they proposed buying 13 SX 64's (portables), which Commodore matched with 13 more. They planned to use the computers to create a mobile computer lab, that would travel to the far corners of Vermont, staffed with an instructor and two assistants, teaching programs customized for the needs of each community and its schools.

They had experimented with a pilot program, put together because they felt that comprehensive computer education in Vermont was being hampered by the long, lonely distances separating their schools, low population density and restricted funding. They found that teacher training, curriculum development and community understanding of computers seemed far behind other areas of the country. Since the miles between schools made it impractical to set up a central educational facility, as had already been done on the main Champlain campus, the mobile lab seemed the perfect solution.

But they desperately needed computers that were truly portable (their pilot program had included lugging full-sized 64 systems and PET's around in U-Haul trailers) to bring their high-tech information to every Vermont hamlet. They felt their traveling computer information lab would be well worth their investing in 13 SX 64's, since everywhere they went with their pilot program, classes were enthusiastically received and filled to capacity.

This project seemed no small undertaking to me and I wondered how Champlain College had become involved in computer education to begin with. Barry Genslinger from Champlain explained it in this way.

A few years ago, the President of Champlain College, Robert Skiff, felt that Champlain needed to address computer education for elementary and secondary schools, as well as their own college-level computer and data processing activities.

According to Genslinger, it was natural for the college, with its long commitment to computers in the business world, to start looking at the education end, and try to help schools deal with the microcomputer revolution.

With this goal in mind, Champlain set up a fully equipped computer resource and training center and created a new department within the college. No expense was spared to set up a $50,000 educational computer resource room, containing all the most popular brands of educational computers and over 1,000 pieces of educational software.

Now, educators from community schools and universities are invited to come in and try out hardware and software, both to learn about com-

puters and to be able to make informed decisions when planning purchases or devising computer curricula. There is a one dollar per day charge for using the facility, and, as Barry Genslinger points out, educators sometimes come in and spend the entire day there, using any computer and software. A full-time lab assistant is available to help visitors use any equipment they might not be familiar with. Genslinger added that Champlain's lab often hosts entire classes from nearby universities (there are three within five miles of Champlain's campus) and that they often put on seminars for community groups ranging from senior citizens to Rotary organizations and Girl Scout troops. The charge for each seminar is based on the number of people attending, the special computing interests and needs of each group and ability to pay. Each seminar is customized for the individual organization attending.

Champlain College is also becoming known around the world for its fine computer camp. Each session runs for either two or four weeks and can be attended by up to 130 campers. Campers from as far away as Venezuela, Egypt, Spain and France have been attracted by the full computer curriculum they offer, as well as more traditional camping activities such as boating, swimming and horseback riding.

Three years spent planning and administering projects, like the camp and educational research lab, gave Genslinger and the other Champlain staffers the experience they needed to coordinate their new mobile computer room on wheels. Sessions are not free, but according to Genslinger, the fee does little more than cover the expenses of the lab and its team of experts and is much cheaper than hiring a consultant. It also saves schools from potentially costly mistakes.

When a school applies to Champlain College for a visit from the mobile lab, they are first sent a 100-page manual that guides them to assess the needs of their school, so that Champlain can tailor its presentation accordingly. After needs are identified and the presentation is planned, the computers are loaded up and the Champlain team is off for two weeks to introduce computers to excited new groups in an outlying area.

When they arrive, they set up their equipment in a facility provided by the school and during the day they work with the students, teachers and administrators. After school hours, the student's parents and any other interested community members are invited in for a hands-on program tailored to their own requests—often a demonstration of software for home and business applications as well as educational programs.

Both Hill House and Champlain College agree that the biggest stumbling block to designing bigger and better community outreach programs is money and both felt they were very lucky to have been able to take advantage of the Commodore Matching Grant program. **C**

Using the Computer to Help Your Child Learn

Suggestions from Commodore's Education Department

Can I Help My Child Learn By Using A Computer?

Nothing takes the place of you and your child working closely together. If you share in the learning experience you will help your child get the most out of a computer, and its software packages. Through this, you can help your child gain the skills he or she will need to succeed in tomorrow's world.

Here are four important ways that you can make learning to use a computer a valuable and fun experience for your child: create a comfortable environment for computer learning, encourage and support your child's computer study, ask questions and discuss the answers and have additional activities available.

How You Begin

Try to learn with your child. Make the learning fun for both of you. Don't worry about making mistakes; that's part of learning. If you work at your child's pace, the excitement that comes from discovery will continue. You will probably find that, after a while, you and your child can help each other learn more about the computer.

Meet regularly with your child's teacher(s). This way you can find out his or her academic strengths and weaknesses. Once you have this information, you can select the software that can help improve his or her skills.

Don't force your child to use the computer. If your child thinks that operating a computer is fun, rather than work, he or she will want to spend more time using the computer. Even time spent playing games leads to useful computer learning.

Before you buy any software package for your child, check it out yourself. Is the information of interest and use to your child? Are the instructions written clearly?

Once you have bought a software package, it's a good idea to go through the program with your child the first time. He or she will appreciate your interest and attention.

Try to learn with your child. Make the learning fun for both of you. And don't worry about making mistakes; that's part of learning.

Creating the Right Environment

Encourage your child to set aside some time during each day for him or her to use the computer. Be flexible in scheduling the time. Make sure that the time chosen doesn't conflict with other activities.

Help your child avoid unnecessary problems at first by setting up the computer for him or her and then testing it to be sure that everything is in good working order. Also teach your child how to set up the equipment and how to use it safely.

Once you've put your computer system together, you may want to keep it that way. It will be easier and more enjoyable for your child to use if all he or she has to do is turn the power on.

Keep both the computer and the programs in a place where both you and your child can easily use them. Easy access usually means more time spent using and learning on the system.

Don't discourage your child's use of computer games. Instead, try to encourage your child to use both games and educational software.

Remember that the computer is not a toy. Keep it in a safe place. Make sure that all the wires are connected properly and that they don't get in the way. Also keep all software away from magnets, out of direct sunlight and off the top of your TV.

Do not let your child place food or drinks near the computer. A cup or plate that's accidentally spilled could damage the computer or software. In addition, be sure that your child's hands are not sticky or very dirty.

Encouragement and Support

Sometimes it's a good idea to just watch and enjoy your child as he or she learns. Your child will know you care about what he or she is doing simply because you're there in the same room.

Be impressed by what your child is doing and listen carefully to what he or she wants to tell you.

If you and your child are playing computer games, let the child win off and on, but don't make it obvious.

Take a few minutes to see what your child has been working on and then praise his or her efforts and accomplishments. More important than success, is that your child feels at ease in front of the computer.

When your child is first learning to use the computer ask only simple questions that can be answered by a yes or no. For example, "Do you want to try again?" Later on you can ask questions which need more detailed answers, such as, "What did you like about what you just did?" "Tell me what you just did," and so forth. Look for ways to praise your child's interest in computers particularly when your child is nearby and can hear you.

Show your child that there is a relationship between the computer programs and his or her own interests. For interest, compare computer games with TV games shows and compare learning programs with the child's school work and your work.

How to Ask Questions

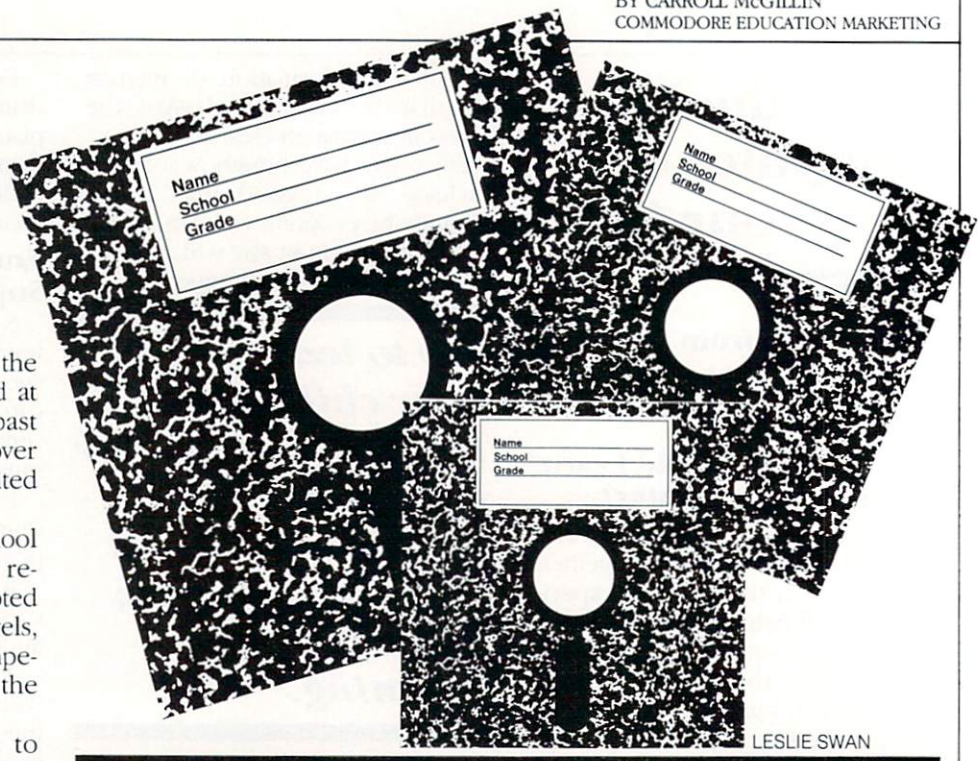
While your child is working with the computer you should ask interesting and relevant questions for him or her to think about. Sample questions are available in most Commodore educational software packages.

Additional Activities

You may want to set up additional activities for your child before and after each computer learning experience. Sample activities are provided in most Commodore educational software packages. **C**

BY CARROLL McGILLIN
COMMODORE EDUCATION MARKETING

1984 Olympics of the Mind



LESLIE SWAN

What happens when 4,000 talented youngsters descend upon Akron, Ohio, to compete in the annual World Finals of the Olympics of the Mind? Aside from longer lines at Burger King, Akron saw some exciting games of the future that not only provided extraordinary color graphics and sound, but were intellectually challenging as well.

The 1984 World Finals of the Olympics of the Mind were held at the University of Akron this past spring and brought together over 400 schools representing the United States and Canada.

To compete at this level, a school first had to complete state and regional competitions. Once accepted to compete at the World Finals levels, the schools engaged in more competitions that further narrowed the field.

The deciding problem was to write a game program that used Commodore 64 graphics to put eight words into a grid. Total score was determined by the way the game was developed and the point values of the words chosen. Competition was divided into three categories: Division I (Grades K-5), Division II (Grades 6-8) and Division III (Grades 9-12).

There were several limitations on how the problem could be solved. The program had to be in the BASIC language, as described in the *Commodore 64 Programmer's Reference Guide* . The *Merriam Webster Collegiate Dictionary* was the official authority for words used in the grid and all programs had to have a built-in check system to catch words that were too long or nonsensical. A complete alphabet had to be centered at the top of the screen and the point value for each letter had to be directly underneath that letter. The word "Olympics" had to appear in alternating reverse characters in the upper left side of the screen. Finally, the grid had to be 12 by eight columns and each program had to have a scoring mechanism that totalled and displayed the score for each word and the game.

Each game was also evaluated on the construction of the grid. The blocks in the grid were to be in an alternate checkerboard pattern, bonus points were given if each box in the grid was outlined in black using 64 characters and bonus points were also given if the program sounded a musical tone each time a letter was entered. In addition, for Division III, bonus points were given if the program ended with animated sprites and music.

The team with the highest score in each division was declared the winner. Awards were given for first, second and third place in each category. A complete Commodore system was awarded to the first place school in each division.

A list of the top six teams from each division and program listings for the two winning programs from Divisions II and III follow. **C**

	DIVISION I	DIVISION II	DIVISION III
FIRST	Schroeder Elementary, Michigan	Oregon Jr. High, Wisconsin	Lincoln East High, Nebraska
SECOND	Madison Extension Program, S.D.	Hamilton Middle School, Colorado	Benson Polytechnic High, Oregon
THIRD	Walter J. Mitchell, Maryland	Northwood Middle School, S.C.	Lucas High, Ohio
FOURTH	Beulah Elementary, Virginia	T.C.A. Middle School, New York	Beneway High, New York
FIFTH	Hoover Elementary, Oregon	Thomas Armstrong Middle School, N.Y.	Centennial Senior High, B.C.
SIXTH	Gwynedd Mercy Academy, Pa.	Weatherbee Jr. High, Maine	Reach Team A, Texas

Division II Winner:
Oregon Jr. High, Wisconsin

```
 1 REM SETUP'BFGB
 5 DIM LV(30)'BGTE
 10 PRINT"[CLEAR,CYAN]";:POKE 53280,1
    :POKE 53281,1'DRED
 11 S=54272:FOR I=S TO S+24:POKE I,0
    :NEXT:POKE S+5,9:POKE S+6,0'LCTL
 15 PRINT"[CLEAR]";:FOR I=55296 TO
    56295:POKE I,3:NEXT'GSNK
 20 PRINT"[SPACE9]ABCDEFGHIJKLMNOPQRST
    UVWXYZ"'BACH
 30 PRINT"[SPACE9]13321424165131137111
    144647"'BAAG
 35 PRINT'BACE
 40 PRINT"[SPACE11,SHFT U,CMDR R,
    SHFT C,CMDR R,SHFT C,CMDR R,SHFT C,
    CMDR R,SHFT C,CMDR R,SHFT C,CMDR R,
    SHFT C,CMDR R,SHFT C,CMDR R,SHFT C,
    CMDR R,SHFT C,CMDR R,SHFT C,CMDR R,
    SHFT C,CMDR R,SHFT C,CMDR R,SHFT I]
     "'BAAW
 44 PRINT"[SPACE11,CMDR Q,BLACK,SHFT +,
    SHFT C,SHFT +,SHFT C,SHFT +,SHFT C,
    SHFT +,SHFT C,SHFT +,SHFT C,SHFT +,
    SHFT C,SHFT +,SHFT C,SHFT +,SHFT C,
    SHFT +,SHFT C,SHFT +,SHFT C,SHFT +,
    SHFT C,SHFT +,SHFT C,SHFT +,CYAN,
    CMDR W]"'BAED
 45 FOR I=1 TO 8'DDLH
 50 PRINT"[SPACE11,SHFT B,BLACK,SHFT B]
     [SHFT B] [SHFT B] [SHFT B]
    [SHFT B] [SHFT B] [SHFT B] [SHFT B]
     [SHFT B] [SHFT B] [SHFT B]
    [SHFT B] [SHFT B,CYAN]";I;"[LEFT3,
    SHFT B]"'BDAT
 51 PRINT"[SPACE11,CMDR Q,BLACK,SHFT +,
    SHFT C,SHFT +,SHFT C,SHFT +,SHFT C,
    SHFT +,SHFT C,SHFT +,SHFT C,SHFT +,
    SHFT C,SHFT +,SHFT C,SHFT +,SHFT C,
    SHFT +,SHFT C,SHFT +,SHFT C,SHFT +,
    SHFT C,SHFT +,SHFT C,SHFT +,CYAN,
    CMDR W]"'BAEB
 55 NEXT'BAEG
 60 PRINT"[SPACE11,SHFT J,CMDR E,
    SHFT C,CMDR E,SHFT C,CMDR E,SHFT C,
    CMDR E,SHFT C,CMDR E,SHFT C,CMDR E,
    SHFT C,CMDR E,SHFT C,CMDR E,SHFT C,
    CMDR E,SHFT C,CMDR E,SHFT C,CMDR E,
    SHFT C,CMDR E,SHFT C,CMDR E,SHFT K]
    "'BABX
 65 PRINT"[SPACE13]1 2 3 4 5 6 7 8 9 0
    1 2[SPACE2]"'BAJN
 70 PRINT"[HOME,DOWN6,RVS,L. RED]O
    [BLACK]R[L. RED]E[BLACK]G[L. RED]O
    [BLACK]N[CYAN,RVOFF]"'BAIK
 80 PRINT:PRINT:PRINT:PRINT"SCORE
    :"'EDFI
 90 PRINT"[SHFT U,SHFT C4,SHFT I]"'BAWK
 100 PRINT"[SHFT B,SPACE4,SHFT B]"'BAIW
 110 PRINT"[SHFT J,SHFT C4,SHFT K]
     "'BANB
 120 PRINT:PRINT:PRINT"ROW:":PRINT
     :PRINT"COLUMN:":PRINT:PRINT"WORD
     :"'HGYH
 130 FOR I=1 TO 26:READ A:LV(I)=A
     :NEXT'GOXE
 132 GOSUB 6000'BEHB
 135 GOSUB 3000'BEEE
 136 CC=2'BDFF
 140 REM MAIN'BEEA
 145 PRINT"[HOME,DOWN16,RIGHT4]";'BBGG
 150 IF R1=1 AND R2=1 AND R3=1 AND
     R4=1 AND R5=1 AND R6=1 AND R7=1
     AND R8=1 THEN 9000'RDQS
 151 L=1:HA=57:LA=49:GOSUB 2000
     :CO=VAL(VA$)'GAFK
 152 IF CO=1 AND R1=1 THEN 140'FJFH
 153 IF CO=2 AND R2=1 THEN 140'FJHI
 154 IF CO=3 AND R3=1 THEN 140'FJJJ
 155 IF CO=4 AND R4=1 THEN 140'FJLK
 156 IF CO=5 AND R5=1 THEN 140'FJNL
 157 IF CO=6 AND R6=1 THEN 140'FJPM
 158 IF CO=7 AND R7=1 THEN 140'FJRN
 159 IF CO=8 AND R8=1 THEN 140'FJTO
 166 PRINT"":VA$=""'CENJ
 167 PRINT"[DOWN,RIGHT7]";:L=2:LA=48
     :HA=57:GOSUB 2000'FTEQ
 168 IF VAL(VA$)>12 THEN PRINT""
     :PRINT"[UP2]";:GOTO 158'HNQR
 169 RO=VAL(VA$):PRINT"":VA$=""'EMHP
 170 PRINT"[DOWN3]";'BBHD
 188 PRINT"[SPACE12,LEFT12,DOWN,
     SPACE18,LEFT18,UP]";'BBLJ
 189 L=12:LA=65:HA=90:GOSUB 2000'ESVS
 190 WO$=VA$:VA$=""'CKVH
 191 PRINT:PRINT"ACCEPT WORD(Y/N)?[RVS]
      [RVOFF,LEFT]";'CCOM
 192 GET YN$:IF YN$=""THEN 192'EKPK
 193 PRINT" ";'BBSH
 194 IF YN$="Y"THEN RR=CO:GOTO 197'FLJO
 195 IF YN$="N"THEN 140'DGVM
 196 PRINT"[UP]";:GOTO 191'CFUM
 197 RB=8-RO:IF RO>8 OR RO+LL<4 THEN
     CO=500:GOTO 199'KXUX
 198 RZ=7:CA$=MID$(WO$,RB,1)
     :GOSUB 5000'EWHT
 199 IF RO+LL>13 THEN PRINT
     :PRINT"[UP]WORD UNACCEPTABLE"
     :GOTO 140'HLHA
 200 FOR I=1 TO LL:CA$=MID$(WO$,I,1)
     :GOSUB 4000:RO=RO+1:NEXT I'JFEI
 205 IF RR=1 THEN R1=1'EGFF
 210 IF RR=2 THEN R2=1'EGHB
 215 IF RR=3 THEN R3=1'EGJG
 220 IF RR=4 THEN R4=1'EGLC
 225 IF RR=5 THEN R5=1'EGNH
 230 IF RR=6 THEN R6=1'EGPD
 235 IF RR=7 THEN R7=1'EGRI
 240 IF RR=8 THEN R8=1'EGTE
 300 PRINT"[HOME,DOWN12,RIGHT]";SC
     :GOTO 140'CHOA
1000 REM DATA'BEST
1005 DATA 1,3,3,2,1,4,2,4,1,6,5,1,3,1,
     1'BEYD
```

Continued next page

```
1010 DATA 3,7,1,1,1,1,4,4,6,4,7'BVNX
1999 END'BACU
2000 REM INPUT ROUTINE'BMSX
2005 B$=" [LEFT2]":PRINT"[SPACE2,
     LEFT2]";:LE=0'DIUF
2010 PRINT"[RVS] [RVOFF,LEFT]";'BBEW
2020 GET A$:IF A$=""THEN 2020'EJBA
2025 IF A$=CHR$(13)AND LE>0 THEN
     PRINT" ";:GOTO 2110'IPVJ
2026 IF LE AND A$=CHR$(20)THEN PRINT
     B$;:VA$=LEFT$(VA$,LE-1):LE=LE-1
     :GOTO 2010'MKRR
2027 IF A$="[F1]"THEN RUN'ECNG
2028 IF A$="[F7]"THEN 10000'DHTH
2029 IF A$="[F3]"THEN PRINT"[CLEAR]"
     :END'FDHJ
2030 IF ASC(A$)<LA OR ASC(A$)>HA THEN
     2020'HQYF
2050 VA$=VA$+A$'CIEC
2060 PRINT A$;'BDGB
2065 LE=LE+1:IF LE=L THEN 2100'FNIL
2070 GOTO 2010'BEAC
2100 GET A$:IF A$<>CHR$(13)AND
     A$<>CHR$(20)THEN 2100'KTHF
2110 IF A$=CHR$(13)THEN
     VA$=RIGHT$(VA$,L):LL=LE
     :RETURN'IWQG
2120 IF A$=CHR$(20)THEN LE=LE-1
     :PRINT"[LEFT]";:GOTO 2010'ISOG
3000 POKE S+24,15:ML=150'DMQY
3001 CO=1:RO=7:CA$="O":GOSUB 7000'EQUC
3002 CO=2:RO=7:CA$="L":GOSUB 7000'EQSD
3003 CO=3:RO=7:CA$="Y":GOSUB 7000'EQHE
3004 CO=4:RO=7:CA$="M":GOSUB 7000'EQVF
3005 CO=5:RO=7:CA$="P":GOSUB 7000'EQAG
3006 CO=6:RO=7:CA$="I":GOSUB 7000'EQTH
3007 CO=7:RO=7:CA$="C":GOSUB 7000'EQOI
3008 CO=8:RO=7:CA$="S":GOSUB 7000'EQGJ
3009 RETURN'BAQE
4000 REM LETTER POSITION FIND'BSTB
4005 CR=RO*2+131+CO*80+1024
     :CV=ASC(CA$)-64'JBFN
4050 POKE CR,CV:POKE CR+54272,CC'DQHG
4055 IF CV>30 THEN CV=30'EIPK
4060 SC=SC+LV(CV)'CKUG
4070 POKE S+1,25:POKE S,177
     :POKE S+4,33:FOR Z=0 TO ML:NEXT Z
     :POKE S+4,32'LFIQ
4100 RETURN'BAQW
5000 REM WORD OK CHECK'BLTA
5002 CR=RZ*2+131+CO*80+1024
     :CV=ASC(CA$+CHR$(0))-64+128'MHVO
5005 IF CV=0 THEN CO=500:RETURN'FJCH
5010 IF PEEK(CR)<>CV THEN PRINT
     :PRINT"[UP]WORD UNACCEPTABLE"
     :GOTO 140'ILAL
5020 RETURN'BAQY
6000 REM CHECKER SETUP'BMVC
6002 CC=5'BDIB
6005 FOR CO=1 TO 8 STEP 2
     :FOR RO=1 TO 12 STEP 2
     :CA$="[CMDR +]":GOSUB 4000:NEXT
     :NEXT'MXMQ
6010 FOR CO=2 TO 8 STEP 2
     :FOR RO=2 TO 12 STEP 2
     :CA$="[CMDR +]":GOSUB 4000:NEXT
     :NEXT'MXOM
6020 RETURN'BAQA
7000 REM OLYMPIC PUT'BKOC
7005 CR=RO*2+131+CO*80+1024
     :CV=ASC(CA$)-64+128'KEYR
7050 POKE CR,CV:POKE CR+54272,4'DPAJ
7055 IF CV>30 THEN CV=30'EIPN
7060 SC=SC+LV(CV)'CKUJ
7070 POKE S+1,25:POKE S,177
     :POKE S+4,33:FOR Z=0 TO ML:NEXT Z
     :POKE S+4,32'LFIT
7100 RETURN'BAQA
9000 REM END'BDBC
9005 FOR T=1 TO 20000:NEXT:END'FJUK
9070 END'BACI
10000 REM RESET'BFSS
10005 PRINT"[CLEAR]OK TO SYSTEM
      RESET(Y/N)?[RVS] [RVOFF,LEFT]";
      'BBYF
10010 GET YN$:IF YN$=""THEN 10010'EMUW
10020 IF YN$="N"THEN RUN'EDKV
10030 IF YN$="Y"THEN SYS 64738'EIDX
10040 GOTO 10010'BFWV
```

Division III Winner:

Lincoln Each High, Nebraska

```
100 PRINT"[CLEAR]";:G$="[RVS] "
    :POKE 53281,1:POKE 53280,8
    :PRINT CHR$(142);CHR$(8);'HGKG
105 DIM P(26):COL=12:ROW=8
    :CD$="[HOME,DOWN23]"'EUJJ
106 E$="[SPACE27]":FOR T=54272 TO
    54272+24:POKE T,0:NEXT'HVCN
107 DIM GD$(COL,ROW)'BMKF
120 REM DISPLAY POINT VALUES
    ----------'BDRE
125 PRINT"[BLUE,RVS,SPACE7]";
    :FOR T=65 TO 90:PRINT CHR$(T);
    :NEXT:PRINT"[SPACE7]";'IPPM
130 PRINT"[RVS,SPACE7]";:FOR T=1 TO 26
    :READ A$:PRINT A$;:P(T)=VAL(A$)
    'IWJI
132 NEXT:PRINT"[SPACE7]"'CBCC
135 DATA 1,3,3,2,1,4,2,4,1,6,5,1,3,1,
    1,3,7,1,1,1,1,4,4,6,4,7'BBBM
140 PRINT"[UP]";:FOR T=1 TO 40
    :PRINT G$;:NEXT:PRINT
    :PRINT"[ORANGE]E[BLUE]A[ORANGE]S
    [BLUE]T [ORANGE]H[BLUE]I[ORANGE]G
    [BLUE]H"'INBM
145 REM PRINT GRID ----------------'B
    ASK
150 S=0:FOR T=1 TO ROW:PRINT TAB(12);
    'GNAH
155 FOR J=1 TO COL*2+1:PRINT"[BLACK]";
    G$;:NEXT:PRINT'IONN
160 PRINT TAB(12);:FOR J=1 TO COL
    :PRINT"[BLACK]";G$;
```

```
    :IF S THEN PRINT"[ORANGE]";
    :GOTO 170'KWIN
165 PRINT"[BLUE]";'BBRG
170 S=(1-S):PRINT G$;:NEXT
    :PRINT"[BLACK]";G$:IF
    COL/2=INT(COL/2)THEN S=(1-S)'NFFR
172 NEXT'BAEE
175 PRINT TAB(12);:FOR J=1 TO COL*2+1
    :PRINT"[BLACK]";G$;:NEXT
    :PRINT'KTYR
180 PRINT"[HOME,DOWN10,BLUE] SCORE:"
    :PRINT" [CMDR A,SHFT *3,CMDR S]"
    :PRINT" [SHFT -,SPACE2]0[SHFT -]"
    :PRINT" [CMDR Z,SHFT *3,CMDR X]
    "'EDSS
185 REM FRAME--------------------'BAAN
190 S=0:L=1195:FOR T=0 TO(COL*2)+1
    :POKE L,102:POKE 54272+L,S
    :L=L+1'MMMU
195 GOSUB 230:NEXT'CEVK
200 FOR T=0 TO(ROW*2)+1:POKE L,102
    :POKE 54272+L,S:L=L+40'KEVJ
205 GOSUB 230:NEXT'CEVC
210 FOR T=0 TO(COL*2)+1:POKE L,102
    :POKE 54272+L,S:L=L-1'KDAJ
215 GOSUB 230:NEXT'CEVD
220 FOR T=0 TO(ROW*2)+1:POKE L,102
    :POKE 54272+L,S:L=L-40'KEWL
225 GOSUB 230:NEXT:GOTO 245'DIJG
230 S=S+1:IF S=1 THEN 230'FJFE
235 IF S=16 THEN S=0'EFKH
240 RETURN'BAQA
245 REM INPUT ROUTINE ---------------
    --'BEPM
246 IF RA=1 THEN RA=0:GOTO 490'FKYL
250 PRINT CD$;"ROW:";:LW=2:GOSUB 270
    :PRINT CD$;E$;:IR=VAL(RC$)'GEUM
251 IF IR<1 OR IR>ROW THEN GOSUB 1000
    :GOTO 250'HQBK
255 PRINT CD$;"COLUMN:";:LW=2
    :GOSUB 270:PRINT CD$;E$;
    :IC=VAL(RC$)'GEQS
256 IF IC<1 OR IC>COL THEN GOSUB 1000
    :GOTO 255'HQAP
260 PRINT CD$;"WORD:";:LW=COL
    :GOSUB 270:PRINT CD$;E$;
    :IW$=RC$'FFYN
261 IF LEN(RC$)<1 THEN GOSUB 1000
    :GOTO 260'GOOJ
265 PRINT CD$;"DIRECTION (D/A):";:LW=1
    :GOSUB 270'DNHP
266 PRINT CD$;E$;:IF RC$<>"D"AND
    RC$<>"A"THEN GOSUB 1000
    :GOTO 265'KWWT
267 ID$=RC$'BGCL
268 IF IW=0 THEN IW=1:FR=IR:FC=IC
    :FW$=IW$:FD$=ID$'IFTX
269 GOTO 490'BDMM
270 REM GET A STRING!  SUBROUTINE'BVIJ
275 WC=0:RC$=""'CHHL
280 Y5=Y5-1:IF Y5>0 THEN 285'FMKK
281 Y5=15'BEPG
282 Y=Y+1:IF Y=1 THEN 280'FJDL
283 IF Y=16 THEN Y=0'EFWK
284 POKE 646,Y:PRINT"[RVS] [LEFT,
    RVOFF]";'CHTM
285 GET A$:PRINT"[BLUE]";
    :IF A$=""THEN 280'FKEO
286 IF A$="[F2]"THEN 2000'DGXN
287 IF A$<>"[F1]"THEN 290'EFCP
288 FOR T=1 TO COL:FOR J=1 TO ROW
    :GD$(T,J)="":NEXT:NEXT:ZZ=0:IR=FR
    :IC=FC:IW$=FW$'NSBG
289 ID$=FD$:IW=1:RESTORE
    :PRINT"[CLEAR]";:RA=1
    :GOTO 120'GVJW
290 IF A$<>CHR$(20)THEN 310'FJJK
295 IF WC=0 THEN GOSUB 1000
    :GOTO 285'FLSP
300 IF WC=1 THEN PRINT A$;
    :GOTO 275'FKWC
305 PRINT A$;:WC=WC-1:RC$=LEFT$(RC$,
    LEN(RC$)-1):GOTO 280'IEVN
310 IF A$=CHR$(13)THEN RETURN'FGHC
315 A=ASC(A$):IF A<48 OR(A>57 AND
    A<65)OR A>90 THEN GOSUB 1000
    :GOTO 280:REM VALID?'OKNT
320 WC=WC+1:IF WC>LW THEN WC=LW
    :GOSUB 1000:GOTO 280'IXNJ
325 PRINT A$;:RC$=RC$+A$:GOSUB 1030
    :GOTO 280'FVQL
490 IF ID$="A"THEN 600'DGIK
500 IF LEN(IW$)+IR>ROW+1 THEN GOSUB
    1000:GOTO 250'ITWI
510 I=1'BCSB
520 LC$=GD$(IC,IR-1+I)'DPJG
530 IF LC$=""THEN 550'DGXF
540 IF LC$<>MID$(IW$,I,
    1)THEN GOSUB 1000:GOSUB 1000
    :GOTO 250'IAQN
550 I=I+1:IF I<=LEN(IW$)THEN 520'HNRL
560 FOR I=1 TO LEN(IW$)'EHPJ
565 IF INT((I+IC+IR+1)/2)=(I+IC+IR+1)
    /2 THEN PRINT"[RVS,BLUE]";
    :GOTO 570'OAKY
566 PRINT"[RVS,ORANGE]";'BBDM
570 PRINT LEFT$(CD$,(I+IR-1)*2+5);
    TAB(11+2*IC);MID$(IW$,I,1)'KGFT
575 GD$(IC,I+IR-1)=MID$(IW$,I,1)'EVHS
580 NEXT:PRINT"[RVOFF,BLUE]";'CCPJ
590 GOTO 700'BDGJ
600 IF LEN(IW$)+IC>COL+1 THEN GOSUB
    1000:GOTO 250'ITGJ
610 I=1'BCSC
620 LC$=GD$(I+IC-1,IR)'DPJH
630 IF LC$=""THEN 650'DGYG
640 IF LC$<>MID$(IW$,I,
    1)THEN GOSUB 1000:GOSUB 1000
    :GOTO 250'IAQO
650 I=I+1:IF I<=LEN(IW$)THEN 620'HNSM
660 FOR I=1 TO LEN(IW$)'EHPK
665 IF INT((I+IC+IR+1)/2)=(I+IC+IR+1)
    /2 THEN PRINT"[RVS,BLUE]";
    :GOTO 670'OALA
667 PRINT"[RVS,ORANGE]";'BBDO
```

Continued next page

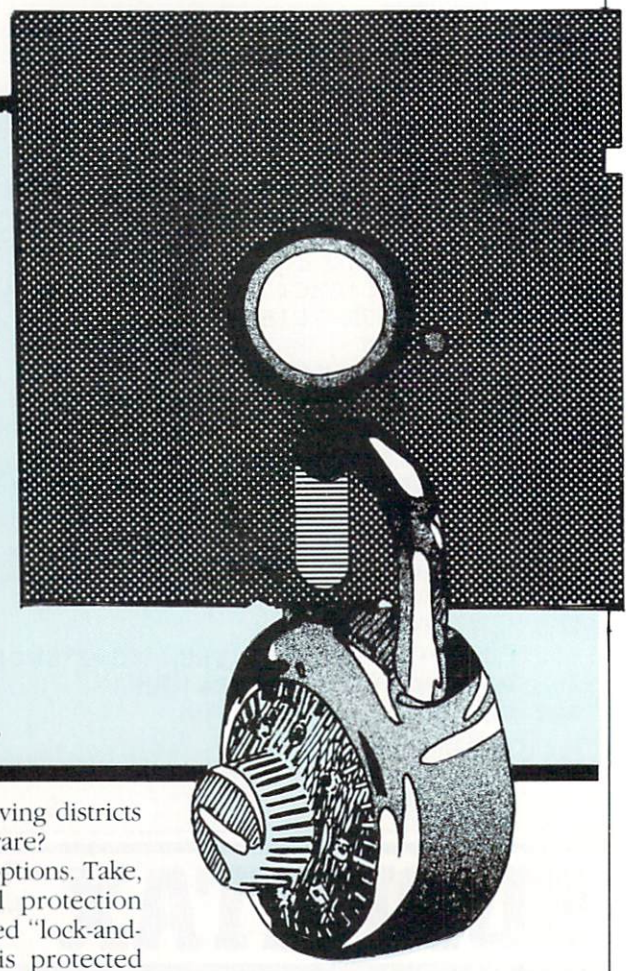
```
670 PRINT LEFT$(CD$,(IR*2)+5);
    TAB((I+IC-1)*2+11);MID$(IW$,I,
    1)'KILU
675 GD$(I+IC-1,IR)=MID$(IW$,I,1)'EVHT
680 PRINT"[BLUE,RVOFF]";:NEXT'CCPK
700 IF IW=1 THEN IW=2:GOTO 250'FKVG
705 FOR I=1 TO LEN(IW$)'EHPK
710 ZZ=ZZ+P(ASC(MID$(IW$,I,
    1))-64)'FUPK
715 IF ZZ<10 THEN LP=4'EHXL
716 IF ZZ>9 AND ZZ<100 THEN LP=3'GLWO
717 IF ZZ>99 THEN LP=2'EHLN
720 PRINT LEFT$(CD$,13)TAB(LP);
    :Z4$=STR$(ZZ):PRINT RIGHT$(Z4$,
    LEN(Z4$)-1);'JJIQ
730 REM MUSICAL BLIP-------------'BYNK
731 POKE 54296,15:POKE 54277,9
    :POKE 54278,0:POKE 54273,200
    :POKE 54272,243'FTOQ
732 POKE 54276,17:FOR T=1 TO 20:NEXT
    :POKE 54276,0'GWCO
740 NEXT:GOTO 250'CETG
1000 REM ERROR BUZZ'BJYV
1005 POKE 54296,15:POKE 54291,96
     :POKE 54292,96:POKE 54287,2
     :POKE 54286,204'FTJJ
1010 POKE 54290,33:FOR T=1 TO 100:NEXT
     :POKE 54290,0:RETURN'HYJD
1030 REM ACKNOWLEDGE BEEP'BPGA
1035 POKE 54296,15:POKE 54277,96
     :POKE 54278,0:POKE 54273,142
     :POKE 54272,24'FTWM
1040 POKE 54276,17:FOR T=1 TO 20:NEXT
     :POKE 54276,0:RETURN'HXCF
2000 REM HARMONY--GRAND FINALE'BUIA
2005 PRINT CHR$(9);" [BLACK]";CD$;E$;
     CD$TAB(5)"[RVS]PLEASE WAIT
     : ASSIMILATING DATA[RVOFF]"'DRVO
2010 S=54272:FOR L=S TO S+24:POKE L,0
     :NEXT'HRFD
2020 DIM H(2,700),L(2,700),C(2,
     700)'BBJB
2030 DIM FQ(11)'BGHX
2040 V(0)=33:V(1)=33:V(3)=33'DUSE
2050 POKE S+10,8:POKE S+22,128
     :POKE S+23,244'GVYH
2060 FOR I=0 TO 11:READ FQ(I)
     :NEXT'FLUF
2100 FOR K=0 TO 2'DDGW
2110 I=0'BCRW
2120 READ NM'BCIX
2130 IF NM=0 THEN 2250'DHTB
2140 WA=V(K):WB=WA-1:IF NM<0 THEN
     NM=-NM:WA=0:WB=0'KDBN
2150 NM=NM+16:DR%=NM/128
     :OC%=(NM-128*DR%)/16'IGKM
2160 NT=NM-128*DR%-16*OC%'FPRI
2170 FR=FQ(NT)'BILE
2180 IF OC%=7 THEN 2200'DIYG
2190 FOR J=6 TO OC%STEP-1:FR=FR/2
     :NEXT'INXM
2200 HF%=FR/256:LF%=FR-256*HF%'FUPE
2210 IF DR%=1 THEN H(K,I)=HF%
     :L(K,I)=LF%:C(K,I)=WA:I=I+1
     :GOTO 2120'JQUM
2220 FOR J=1 TO DR%-1:H(K,I)=HF%
     :L(K,I)=LF%:C(K,I)=WA:I=I+1
     :NEXT'KPFN
2230 H(K,I)=HF%:L(K,I)=LF%
     :C(K,I)=WB'DDAH
2240 I=I+1:GOTO 2120'DIQD
2250 IF I>IM THEN IM=I'EGHF
2260 NEXT:PRINT CD$;E$;"[SPACE9]";
     'CJHG
2500 POKE S+5,5:POKE S+6,240'ELOD
2510 POKE S+12,5:POKE S+13,240'ENAF
2520 POKE S+19,5:POKE S+20,240'ENFG
2530 POKE S+24,15'CGOE
2540 FOR I=0 TO IM'DEEF
2550 POKE S,L(0,I):POKE S+7,L(1,I)
     :POKE S+14,L(2,I)'FEKN
2560 POKE S+1,H(0,I):POKE S+8,H(1,I)
     :POKE S+15,H(2,I)'GFNP
2570 POKE S+4,C(0,I):POKE S+11,C(1,I)
     :POKE S+18,C(2,I)'GGVQ
2580 FOR T=1 TO 80:NEXT:NEXT'FGJL
2590 FOR T=1 TO 200:NEXT
     :POKE S+24,0'GMHO
2600 DATA 34334,36376,38539,40830'BXCF
2610 DATA 43258,45830,48556,51443'BXEG
2620 DATA 54502,57743,61176,64814'BXDH
3000 DATA-128,180,185,192,187,180,187,
     194,320,324,312,324,185'BCJF
3002 DATA 180,185,192,187'BPVA
3005 DATA 180,187,194,320,313,-512,
     -128,196,192,196,185,192'BYNK
3007 DATA 180,183,309,313,322'BTYG
3010 DATA 453,194,187,194,183,187,178,
     181,308,311,320,452,192'BBYG
3012 DATA 185,192,309,450'BPRB
3015 DATA 187,183,187,308,448,185,181,
     185,306,315,320,0'BUYK
4000 DATA 281,553,296,169,164,169,176,
     171,164,171,178,304,297,296,292,
     169'BNLI
4005 DATA 164,169,176,171,164,171,178,
     304,297,304,297,178'BWPK
4007 DATA 169,165,169,162,165'BTRH
4010 DATA 153,160,283,290,295,427,167,
     164,167,160,164,151'BWVG
4012 DATA 155,281,288,162,165'BTND
4015 DATA 155,162,279,274,151,167,165,
     167,288,274,151,167,165,167,288,
     0'BLUO
5000 DATA-1440,0'BHMX
6000 REM SPRITE ROUTINE-------------
     --'BEQF
6005 FOR T=0 TO 62:READ A:POKE 832+T,A
     :NEXT'HOOK
6010 DATA 0,0,0,0,0,0,0,0,0,7,158,120,
     15,255,252,24,97,134'BXSI
6012 DATA 24,97,134,15,255,252'BUDF
6015 DATA 7,255,248,1,255,224,3,12,48,
     3,12,48,1,255,224,0'BWIN
6017 DATA 243,192,0,0,0,0,0,0,0'BVDK
6020 DATA 0,0,0,0,0,0,0,0,0,0,0,0,0,
```

```
     0'BCTF
6025 V=53248:POKE 2040,13:POKE V+21,1
     :POKE V,10:POKE V+1,175
     :POKE V+29,1'JNVS
6027 POKE V+23,1:GOSUB 7000'DKFK
6028 SC=2:POKE V+39,2:FOR I=1 TO
     15'GOGP
6030 FOR L=18 TO 66:POKE V,L'EJAF
6035 NEXT:GOSUB 6300'CFSI
6040 FOR L=66 TO 18 STEP-1
     :POKE V,L'GKCI
6045 NEXT:GOSUB 7015'CFWJ
6050 NEXT'BAED
6200 FOR I=1 TO 65 STEP 16'EGDD
6230 FOR L=18 TO 66:POKE V,L'EJAH
6235 FOR U=1 TO I:NEXT:NEXT
     :GOSUB 6300'GKXN
6240 FOR L=66 TO 18 STEP-1
     :POKE V,L'GKCK
6245 FOR U=1 TO I:NEXT:NEXT
     :GOSUB 7015'GKCO
6250 NEXT'BAEF
6260 GOTO 8000'BEFH
6300 SC=SC+1:IF SC=16 THEN SC=2'GNCI
6305 POKE V+39,SC:RETURN'DHPJ
7000 REM SOUND EFFECT FOR
     SPRITE-------'BCOG
7005 FOR T=54272 TO 54296:POKE T,0
     :NEXT'FQRK
7010 POKE 54296,15:POKE 54277,96
     :POKE 54285,0:POKE 54273,10
     :POKE 54272,100'FTJL
7012 RETURN'BAQC
7015 POKE 54276,33:FOR T=1 TO 50
     :NEXT'FOGK
7020 POKE 54276,0:FOR T=1 TO 13
     :NEXT'FNBG
7025 RETURN'BAQG
8000 END'BACA
```

BY JAMES BUSSEY AND GAIL AUSTIN

Update on Networking

Software publishers want to protect their programs from copying. Educators say they can't afford to buy single copies for every computer in a classroom.



An increasingly complex and controversial issue for educators, software publishers and hardware manufacturers is software compatibility with multi-user networking systems. Many software publishers have resisted making their programs compatible with disk-shared systems because of the loss of revenue. Educators, however, maintain that they cannot afford to pay a single-copy price for each computer in a classroom. Hardware manufacturers are caught somewhere in the middle, pressed to work cooperatively with software developers who want protection and educators who seek computers with low-cost networking capabilities.

According to Dane Bigham of Broderbund Software in San Rafael, California, as much as forty percent of all software in use today may have been pirated—that is, copies may have been made and distributed illegally, in violation of the manufacturer's copyright. Whether the percentage is really this high or not, the fact remains that, combined with the already high cost of developing software, piracy has led manufacturers to create more complex protection schemes. The problem for educators is that such protection often prevents the software from operating with a network.

Educators, of course, argue that technological advances like networking—designed to make software use more efficient and less costly—are subverted by such protection methods. In addition, it is also illegal, according to software copyright law, to use one copy of a program to load into several computers without permission from the copyright proprietor. This further complicates the issue.

To avoid the whole problem, a few school districts have resorted to alternatives. The Houston school district, for instance, developed its own word processing program for use in its classrooms and therefore did not have to concern itself with either protection schemes or copyrights. But is there another solution to the dilemma, aside from having districts develop their own software?

Yes, there are some options. Take, for example, a typical protection method sometimes called "lock-and-key." When software is protected with this method, constant disk access often locks up a networked system. It is not hard to modify this protection, however, to allow for networking. Certain program segments that are constantly used can be provided on a separate disk, which is not protected. Thus the master disk remains protected, and, at the same time, the program segments on the unprotected disk won't work without the master disk.

Some software companies such as Scholastic and DLM have found a workable solution by providing software at two to three times the single-copy price if it is to be used in a networked situation. But the fact still remains that the software provided for networking may need to be unprotected, depending on the sophistication of the networking system—the more sophisticated the system, the less likely it is to work with protected software. This has led to yet a third possible solution—licensing agreements. Special licensing agreements can allow a school district to make unlimited copies for a specific use at a negotiated price. Software companies nevertheless have reservations about this type of agreement. They are reluctant to issue unprotected copies of software, regardless of what kind of guidelines are agreed to by a school district.

A fourth solution to the dilemma might be for software manufacturers to develop products specifically for the purpose of networking. Prices could be adjusted accordingly to cover extra costs of development and to make up for the fact that the buyer will need only one copy.

In formally addressing the networking problem, the International Council for Computers in Education (ICCE) issued a "Policy Statement on Network and Multiple-Machine Software." In the statement, responsibilities of educators, hardware vendors and software developers are clearly outlined. According to the policy statement, educators have a valid need for quality software and reasonable prices. Hardware devel-

opers and/or vendors also must share in the effort to enable educators to make maximum cost-effective use of that equipment. And, of course, software authors, developers and vendors are entitled to a fair return on their investments.

Educators' Responsibilities

The ICCE's policy is that educators need to face the legal and ethical issues involved in copyright laws and publisher license agreements and must accept the responsibility for enforcing adherence to these laws and agreements. They do not see budget constraints as an excuse for illegal use of software.

The council also thinks educators should be prepared to provide software developers or their agents with a district-level approved written policy statement including as a minimum:

1. A clear requirement that copyright laws and publisher license agreements be observed.
2. Provisions for on-approval purchases to allow schools to preview the software to ensure that it meets the needs and expectations of the educational institution. Additionally, software developers are encouraged to provide regional or area centers with software for demonstration purposes. The ICCE encourages educators to develop regional centers for this purpose.
3. Cooperation with hardware vendors to provide an encryption process which avoids inflexibility but discourages theft.
4. Provision for multiple-copy pricing for school sites with several machines and recognition that multiple copies do not necessarily call for multiple documentation.
5. Provision for network-compatible versions of software with pricing structures that recognize the extra costs of development to secure compatibility and recognize the buyer's need for only a single copy of the software.

Other solutions rely on publishing special versions of the software for the various network systems available. These versions do not run on single computers.

Networking Case Studies

The Peirce Middle School in West Chester, Pennsylvania, successfully tested three networks, two "passive" and one "active", and came to some interesting conclusions.

The VIC Switch, a network manufactured by Handic Software, allows eight Commodore 64's to be networked with compatible Commodore peripherals. In this case, the model 1541 disk drive and model 1525 were used. (Note: We understand that it can also be used in conjunction with VIC 20's, provided your software is applicable to both computers, but this was not part of our evaluation.) This "passive" network basically allows the loading and saving of programs and access to the printer, and not much more. We discovered a number of positive reasons to use such a network.

First, there are only a few things for a teacher to learn. It is easy to install. Peripherals can be used by all computers on a shared basis. Some copy-protected and some interactive programs can be loaded (done with legal permission from software manufacturers, of course) and the teacher can see which student is using the peripherals because LED's (or little red lights for you non-technical types) are located on the front of the VIC Switch. (There are also numerals on the back so you can keep track of how you should number your machines.) The network is affordable for most schools. (Please be certain that you order cables since they are not usually included in the base price. These cables come in four different lengths allowing plenty of different room configurations.) And, finally, no dedicated computers are needed. (In other words, every computer can be used by the students).

The network occasionally becomes hung, however. This can be corrected for the most part by doing one or more of several things. You can shut off the printer. If the red disk drive light will not turn off, you can have a computer load in the directory. This usually overrides the problem. Or you can shut down the computer that is hanging up the system—or shut down everything and start over.

You might think that this kind of network is more than you can handle, but you will soon discover that for most classroom use, it is more than adequate and a needed part of a computer lab which has limited funds.

Sid Wesseldine, a technical advisor for Handic, commented on another positive feature of this equipment. "In the two years I have been working with the VIC Switches, I have never heard of one of them breaking." He also mentioned that because of Handic's large manufacturing facilities, there would be no problem in getting these networks when ordered.

The CSI 64 Switch Model 1207, a second "passive" system, is manufactured by Computer Specialities, Inc. of Melbourne, Florida. It is very similar in appearance to the VIC Switch and has many of the same fine features.

One important difference is that the CSI 64 Switch does not have LED's on the front of the unit. Therefore, if the unit gets hung, as all networks will do at times, the teacher is

Commodore Announces Networking Policy

Commodore recently announced its official position concerning the networking of Commodore-manufactured software. The policy allows schools to network the following Commodore products: *LOGO, Pilot, Easy Script, Typing Professor, Chopper Math,* the EduKat Learning series, the Tutor Math series and the Kinder Koncepts series of educational software.

At no additional charge, these products may be networked to not more than four Commodore 64 computers using one disk drive. That means one product must be purchased for every group of four computers. In addition, up to four copies of the documentation may be xeroxed for each product purchased.

—Patricia Walkington
Director, Commodore Education Marketing

unable to determine which computer is causing the problem and must physically check or ask students if they are having any problems. This may not seem difficult, but it can be annoying, particularly if the student is involved in a game or timed educational program. In some cases, it is possible that the teacher may have to have the entire system (including all the computers) shut down if he/she cannot locate the problem. This can be frustrating for both teacher and students.

Another minor difference between these two networks is the fact that there are no numerals on the back of the CSI 64 Network. With no LED's on the front, there is no need to plug in the computers in rotation. However, when installing the network, the teacher may be concerned about this.

Our experience with these two networks showed that the students were less frustrated in dealing with the VIC Switch than with the CSI 64, mainly because the CSI system lacked LED's. The children also questioned the need for continually disconnecting the cables (as suggested in the CSI direction sheet) on any computer not using the network. They felt that there would be a lot of wear and tear on these cables since students may not be careful in disconnecting them and yet they would not want to wait for the teacher to do this.

A third network, the Multi-Link, is manufactured by Richvale Telecommunications Ltd. in Canada. This network is much more complex than the other two. Multi-Link is an "active" network, which means it does much more than simply load and save programs and allow use of the printer. However, as a result, it requires more money and needs to be installed by a competent technician. It also requires a dedicated computer, which must be adapted for the network. This computer is called the master and the students' computers are called the satellites.

Now, what makes Multi-Link worth paying the additional costs? The following is only a partial list of what it can do.

—Has extremely quick loading time for the entire network.
—Allows up to 48 Commodore 64's to be networked in groups of six (our evaluation had only fourteen hooked up and running, however).
—Allows and disallows computers to use peripherals.
—Halts (freezes) and continues (unfreezes) any or all satellites.
—Can make the satellites' BASIC programs stop.
—Can duplicate the master screen on some or all satellites.
—Can lock and unlock the master unit for security purposes.
—Can completely reset any or all satellites to power up.
—Can send messages from master to satellites or from one satellite to another.
—Has a security system to protect files from certain satellites.
—Can allow the teacher to get a snapshot view of a satellite screen.
—Can prevent satellites from using peripherals unless they get permission.

We encountered most of our problems with Multi-Link right in the beginning when both teacher and students weren't sure what to do. However, because the manual is very comprehensive, it was easy to locate information we needed.

Multi-Link does require a lot more time in terms of teacher preparation. However, the time is worth it, and after you get used to it, you realize problems are minor considering its complexity.

All things considered, the Multi-Link is probably not suited for a novice teacher who is still having difficulty determining what the computer jargon is all about. However, Multi-Link is definitely worth considering if an experienced teacher with a good cash flow wishes to network. It can allow your network to expand as you purchase additional Commodore computers.

Since there are several other networks on the market and several other prototypes that we know about, more information will be available after we have the opportunity to evaluate them. If you are aware of any networks for the Commodore 64, please write to us in care of Commodore. We would appreciate your sharing—after all, that's what networks are all about. **C**

BY TIMOTHY CHOATE

Manager Arithmetic Part 1

How Arithmetic Mode Works

The Arithmetic mode used in *The Manager* for the Commodore 64 can be confusing to a new user. However, when used correctly, this mode can provide useful information about your data.

Using the Arithmetic mode in *The Manager*, you can do arithmetic using registers, display positions and the field data you entered into your file in the Enter/Edit mode. Arithmetic is used mainly for calculations such as sums and averages, although it can also be used to send literal displays (numeric or alphanumeric) to specified positions on the screen.

The main variables used in Arithmetic besides the fields themselves are registers and display positions. Registers (R#) are used normally as temporary storage sites for numeric variables that are to be manipulated to obtain results. Although registers can be displayed directly in reports (by choosing "R" for data type), final results are normally shown in display positions.

Display positions (D#) are positions on the screen in which arithmetic results are shown. Display positions do appear in the Enter/Edit mode while registers do not. After entering the Arithmetic mode, you must decide the number of display positions and their locations before actually doing the arithmetic. Thus, be sure you have empty space on your Enter/Edit screen for the display positions to appear. However, display positions should be used only to show final results. All intermediate calculations should be performed using registers.

Display positions are defined from D1 to D (number of display positions defined). Since registers are not previously defined, you can use random register numbers from R1 to R100. Registers R101 to R105 are previously defined and will be discussed in Part 2 of this series. Literal text in display positions may be up to 40 characters in length while literal numbers may be up to 11 positions. The display positions can be only as long as you define them to be and that a decimal point is considered as one position in a literal number.

In Arithmetic, you can also use the numeric and alphanumeric fields you set up in Create/Revise for manipulating data. Be sure to define your field types carefully when creating a file if you plan to use the Arithmetic mode because a field is considered numeric (N#) only if you define it to be numeric in the Create/Revise section of *The Manager*. If you do not define numeric fields when you originally create the screen, then you end up with only alphanumeric fields, and alphanumeric fields cannot be used as numbers (for multiplication, division, addition, etc.). Alphanumeric fields can be used only in loops in Arithmetic (e.g., if F1 = "yes" then . . . endif) which will be discussed in Part 2 of this series.

All of the normal arithmetic signs can be used with *Manager Arithmetic*. There is a list of them in your *Manager* manual on page 22. In addition, *The Manager* allows you the use of several function keys for easy organization in the Arithmetic mode. These are listed in your manual on page 20. If you want to add explanatory comments to your Arithmetic, all you need to do is place a semicolon before the additional information that you want to type in.

Using Arithmetic Mode With Alphanumeric Fields

Probably the best way to explain Arithmetic is to go through an example that will count the number of records that have been used and display the sum on the screen. For this example, you can use any data file since no numeric fields are required.

To begin, choose the Arithmetic option from the main menu by pressing "A" at the main menu prompt. Then, put in the file name (of a previously created file) at the prompt and insert your data disk (where the file is stored) before pressing RETURN. *The Manager* will now load the file into the computer's memory. The next prompt will be for the number of display positions. For what we are doing, we need only one, so input this and press RETURN.

Now the computer will ask for line number, column number and length. Choose a line and column where nothing else appears on your Enter/Edit screen. For my file, the length will be three since I have less than 1,000 records. Your length may be more or less than this depending on how long your file is (if your file is less than 100 records long then you only need a length of two). Remember, when setting the length of your display position that the decimal point is counted as one position if decimal places are included. You should thus adjust the length of your display position accordingly to account for decimal places and the decimal point.

After inputting the three items, press the back-arrow key to store the display position. Remember, no matter how many display positions you have, you must hit the back-arrow key at the end of each line of position

data to go on to the next position settings or to actually do the arithmetic. The arithmetic for our example will be as follows:

R1 + 1 TO R1
R1 TO 0D1

The first line of this will simply increase register one by one each time another record is accessed. The second line will send the value of register one to display position one. The zero means that we want no decimal places to appear in the display position. If we change this number to a two, we would get two decimal places in the display position.

When you are done inputting the arithmetic, press the back-arrow key to store it. At this time, your data disk should be in the drive. The computer will first check to make sure the structure of the arithmetic is correct. If the arithmetic is correct, the computer will prompt with, "Are you sure (y/n)?" If you are sure that the arithmetic is how you want it, then simply type "y" and RETURN. A "y" at this prompt will cause the computer to store the arithmetic and then return to the main menu. If you go to the Enter/Edit section now, you should see a number on line 10 starting at column one on the screen. However, you may have to Accumulate (A) to make sure that the number is correct.

Whenever you move from one record to another in the Enter/Edit section, the display positions from those two records will be summed. There is no way to avoid this so you will need to use the Accumulate command whenever you want to double-check the number in a display position on your screen. You do not have to worry about this in the Report Generate mode—correct results will automatically be printed if *The Manager* is told to put the value from a display position in the report.

Using the Accumulate command is relatively simple. All you need to do is press "A" from the Enter/Edit mode. The cursor will then appear in the first field. If you want to accumulate all of the arithmetic in every record, all you need to do is press the back-arrow key at this point. This will accumulate the display-position data while scanning through the file record by record. If you want only one or certain records to be accumulated, you should use one of the searching options.

A complex search allows you to find records that meet several search criteria.

Remember, if you have display positions which involve summing data between records, only those records which fit the search conditions will have their data included in the display positions. Thus, if you want an overall balance in your display position, you should use the back-arrow alone to do your accumulating. On the other hand, if you wanted to find the total invoices for a particular month, you could do that using search criteria and accumulate.

If you have display-position data printed out in your report, the overall totals of each particular record will be displayed with each record's data, just as if you did accumulate in Enter/Edit using only the back-arrow.

There are three searches you can do to find the records to be accumulated: the position-dependent search, the non-position-dependent search (hunt for data anywhere in field), and the complex search.

The position-dependent search will search for all records which have data in the exact same position and field as you specify and accumulate their arithmetic. This search is performed by pressing RETURN until you reach the field you want to search by, typing in the data that you want to be accumulated (note: this data must be in the same position in that field for the search to find a record which fits the criteria) and then hitting the F3 key followed by the back-arrow key to execute the search and accumulate.

The non-position-dependent search will search for records which have the same data as your criteria, but anywhere in the field that you specify. Thus, if the criterion were "test" and the field in a particular record showed "intest," that record would be included as fitting that search criterion. To perform a non-position-dependent search, press RETURN until you reach the field you want to search by, type in the criteria, then press the F4 key followed by the back-arrow.

Finally, the complex search allows you to accumulate records which fit several search criteria. This search is done in the same way as a search in Report Generate. For example, with the complex search you can find records of invoices received from a particular company in a particular month and involving a particular type of product.

A complex search is done by simply pressing the F5 key after pressing "A" for accumulate. This will take you to a clear screen where you can define your search criteria. When you have finished defining your search criteria (defining search criteria is explained in your manual starting on page 26) all you have to do is press the back-arrow key and the search and accumulation will be performed.

When *The Manager* is finished accumulating, either the last record that fit the search criteria or the last record on file (if no search criteria was defined) will be displayed on the screen, showing each display position and its total. The words "Record not found" will appear at the bottom of the screen.

Using Arithmetic With Numeric Fields

Using the Arithmetic mode, you can also find the sum of all the records in any field that you defined as "numeric" in Create/Revise. All you have to do is choose "A" from the main menu for Arithmetic and input the file name (the data disk should now be in the drive). Next, input your display position data and press the back-arrow key after the data for each display position.

You will need only one display position for the example below. After inputting the position data and pressing the back-arrow key, you can prepare the arithmetic. For this

example, we want to find the sum of all our third fields, which were defined as numeric. Thus, the arithmetic will be:

R1+N3toR1	adds each third field to register 1
R1to2D1	sends the total in register 1 to the first display position, which will have two decimal places

The above numeric arithmetic is all you need to find the sum total of any one numeric field in your file. To find the sum of a field other than field three, just change the N3 to an N# where # is your field number.

As you can see, *The Manager* Arithmetic is actually not too difficult to use, but it can be extremely useful and it can save much time and effort. In Part 2 of this article, I will discuss loops, conditional statements, predefined registers and more. In addition, I will provide more complex examples of Arithmetic, which can be adapted for your own use.

C

Arithmetic In Short

Register (R#)

- Used normally as a temporary storage site for data to be manipulated.
- Can use numbers anywhere from one to 100.
- Does not have the number of decimal places defined.

Display Position (D#)

- Used to display final arithmetic results.
- Can use display-position numbers from one to the number of display positions defined.
- Must have the number of decimal places defined by "xD#" where # is the display position number and x is the number of decimal places.
- Counts decimal places and decimal points as part of its length.
- Appear on the Enter/Edit screen wherever you have designated them to appear.

Arithmetic Syntax

- Done using registers, constants (numbers) and numeric fields.
- Appears in the syntax: calculations to place (e.g., R1+1 to D1).
- Manipulates registers, constants and numeric fields to find results.
- Sends results to fields, registers or display positions.

-Timothy Choate

BY DON FABRIZIO, COMMODORE TRAINING MANAGER

Testing the Commodore 64 Cassette Interface

The cassette interface on the Commodore 64, as shown in Figure 1, is controlled electronically by the 6510 microprocessor U7, and the 6526 complex interface adapter U1. There are two inputs—Cassette Read and Cassette Sense, and two outputs—Cassette Write and Cassette Motor. I have developed simple tests to check each signal on the interface. An explanation of the circuit theory of operation is included for each.

Construct Circuit A. Enter and execute the program below. The light indicating diode should blink off and on. This indicates the Cassette Write output is operating properly.

```
10 poke1,peek(1) or 8:rem ****
   turn LED on *******
15 for x=1to1000:nextx
20 poke1,peek(1) and 247:rem
   ***** turn LED off *******
25 for z=1to1000:nextz
30 goto 10
```

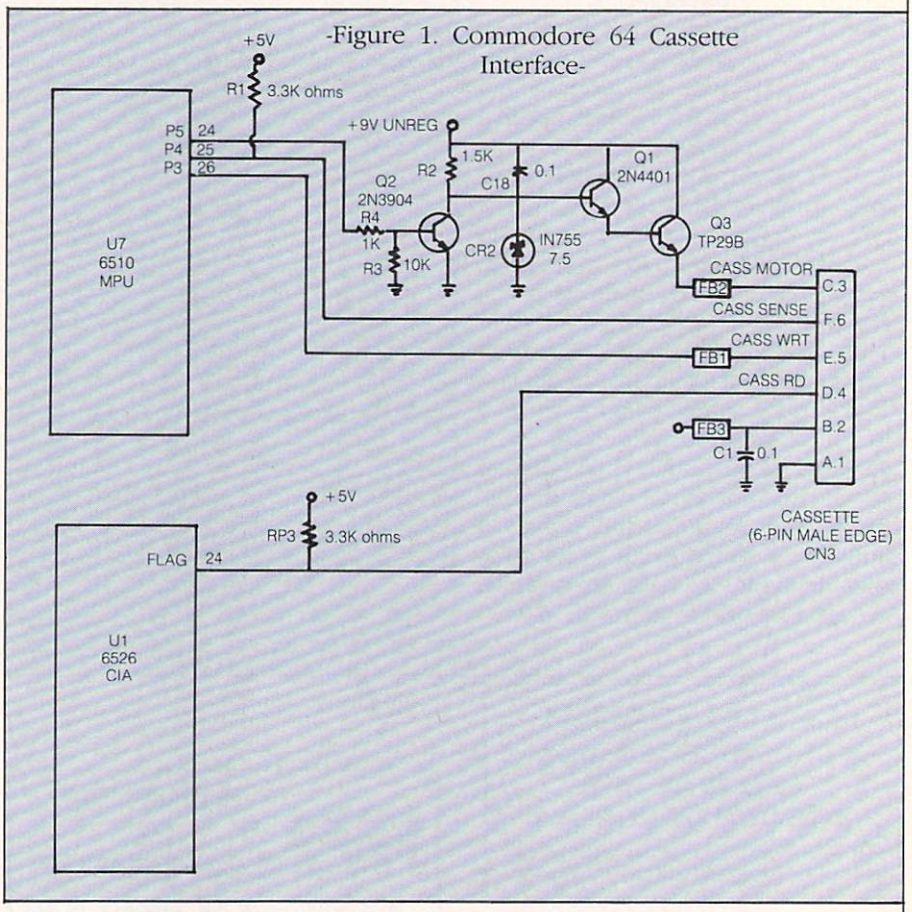
Testing the Cassette Write Output

As shown in Figure 2, the output P3 on the microprocessor is connected directly to the cassette port edge connector pins E and 5. Data being recorded on cassette tape is passed from the microprocessor output P3 to the pre-amplifier inside the cassette deck via the cable connection on CN3. The pre-amplifier shapes the signal, and the power amplifier converts the voltage input into a proportional current output. The current output is applied to the read/write coil. Through induction, magnetic fields representing the data are produced on the tape.

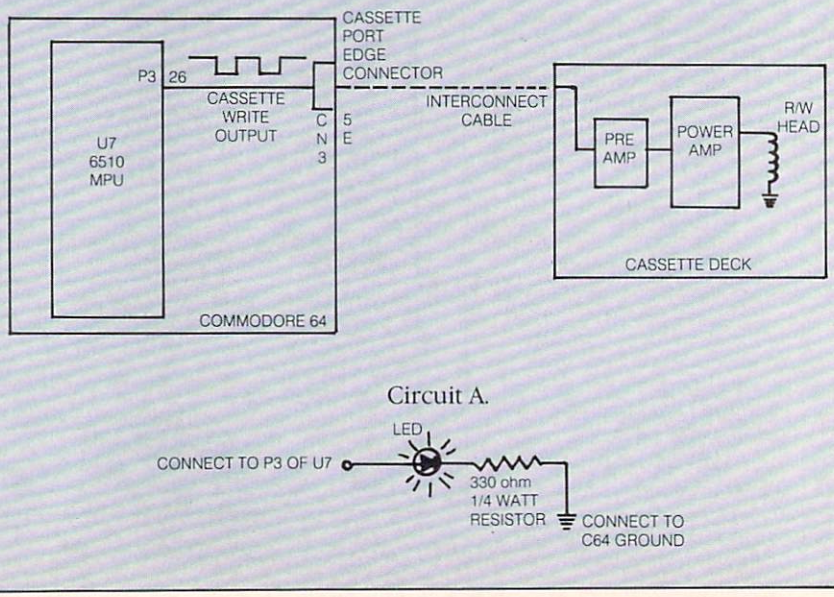
Testing the Cassette Motor Output

The Cassette Motor output is applied to current amplifiers Q1 and Q3, which drive the motor coil. If the output P5 of U7 goes low, this turns off the base biasing to Q2. This allows CR2 to regulate Q1's base bias at 7.5 volts. Q2 and Q3 provide a complete current path from ground to

-Figure 1. Commodore 64 Cassette Interface-



-Figure 2. Cassette Write Output-



Circuit A.

the nine-volt unregulated supply. See Figure 3.

Construct Circuit B. Enter and execute the two-line program below. The LED should light indicating the Cassette Motor output is operating correctly.

```
10 poke 1,peek(1)and 31
20 goto 10
```

Testing the Cassette Read Input

The Cassette Read input, as shown in Figure 4, is connected to the flag input of U1. The flag input senses high to low going pulses from the cassette deck read output. This is then converted to the data that was originally recorded. The program below will check this input.

```
10 a = peek(56333)
20 if a <> 16 then 40
30 print"Cassette read input
   O.K.":end
40 print"Cassette read input does
   not work!":end
```

NOTE: When running test program, jumper pins 24 and 25 of U1. This connects the phase two clock to the cassette read input, and simulates data being received from the cassette deck.

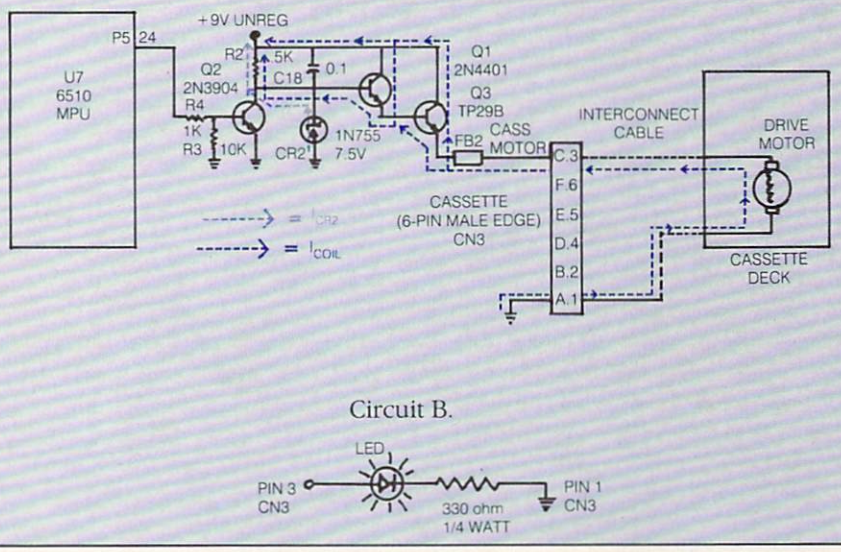
Testing the Cassette Sense Input

The Cassette Sense input monitors the position of the play switch on the cassette deck. When the play switch is depressed, a ground potential is applied to this input. (See Figure 5.) This must happen before the 64 will initiate a read or write operation. The simple program below will test this input. A jumper must be connected from P4 on U7 to ground. This simulates the cassette deck play button being depressed.

```
10 a = peek(1)
20 if a <> 7 then 40
30 print"Cassette sense input
   O.K.":end
40 print"Cassette sense input
   does not work!":end
```

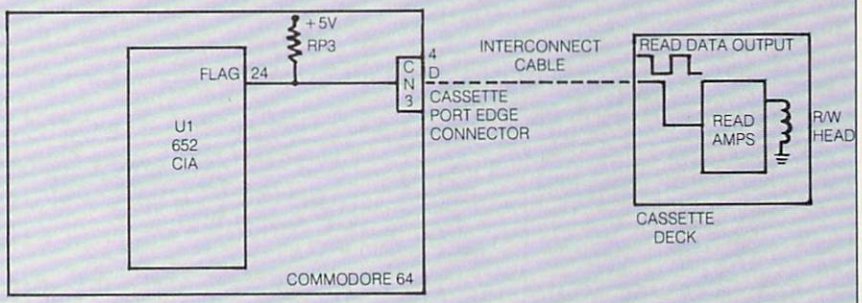
NOTE: When running test program, jumper pins 21 and 25 of U7. This connects a ground po-

-Figure 3. Cassette Motor Output-

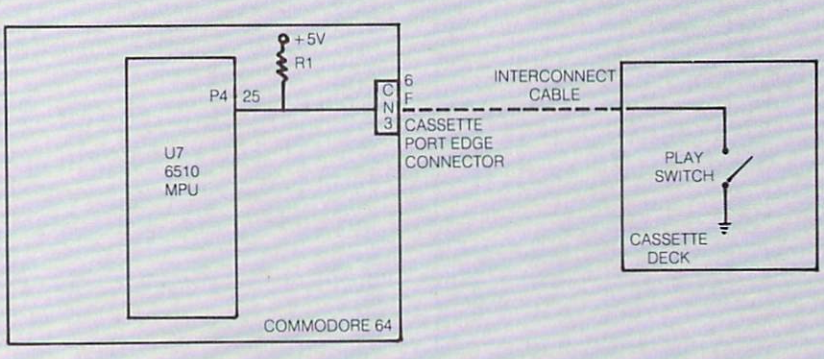


Circuit B.

-Figure 4. Cassette Read Input-



-Figure 5. Cassette Sense Input-



tential to the cassette sense input, and simulates the cassette play button being depressed.

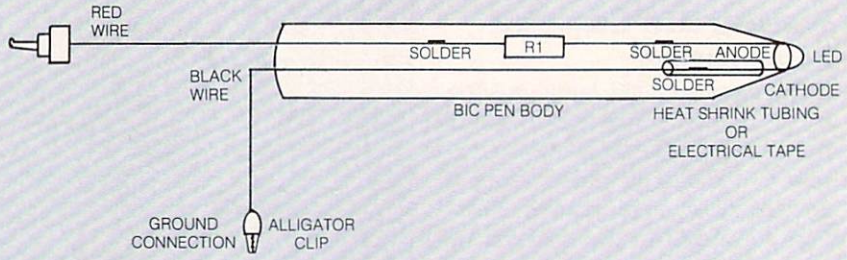
Building a Tester

The tester in Figure 6 can be built with spare parts from your junk box or parts from a local supplier for less than a dollar. This simple test circuit can be used to help isolate circuit faults in the cassette interface circuitry as explained in this article. (This will be used in future articles when testing other parts of the Commodore 64.) You need these parts:

BIC pen plastic body
B1 = 330 Ω 1/4-watt resistor
LED (standard)
Alligator clip
Miniature proto-clip
Red, black wire
Heat-shrink tubing

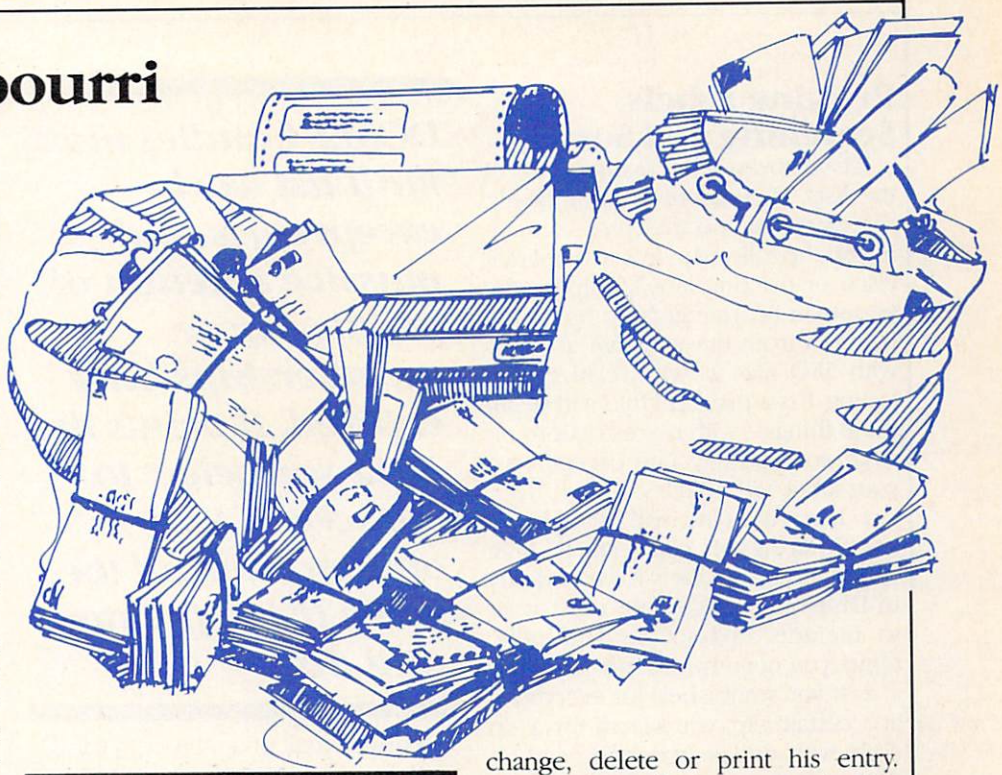
C

-Figure 6. A Simple Test Circuit-



BY DICK BARNES

SuperPET Potpourri



Need to keep a small mailing list? Forget relative files. SuperPET's microEditor will do the trick.

Sooner or later, anyone who owns a computer is forced by business or asked by friends to set up a mailing list and to print mail labels from it. The local Scout leader or the preacher will say, "You know, we have to send out these announcements all the time, and I was wondering . . ." Two days later, you have another mailing list project. You can do the job with relative files, which take a lot of programming, but with SuperPET you needn't make the job that complicated for lists of up to perhaps 1,200 names (I call these small lists).

Ask yourself why you'd use relative files for mail lists. Answer: So you can find, change or refile a specific entry quickly by record number, without having to replace the whole file every time you make a single change. On all Commodore computers but SuperPET, there's no other way to do the job quickly.

Out of habit, I set up my first few mailing lists on SuperPET using relative files, but always cursed the need to keep an up-to-date alphabetical index of names, exactly as entered and marked with the record number, so I knew where to find Sampson Q. Smith or Virginia L. Jones. Unfortunately, Sampson always signed his letters "Sam," and Virginia signed hers "Ginny." Any searches for Sam Smith and Ginny Jones always failed unless I kept a hard copy index and could figure out that Ginny indeed was Virginia L. There had to be a simpler, less time-consuming way to handle the files. And there is—for small lists.

MicroEditor to the Rescue

Once you think about it, you find that we're in the habit of using relative files because previously there wasn't any other way to find, change or print specific entries quickly.

Now there is! It's called the microEDITOR. You can call any list of up to about 320 names and addresses into the mED very quickly and can find any entry on that list with mED's search capability. It takes less time than loading and running a mail list program set up to handle relative files. (You must make sure of one thing, though: every name/address block on the list must be separated from the next block by one—and only one—blank line if you use my method.)

Once you have the file in the mED, to find either Sam or Ginny you could search for all the Smiths and Joneses, but it's far easier to locate them by address. If Sam's is 1234 Globular Avenue, you search for it, at command cursor in mED, with:

/1234 Globular Av <RETURN>

The slashbar (/) means "find." You needn't bother with all of "Avenue" because who knows how it's on the mail list—as "Av.", "Ave." or "Avenue"? With mED's search capability you find Sam quickly. You can change, delete or print his entry. After making all changes to the list, you refile it to disk. There's the rub. Can we make the job even simpler? Indeed we can.

Maintaining Your List

We don't haul the mail list off disk every day, as the mail comes in with address changes, expirations and new entries. Instead we keep a log of all the changes on a separate disk file. We add to the log each day. When it comes time to print mailing labels, we haul the big mail list into mED, go to the end of it with $<RETURN> (which gets us there instantly) and "get" the log while the screen cursor is on the last line. Our log appends to the bottom of the mail list as a worksheet. When we've revised the big list (and do we use the search command!) we delete the log and refile the mail list. If you print labels only once a month or so, this approach is simple and swift.

If your mail list is much larger than 320 entries, you'll have to break the mail list into two or more files, such as mail *A,* which takes care of names from A to K, and mail *L,* which covers L to Zzizard. You likewise keep two logs, log *A,* and log *L.* This gets a bit cumbersome for big, long lists, but I didn't promise a replacement for relative files, only a simple way to handle small mail lists.

Printing Labels, Searching and Sorting

We've covered the maintenance of the lists. How about printing labels, searching for specific entries, counting all the folks who live in San Francisco or printing labels only for the people in Peoria? Such problems are handled from the program as easily with SEQ files as with relative files. Listing 1 is a program that will do all these things—with no restrictions on what goes on any line except what your label will hold.

1. It searches the mail list with two search strings. If you want to find, count and print labels for everybody in Dullsville, Kansas, but don't want to include anybody in Dullsville, Ohio, you need two search strings.

2. If you want labels for everybody at a certain zip, you search for a zip code with one search string and either null the second or further define the search by city.

3. You print and count your whole mail list if you search the file with two null search strings. What could be simpler?

I call the program DOALL, since it handles most mail list work except sorts and massive deletion of people whose memberships have expired. It always prints the data you select to screen, and optionally sends the same list to printer and disk. Output may be in mail label format or condensed into a simple, single-spaced list. The program asks which format you want.

Using DOALL

As written, DOALL handles mailing entries from one to seven lines long on standard 1.5 × 4-inch, one-wide labels. It's easy to change it for smaller or larger labels. The size of the matrix (array) for labels (line 130, Listing 1) can be adjusted to fit larger or smaller labels. Remember that every matrix print statement *starts and ends* with a carriage return (CR), so you must add two lines to the size of the matrix to sum the total number of lines you print. For example, if you DIMension a matrix to seven, the zeroeth element of the matrix gives you eight lines; add two for the automatic CR's from "mat print" and you will print a total of ten lines. In short, you always get three lines more than the number you DIMension. (If you don't understand matrix printing, read "SuperPET Potpourri" in the September/October 1984 issue of this magazine.)

DOALL handles most mail list work except sorts and massive deletion of people whose memberships have expired. It prints the data you select to the screen and optionally send the same list to printer and disk.

Since your starting matrix is filled in the program with plain carriage returns (see lines 175-185 in Listing 1) designed to space from top-of-label to the top of the next label, all we do is overwrite *the first part* of that matrix with the label information. Old Sam's might look like this when we print it. (You can easily see how matrix printing spaces labels without counting lines.)

Line 1	Carriage return from matrix print statement
Line 2	EXP 8/12/84 SMI 2345 DDGY
Line 3	Sampson L. Smith
Line 4	1234 Globular Ave.
Line 5	Dullsville, OH 00000
Line 6	CR$
Line 7	CR$
Line 8	CR$
Line No CR	Print no CR here because of the next one. Sneaky.
Line 9	Carriage return from matrix print statement.

Well, that's fine for automatic spacing of labels without loops or a line count, but what do you do when you want a plain list without all those blank lines at the end? Easy. You DIMension the original matrix but don't stuff in any carriage returns. Then your list entries are separated only by the carriage returns from the matrix print statement at top and bottom of the entry. See lines 185-195 of Listing 1, where we leave the matrix null if we want to print a simple list.

In previous columns we've discussed the power and speed of IDX as a search command. Note how IDX is used to locate the search strings in lines 300-305. IDX is *fast*, since it calls a machine language routine in ROM. Couple it with the LINPUT statement, which gulps a whole line from disk, and you have a program so fast it'll have to wait for your printer to catch up! (LINPUT makes ordinary INPUT or GET look as slow as sick snails.)

You can pause the program in Listing 1 at any time by pressing OFF. Resume what you were doing by pressing OFF again. If you look at the code for this (lines 325-340), you may be surprised that I don't clear the keyboard buffer for the GET. In SuperPET, you don't need to. GET returns zero or a keypress value. You thus may use the same key to both stop and resume operations in any loop.

Note also that we GET the ASCII code for the OFF key (255), rather than a string value. SuperPET allows you to GET the orginal (or ASCII code number) with a "get variable%" statement (get an integer value) and will also return a string value if you say "get variable$". I strongly prefer to get integer values, since programs run much faster with them than they do if you employ string values.

For this same reason—speed—the program in Listing 1 senses integer values wherever they can be used. Integers run from 25 percent faster than real (or decimal) values and over 50 percent faster than string values. It's far faster, for example, to say "if halt%" (if integer variable halt% is >0) than it is to say "if halt$ > "" or "if halt." In particular, FOR . . . NEXT loops are fastest if the index and all values in the loop are integers. This may be contrary to your experience in other dialects of BASIC, so be aware of it.

Use Procedures in Your Programs

So far, I've tried to weave together and use all the general material which has appeared in previous columns. Listing 1 shows how to quit loops, use IDX, the clarity of long variable names and structure, how to pass matrices as parameters from a main program to a procedure and how to use mat print statements in place of slow loops.

One thing hasn't been covered previously, though: procedures themselves. Wherever and whenever you find yourself repeating in-line code, you probably need a procedure to do once what you'd otherwise do many times. Procedures may be located anywhere—top, bottom or middle—in your program. The time to call them is invariant, wherever they may be located (unlike GOTOs). And, to make life even simpler, you call them by name ("call printt" for example) rather than by meaningless line number. When a procedure is finished, you return to the statement which immediately follows the call to the procedure.

Listing 1 uses two procedures. The first gets all "yes/no" input, and returns variable "yes%" with a value of one if "yes" is chosen. If there's much input needed, this approach saves a lot of code and avoids input errors. The second procedure prints everything—to disk, to printer and to screen. Since what we print depends on what we do, we pass a parm to it—the matrix we want printed. Note that it contains no loops, and that it prints *any* matrix we pass so long as that matrix has no more than ten values (so we needn't DIMension).

In sum, Listing 1 ties together much of what we've discussed to date, and will let you handle simple mail lists with little effort. It's certainly far simpler and easier to use than any program we've seen for relative files. You do face, however, two remaining problems: 1) making an alphabetical list of the entries and 2) deleting from the list, *en masse*, entries for people who are inactive. We'll cover both next issue. **C**

```
100 ! DOALL. Searches mailist with two search strings and prints entries
105 ! found to screen, disk, or printer as a list or as mail labels.
110 ! Given two null strings as search strings, prints all mail labels.
115 ! ------------------------------------------------------------------------
120 !              DEFINE CONSTANTS and DIMENSION MATRIX
125 !Clear Screen : Cursor Down : Carriage Ret'n
130  CS$=chr$(12) : D$=chr$(10) : CR$=chr$(13) : one%=1 : dim list$(7)
135 ! ------------------------------------------------------------------------
140 !                 CALL for INPUT, FILES & DATA
145 print CS$; : input "Enter filename of list to be searched: ", file$
150 print : input "Enter first search string: ", search1$
155 print : input "Enter second search string: ", search2$
160 print D$; "Do you want hard copy? y/n: " : call inputt
165 if yes%
170   print D$; "Do you want mail labels? y/n: " : call inputt
175   if yes%                                          ! Fill matrix with  CR$.
180     make_label%=one% : mat list$=(CR$) : list$(7)=""
185   else
190     print D$; "A plain list will be printed." ! Matrix list$ remains null.
195   endif
200   print : input "If printer is ready, press RETURN ", o$
205   hard%=one% : open #34, "ieee4", output
210 endif
215 print CR$; "Want a disk file? y/n: " : call inputt
220 if yes%
225   print : input "Enter name of new disk file: ", newfile$
230   disk_file%=one% : open #20, newfile$, output
235 endif
240 print CS$; "Pause Printing at Any Time with OFF Key. Resume with OFF."
245 open #25, file$, input
250 ! ------------------------------------------------------------------------
255 !          GET LIST FROM DISK, FIND SEARCH STRINGS, PRINT TO FILES
260 on eof ignore
265 loop
270   found1%=0 : found2%=0                  ! Set search string flags to zero.
275   for i%=0 to 7
280     linput #25, bare$
285     if io_status <> 0 then eof_flag%=one%       ! Flag end of file.
290     if eof_flag% then quit
295     if bare$="" then quit
300     if idx(bare$, search1$) then found1%=one%   ! Search strings present?
305     if idx(bare$, search2$) then found2%=one%
310     list$(i%)=bare$+CR$                         ! Shove entry into matrix.
315   next i%
320   entries%=entries%+one%
325   get halt%                     ! Pause if OFF key is pressed while in loop.
330   if halt%=255
335     get proceed% : if proceed%<>255 then 335        ! Resume with OFF key.
340   endif
345   if found1% and found2%       ! If both search strings are found...
350     count%=count%+one%
355     call prinnt(mat list$)     ! Print to all specified files.
360   endif
365   if make_label%
370     mat list$=(CR$) : list$(7)=""          ! Clean the matrix for labels,
375   else
380     mat list$=null$                        ! or for a single-spaced list.
385   endif
390   if eof_flag% then quit       ! Quit if we're at end of file.
395 endloop
400 ! ------------------------------------------------------------------------
405 !                       SUMMARIZE WHAT IS FOUND
410 endd$(0)="Items above printed on " + date$ + " " + time$ + CR$
415 endd$(1)="in search for '" + search1$+" and "+ search2$ + "'" + "from "
420 endd$(2)=CR$ + "file " + file$ +". " + value$(count%) + " entries located"
425 endd$(3)=CR$ + "in a file with " + value$(entries%) + " entries."
430 call prinnt(mat endd$)
435 stop                  ! STOP closes all files. No separate closes required.
440
445 ! ------------------------------------------------------------------------
450 !                        SUPPORTING PROCEDURES
455 proc inputt
460   loop                           ! Get a "y" or "n" reply in ASCII code.
465     get yes%
470   until yes%=121 or yes%=110
475   if yes%=110 then yes%=0      ! And zero out a "no".
480 endproc
485
490 proc prinnt(mat what$)
495   print "Entries Found:"; count%; mat what$;
500   if hard% then print #34, mat what$;
505   if disk_file% then print #20, mat what$;
510 endproc
```

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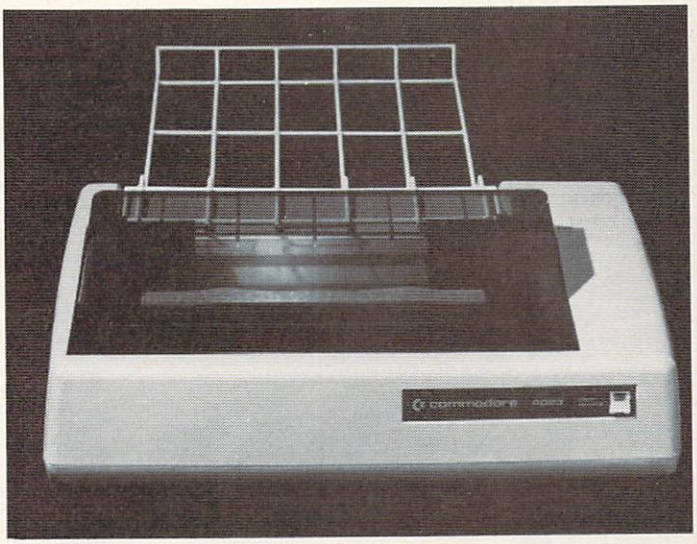

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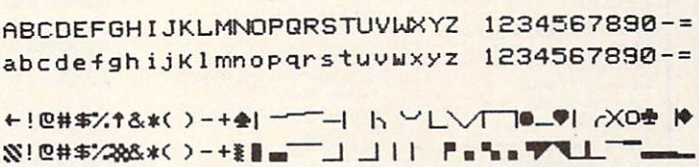

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Pete Lobol
(516) 957-1512

Merrick Commodore Club
2158 Vine Dr.
Merrick, NY 11566
Howard Miller

Rockland County Commodore Users Group
P.O. Box 573
Nanuet, NY 10965
Ross Garber

New York 64 Users Group
222 Thompson St.
New York, NY 10012
Bruce Cohen
(212) 673-7241

New York Commodore Users Group
380 Riverside Dr.
New York, NY 10025
Ben Tunkelang
(212) 566-6250

The New York City VIC/64 Users Group-NYCUG
436 East 69th St.
New York, NY 10021
Jocelyn Woods
(212) 787-2854

VIC 20/64 Users Group
NYU
Waverly Place
New York, NY 10003
Lawrence Schulman
(212) 358-5155

Finger Lakes Commodore Users Group
c/o Rose City Computer Associates
229 West Union St.
Newark, NY 14513
(315) 331-1185

Norny Chug
P.O. Box 226
Norwood, NY 13668
2nd Wed. of month @ 7 p.m.
Andrew VanDuyne
353-4591

Commodoreee 64 Users Group
S.U.N.Y. at Oswego
Dept. of Industrial Arts
Oswego, NY 13126
John R. Boronkay

SPUG
4782 Boston Post Rd.
Pelham, NY 10803
Paul Skipski

West Chester County VIC Users Group
P.O. Box 146
Pelham, NY 10552
Joe Brown

Poughkeepsie VIC User Group
2 Brooklands Farm Rd.
Poughkeepsie, NY 12601
Joe Steinman
(914) 462-4518

The Commodore Users Group Rochester
78 Hardison Rd.
Rochester, NY 14617
Phone Evenings between 7-10
Tom Werenski
(716) 544-5251

VIC 20 User Group
Paper Service Division
Kodak Park
Rochester, NY 14617
David Upham

Adirondack Commodore 64 Users Group
205 Woodlawn Ave.
Saratoga Springs, NY
Paul Klompas
(518) 584-8960

SCUG (Schenectady Commodore Users Group)
c/o The Video Connection
Canal Square
Schenectady, NY 12305
1st Mon. of month
Timothy Davis

Commodore Masters
25 Croton Ave.
Staten Island, NY 10301
Stephen Farkouh

VIC Users Club
76 Radford St.
Staten Island, NY 10314
Michael Frantz

VIC Users Group
c/o Stoney Brook Learning Center
1424 Stoney Brook Rd.
Stoney Brook, NY 11790
Robert Wurtzel
(516) 751-1719

Commodore Sig Computer Club of Rockland
P.O. Box 233
Tallman, NY 10982
Peter Bellin
(914) 357-8941

Mohawk Valley Commodore Users Group
P.O. Box 343
Tribes Hill, NY 12177
2nd Tues. of month @ 7 p.m.
William Nowak
(518) 829-7576

L&M Computer Club VIC 20 & 64
4 Clinton St.
Tully, NY 13159
Dick Mickelson
(315) 696-8904

Utica Commodore Users Group
1801 Storrs Ave.
Utica, NY 13501
Phil Rothstein
(315) 733-2244

Chautauqua County Commodore Users Group
c/o Sector One Computer
19-21 East Main St.
Westfield, NY 14787
Mark Dunlap
(716) 326-2222

PET User Club of Westchester
P.O. Box 1280
White Plains, NY 10602
Ben Meyer

VIC 20 User Club
151-28 22nd Ave.
Whitestone, NY 11357
Jean F. Coppola

USER GROUPS

NORTH CAROLINA

Raleigh VIC 20/64 Users Group
410-D Delta Court
Cary, NC 27511
Larry Diener
(919) 469-3862

Cleveland County Computer Club
P.O. Box 489
Grover, NC 28073
Todd Patterson
(704) 937-9124

Down East Commodores
302 Belltown Rd.
Havelock, NC 28532
Bruce Thedin
(919) 447-4536

VIC Users Club
Rt. 11
Hickory, NC 28601
Tim Gromlovits

VIC Users Club
Route 3
Lincolnton, NC 28092
David C. Fonenberry

Tryon Commodore 64 Club
P.O. Box 1016
Tryon, NC 28782
1st Mon. of month at 7 p.m.
Robin Michael
(704) 859-6340

Microcomputer Users Club
Box 17142 Bethabara Sta.
Winston-Salem, NC 27116
Joel D. Brown

NORTH DAKOTA

CCCC (Capitol City Computer Club)
c/o Veterans Memorial Public Library
520 Avenue A East
Bismarck, ND 58501
Rolf Arnold

The Computer Club
Lock Drawer 1497
North Dakota State Penitentiary
Bismarck, ND 58502
Ed Reitan

OHIO

C.P.U. Connection
P.O. Box 42032
Brook Park, OH 44142
Danni Hudak

Chillicothe Commodore Users Group
P.O. Box 211
Chillicothe, OH 45601
William A. Chaney

Commodore Users of Blue Chip (Cincinnati)
816 Beecher St.
Cincinnati, OH 45206
Ted Stalets
(513) 961-6582

S.W.O.C.U.G.(SW. Ohio Commodore Users Gp.)
8401 Wicklow Ave.
Cincinnati, OH 45236
Joe Beresford

Southwestern Ohio Commodore Users Group
P.O. Box 399117
Cincinnati, OH 45239
2nd Wed. of month at 7 p.m.

Central Ohio Commodore Users Group
107 S. Westmoor Ave.
Columbus, OH 43204
Phillip H. Lynch
(614) 274-0304

Commodore Local Users Exchange (C.L.U.E.)
3040 Highcliff Ct.
Columbus, OH 43229
2nd mon. of month @ 6
Pat Murphy

Akron Area C-64 Users Group
2453 Second St.
Cuyahoga Falls, OH 44221
4th Sat. of month @ 1-4pm
Paul Hardy
(216) 923-4396

Commodore Users Group
18813 Harlan Dr.
Maple Heights, OH 44137
Carl Skala
(216) 581-3099

Marion Ohio Commodore Users Group (MOCUG)
775 Wolfinger Rd.
Marion, OH 43302
Van Munro
(614) 726-2630

Medina Commodore Users Group
P.O. Box 182
Medina, OH 44258
2nd Wed. @ 7 p.m.
Jill Carpenter
(216) 722-2611

Licking County 64 Users Group
323 Schuler St.
Newark, OH 43055
(614) 345-1327

11433 Pearl Rd.
Strongsville, OH 44136
Paul M. Warner

Commodore Computer Club of Toledo
734 Donna Dr.
Temperance, MI 48182
Gerald Carter

Dayton Area Commodore Users Group
679 Murray Hill Dr.
Xenia, OH 45385
Charles Tobin
(513) 372-4077

OKLAHOMA

Commodore Users of Bartlesville
1704 S. Osage
Bartlesville, OK 74003
Fred Mayes
(918) 336-0233

Southwest Oklahoma Computer Club
c/o Commodore Chapter
P.O. Box 6646
Lawton, OK 73504
meets 1

Commodore Users Group
Muskogee Computer Society
202 S. 12th St.
Muskogee, OK 74401
Steve Ford

Commodore Users of Norman
209 Brookwood
Noble, OK 73068
Matt Hager

Commodore Oklahoma Users Club
4000 NW 14th St.
Oklahoma City, OK 73107
Stanley B. Dow
(405) 943-1370

Commodore Users
Box 268
Oklahoma City, OK 73101
Monte Maker

Greater Oklahoma Commodore Club
1401 N. Rockwell
Oklahoma City, OK 73127
Randy Hill
(405) 789-3229

Tulsa Area Commodore Users Group
7804 N. 117th E. Ave.
Owasso, OK 74055
Craig Bowman
(918) 272-9755

OREGON

Jefferson State Computer Users Group-JUG
2355 Camp Baker Rd.
Medford, OR 97501
John Newman

Southern Oregon VIC/64 Users Group
3600 Madrona Lane
Medford, OR 97501
James Powell
(503) 779-7631

NW PET Users Group
2134 N.E. 45th Ave.
Portland, OR 97213
John F. Jones

United States Commodore Users Group
P.O. Box 2310
Roseburg, OR 97470
Richard Tsukiji
(503) 672-7591

PENNSYLVANIA

Lincoln Technical Inst.
5151 Tilghman
Allentown, PA
2nd & 4th Thurs. @ 7
Alan Karpe
(215) 770-1032

Bellwood - Altoona Users Group
1433 - 13th Ave.
Altoona, PA 16603
D.N. Dantof
(814) 942-9565

COMPSTARS
130 Blue Teel Circle
Audubon, PA 19403
Meet at Audio Video Junct.
Mike Norm

Worldwide Commodore Users Group
P.O. Box 337
Blue Bell, PA 19422
David Walter

Scranton Commodore Users Group
P.O. Box 211
Clarks Summit, PA 18411

Cliftin Heights Users Group
P.O. Box 235
Clifton Heights, PA 19018

VIC 20 Programers
c/o Watson Woods
115 Old Spring Rd.
Coatesville, PA 19320
Robert Gougher

Castle Commodore Computer Club
RD #1
Edinburg, PA 16116
3rd Thursday
D. Wade
(216) 673-9261

Commodore Users Group
3021 Ben Venue Dr.
Greensburg, PA 15601
Jim Mathers
(412) 836-2224

NADC Commodore Users Club
248 Oakdale Ave.
Horsham, PA 19044
Norman McCrary

Westmoreland Commodore Users Club
c/o DJ & Son Electronics
Colonial Plaza
Latrobe, PA 15650
Jim Mathers

CACC (Capitol Area Commodore Club)
P.O. Box 333
Lemoyne, PA 17043
Geoffrey Hebert
(717) 732-5255

PET User Group
P.O. Box 371
Montgomeryville, PA 18936
Gene Beals

Eight Squared
Mindy Skelton
P.O. Box 76
Mount Holly Springs, PA 17065
(717) 766-5185 or
(717) 486-3274

A-K 64 Users Group
1762 Fairmont St.
New Kensington, PA 15068
2nd & 4th Tues. of month
Alton E. Glubish
(412) 335-9070

G.R.C. User Club
300 Whitten Hollow Rd.
New Kensington, PA 15068
Bill Bolt

Boeing Employees Personal Computer Club
The Boeing Vertol Co.
P.O. Box 16858
Philadelphia, PA 19142
Jim McLaughlin
(215) 522-2257

Oxford Circle 64 User Group
Trinity Church
6900 Rising Sun Ave.
Philadelphia, PA 19111
3rd Mon. of month 7
Roger Nazeley(215) 535-9021
(215) 743-8999

PACS Commodore Users Group
LaSalle College
20th & Olney Ave.
Philadelphia, PA 19141
Stephen Longo
(215) 951-1258

VIC Software Development Club
440 W. Sedgwick
Apt. A-1
Philadelphia, PA 19119
Tracy Lee Thomas
(215) 844-4328

PPG (Pittsburgh PET Group)
2015 Garrick Dr.
Pittsburgh, PA 15235
Joel A. Casar
(412) 371-2882

G/C Computer Owners Group
c/o Gilbert Associates
P.O. Box 1498
Reading, PA 19607
Jo Lambert (215) 775-2600
Extention 6472

Penn Conference Computer Club
c/o Penn Conference of SDA
720 Museum Rd.
Reading, PA 19611
Dan R. Knepp

Bits & Bytes
1015 Dale Rd.
Secane, PA 19018
Dave Boodey
(215) 544-5875

4820 Anne Lane
Sharpsville, PA 15150
Gene Planchak
(412) 962-9682

Upper Buxmont C-64 Users
655 Bergey Rd.
Telford, PA 18969
Don Roques
(215) 723-7039

CACCC-Centre Area Commodore Computer Club
214 Computer Building
University Park, PA 16802
Bill Hillner
(814) 237-5912

Commodore Users Group
781 Dick Ave.
Warminster, PA 18974
Matt Matulaitis

Main Line Commodore Users Group (MLCUG)
1046 General Allen Lane
West Chester, PA 19380
Emil Volcheck
(215) 388-1581

The Commodore Users Club of S.E Pittsburgh
c/o Groves Appliance & TV
2407 Pennsylvania Ave.
West Mifflin, PA 15122
Charles Groves

West Branch Commodore Users Group
P.O. Box 995
Williamsport, PA 17703
Gene Loveland
(717) 323-7901

PUERTO RICO

VIC 20 User Group
655 Hernandez St.
Miramar, PR 00907
Robert Morales

Commodore Users Group of Ponce
BP5 Ext. Las Delicias
Ponce, PR 00731
(809) 844-5733

CUG of Puerto Rico
RFD #1
San Juan, PR 00914
Ken Burch

RHODE ISLAND

Commodore Users Group
c/o Data-Co.
978 Tiogue Ave.
Coventry, RI 02816
Victor Moffett
(401) 828-7385

Irving B. Silverman
160 Taunton Ave.
E. Providence, RI 02914
Michelle Chavani

Newport VIC/64 Users
10 Maitland Ct.
Newport, RI 02840
Dr. Matt McConeghy
(401) 849-2684

RICE (Rhode Island Computer Enthusiasts)
198 Morris Ave.
Pawtucket, RI 02860
Michael Skelton
(401) 728-8602

SOUTH CAROLINA

Beaufort Technical College
100 S. Ribaut Rd.
Beaufort, SC 29902
Dean of Instruction

Commodore Users Society of Greenville(CUS)
Horizon Records-Home Computers
347 S. Pleasantburg Dr.
Greenville, SC 29607
Bo Jeanes
(803) 235-7922

The Executive Touch C-64 & VIC 20 Users
208 Hwy 15
Myrtle Beach, SC 29577
Patricia Watkins
448-8428

The Charleston Computer Society
P.O. Box 5264
N. Charleston, SC 29406
3rd Tues. of month at 7 p.m
Jack Furr
(803) 747-0310

Spartanburg Commodore Users Group
803 Lucerne Dr.
Spartanburg, SC 29302
James Pasley
(803) 582-5897

Commodore Computer Club of Columbia
P.O. Box 2775
Cayce
West Columbia, SC 29171
Chuck Howard-Sect./Tres.

SOUTH DAKOTA

PET User Group
515 South Duff
Mitchell, SD 57301
Jim Dallas
(605) 996-8277

VIC/64 Users Club
608 West 5th
Pierre, SD 57501
Larry Lundeen
(605) 224-4863

TENNESSEE

Commodore User Club
Metro Computer Center
1800 Dayton Blvd.
Chattanooga, TN 37405
Mondays 7

Jackson Commodore Users Group
31 Carriage House Dr.
Jackson, TN 38305
Rick Crone
(901) 668-8958

ET 64 Users Group
P.O. Box 495
Knoxville, TN 37901
Walt Turner
(615) 966-8478

Metro-Knoxville Commodore Users Club
7405 Oxmoor Rd.
Knoxville, TN 37931
2nd Thurs. 6
Ed Pritchard
(615) 938-3773

Memphis Commodore Users Club
2476 Redvers Ave.
Memphis, TN 38127
Harry Ewart
(901) 358-5823

Nashville Commodore Users Group
P.O. Box 121282
Nashville, TN 37212
3rd Thurs.at Cumberland Mus
Dave Rushing
(615) 331-5408

USER GROUPS

TEXAS

Commodore Users Group (Austin)
P.O. Box 49138
Austin, TX 78765
Dr. Jerry D. Frazee

Corpus Christi Commodores
P.O. Box 6541
Corpus Christi, TX 78411
Bob McKelvy
(512) 852-7665

Gulf Coast Commodore Users Group
P.O. Box 128
Corpus Christi, TX 78403
Lawrence Hernandez
(512) 887-4577

Tarant County Commodore 64 Club (TCCC)
1901 Lanewood
Fort Worth, TX 76112
Jeff Speed

VIC 20 Users Group
6416 Brookhaven Trail
Ft. Worth, TX 76133
Jeff Southerland
(817) 346-1407

CHUG (Commodore Houston Users Group)
8738 Wildforest
Houston, TX 77088
John Walker
(713) 999-3650

Savid Computer Club
312 West Alabama
Suite 2
Houston, TX 77006
Davi Jordan

Mid-Cities Commodore Club
413 Chisolm Trail
Hurst, TX 76053
Garry Wordelman

ICUG (Irving Commodore Users Group)
3237 Northgate #1289
Irving, TX 75062
Robert Hayes
(214) 252-7017

Longview Users Group
P.O. Box 2504
Longview, TX 75606
Joyce Pope
(214) 759-3459

South Plains '64' Users Group
7709 Avenue 'W'
Lubbock, TX 79423
John N. Bottoms
(806) 745-4381

VIC Users Group
3817 64th St.
Lubbock, TX 79413

1110 Texas Ave.
Mart, TX 76664
James Meeker
(817) 876-2710

Commodore Computer Club (C3)
2217 N. Sumner
Pampa, TX 79065
every other Thurs. 7 p.m.
Randy Mills
(806) 665-3444

64 Users Group
2421 Midnight Circle
Plano, TX 75075
S. G. Grodin

SCOPE
P.O. Box 3095
Richardson, TX 75083
2nd Sat. of month @ 1

P.O. Box 652
San Antonio, TX 78293
Larry Williams

Interface Computer Club
814 North Sabinas
San Antonio, TX 78207
M.E. Garza

The Great Northwest CBM 64 Users Group
6302 War Hawk Dr.
San Antonio, TX 78238
Randy
647-3881

Commodore Users Group
624 Bellview St.
Sulphur Springs, TX 75482
Danny Miller

PET User Group
Texas A & M
Microcomputer Club
Texas A & M, TX
John Bowen

The Woodlands Commodore Users Group
3 Splitrock Rd.
The Woodlands, TX 77380
Andrew Gardner
(713) 292-8987

Crossroads Commodore Users Group
417 Irma Dr.
Victoria, TX 77901
meets twice a month
Jerry Guy
(512) 575-0342

UTAH

The Commodore Users Group
652 West 700 North
Clearfield, UT 84015
Rodney Keller
(801) 776-3950

Northern Utah VIC & 64 Users Group
P.O. Box 533
Garland, UT 84312
David Sanders

The Commodore Users Club
742 Taylor Ave.
Ogden, UT 84404
Todd Woods Kap

Utah PUG
2236 Washington Blvd.
Ogden, UT 84401
Jack Fleck

Uintah Basin Commodore Users Club
P.O. Box 1102
Roosevelt, UT 84066
2nd & 4th Thursday of month
Terry Hall

Mountain Computer Society
P.O. Box 1154
Sandy, UT 84091
Dave Tigner

The VIClic
799 Ponderosa Dr.
Sandy, UT 84070
Steve Graham

VIC 20 Users
324 North
Smithfield, UT 84335
Dave DeCorso

VERMONT

Burlington Area Commodore Users Group
6 Mayfair
South Burlington, VT 05402
Steve Lippert
658-4160

VIRGINIA

Alexandria Users Group
1206 Westgrove Blvd.
Alexandria, VA 22307
Jeff Hendrickson

Franconia Commodore Users Group
J. Marshall Library
6209 Rose Hill Dr.
Alexandria, VA 22310
3rd Tues. of month
Mark Sowash
(703) 971-5021

Arlington VICtims (20/64)
Arlington Community Center
4501 Arlington Blvd.
Arlington, VA 22204
2nd Wed. of month @ 7 p.m.
Clifton M. Gladney
(703) 524-0236

VIC 20 Victims
4301 Columbia Pike #410
Arlington, VA 22204
Mike Spengel
(703) 920-0513

Dale City Commodore Users Group
4303 Hemingway Dr.
Dale City, VA 22193
Pat Sullivan
(703) 590-4998

135 Beverley Rd.
Danville, VA 24541
David Gray

PENTAF (Pentagon)
9912 Colony Rd.
Fairfax, VA 22030
Ralph Poole
(703) 273-1337

Commodore Users of Franklin
1201 N. High St.
Franklin, VA 23851
D. Bruce Powell
(804) 562-6823

Frdericksburg Computer Club
P.O. Box 1011
Fredericksburg, VA 22402
Shelkee Asso.
Steven Northcutt
(703) 371-4184

Fredericksburg Area Computer Enthusiasts
P.O. Box 324
Locust Grove, VA 22508
Michael Parker
(703) 972-7195

VIC Users Group
Rt. 2
Lynchburg, VA 24501
Dick Rossignol

Washington Area C-64 UG
c/o Kent Gardens School
7426 Eldorado St.
McLean, VA 22012
3rd Thurs. of month @ 7 p.m
Martin Smith
(703) 523-1995

Washington Areea C-64 (Burke)
P.O. Box 93
Mt. Vernon, VA 22121
Burke Library
Dick Jackson
(703) 360-6749

Peninsula Commodore 64 Users Group
124 Burnham Place
Newport News, VA 23606
Richard G. Wilmoth
(804) 595-7315

Norfolk Users Group
1030 West 43rd St. B-4
Norfolk, VA 23508
Larry Pearson
489-8292

Northern VA PET Users
2045 Eakins Court
Reston, VA 22091
Bob Karpen
(803) 860-9116

VIC Users Group
1502 Harvard Rd.
Richmond, VA 23226
Donnie L. Thompson

R.A.C.E. Commodore Users Group
4726 Horseman Dr.
Roanoke, VA 24019
Larry Rackow
(703) 362-3960

Capitol Area Commodore Enthusiasts
P. Henry Library
2312 Tangle Vale
Vienna, VA 22180
2nd Sat. of month @ 1
Don Swinney
(703) 938-6313

Tidewater Commodore Users Group
4917 Westgrove Rd.
Virginia Beach, VA 23455
Fred Monson

NASA VIC 20 User Group
713 York Warwick Dr.
Yorktown, VA 23692
Harris Hamilton

WASHINGTON

C-64 Diversity
18204 - 67th Ave.
Arlington, WA 98223
Jill Johnston
(206) 435-4580

CBM Users Group
803 Euclid Way
Centralia, WA 98531
Rick Beaber
(206) 736-4085

Fort Lewis Commodore Computer Club
Quarters 2821-A
Fort Lewis, WA 98433
1st & 3rd Thurs. @ 7
Jim Litchfield
(206) 964-1444

Whidbey Island Commodore Computer Club
947 N. Burroughs Ave.
Oak Harbor, WA 98277
Michael D. Clark

Computer Club
c/o Honeywell
5303 Shilshole Ave.
Seattle, WA 98107
Art Witbeck
(206) 789-2000

NW PET Users Group
2565 Dexter N. 3203
Seattle, WA 98109
Richard Bell

PET Users Group
1800 Taylor Ave. N102
Seattle, WA 98102
Kenneth Tong

Spokane Commodore User Group (SCUG)
c/o N. 310 Raymond #1
Spokane, WA 99206
Stan White

Blue Mountain Commodore Users Club
15 Stone St.
Walla Walla, WA 99362
Keith Rude
(509) 525-5452

Central Washington Commodore Users Group
P.O. Box 10937
Yakima, WA 98909
Sam Cox
(509) 248-8193

WEST VIRGINIA

Personal Computer Club
P.O. Box 1301
Charleston, WV 25325
Cam Cravens

TriState Commodore Users
73 Pine Hill Estates
Kenova, WV 25530
Marc Hutton
(304) 453-2124

Commodore Computer Club
203 Lightner Ave.
Lewisburg, WV 24901
Chris Apperson
(304) 645-1150

Logan Computer Club
P.O. Box 480
Logan, WV 25601
1st Tues. of month @ 7 p.m.
C.R. Wilson

Commodore Home Users Group - 81 Lynwood Ave.
Wheeling, WV 26003
Alice Shipley
(304) 242-8362

WISCONSIN

C.L.U.B. 84
6156 Douglas Ave.
Caledonia, WI 53108
2nd Sat every month 10 Jack White
(414) 835-4645 pm

Chippewa Valley Commodore 64 Users Group
620 West Central St.
Chippewa Falls, WI 54729
Leo Lato
(715) 723-8095

Vicky Badger Club
2825 Riva Ridge
Cottage Grove, WI 53527
George Cooper

The Eau Claire CBM64 Users Group
Rt. 5
Eau Claire, WI 54703
John Slavsky
(715) 874-5972

Milwaukee Area CBM64 Enthusiasts (M.A.C.E)
P.O. Box 340
Elm Grove, WI 53122
Kevin Wilde
(414) 259-5991

Project-20
P.O. Box 359
Elm Grove, WI 53122

Comm Bay 64
2589 Haven Rd.
Green Bay, WI 54303
Jeff Schwecler
(414) 439-1619

S.W.I.T.C.H.
W156 N8834 Pilgrim Rd.
Menomonee Falls, WI 53051
Len Lutz
(414) 255-7044

Menomonie Area Commodore Users Group
510 12th St.
Menomonie, WI 54751
Mike Williams
(715) 235-4987

Madison Area Commodore Users Group
1552 Park St.
Middleton, WI 53562
3rd Thurs. each month
John Carvin
(608) 831-4852

Sewpus
P.O. Box 21851
Milwaukee, WI 53221
Theodore J. Polozynski

VIC-20 & 64 User Group
522 West Bergen Dr.
Milwaukee, WI 53217
Mr. Wachtl
(414) 476-8125

Commodore 64 Software Exchange Group
P.O. Box 224
Oregon, WI 53575
E. J. Rosenberg

C.U.S.S.H.
3614 Sovereign Dr.
Racine, WI 53406
3rd Saturday of month
Tim Tremmel
(414) 554-0156

Waukesha Area Commodore User Group (WACUG)
256 1/2 W. Broadway
Waukesha, WI 53186
Walter Sadler
(414) 547-9391

WI Asso. of VIC/64 Enthusiasts (W.A.V.E)
P.O. Box 641
Waukesha, WI 53187
1st & 3rd Fri. @ 7 p.m.
Annette Levandowski
(414) 771-7016

CHIPS
1017 Kilbourn Ave.
West Bend, WI 53095
2nd Wed. & 4th Thurs.
Richard Kohn (E) 334-2494
(414) 338-1609 D

WYOMING

Commodore Users Club
c/o Video Station
670 North 3rd #B
Laramie, WY 82070
Pamela Nash
(307) 721-5908

AUSTRALIA

VIC-UPS Computer Users Group
1 Jubilee St.
South Perth 6151
2nd & 4th Tues. at 7
Peter Prisgrove
09-367-9505

WA VIC-UPS (VIC 20/CBM 64 Users)
14 Glengariff Dr.
Floreat Park 6014
B.J. Cook
09-387-5636

USER GROUPS

AUSTRIA

Commodore Users Club
Postfach 5026
Salzburg, Austria
D.A. Stagg
(062) 222-5391

BAHAMAS

Commodore Computer Club
c/o Syntex Corporation
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Bill Maxwell

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Garza Garcia
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Association Dr Usuarios Commodore
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Alejandro Lopez Arechiga

Club Herra*Tec C64
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Vicente Suarez 25
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Club Microvic
Villaldama 225
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NEW ZEALAND

Commodore Users Group
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Mount Roskill
3rd Wed. of month 7
Roger Altena
278-5262

Nelson VIC Users Group
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Nelson
Peter Archer

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WEST GERMANY

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Mark Mahannah
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Trinidad Asso. of Computer Owners T.A.C.O
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If you would like to publish your user group information or need to make changes to an existing listing, drop a card to Pete Baczor, Commodore User Group Coordinator Commodore Business Machines 1200 Wilson Drive West Chester, PA 19380.

FACTORY

Continued from page 33

fore lining up the machines.

I have to say that I spent the most time and had the most fun with job number three. I started out requesting an easy challenge. It's true, it was easy. So I bypassed medium and went straight to hard.

Aha. This was more like it.

The program wanted me to recreate something that looked like the British flag shot full of holes and balanced on one corner.

I carefully picked and chose the machines in my assembly line, confident that I was rotating correctly here, punching appropriately there and flawlessly striping my way to an exact duplication.

I won't tell you what I ended up with. Let's just say my rotations were a bit off.

The program lined up my creation with the original and stated bluntly, "Your product has a flaw."

I try it again. I am determined. The phone rings, I ignore it. I focus on the problem at hand and painstakingly choose the first four machines. I'm really concentrating now. The phone rings again. I realize that my fourth machine's rotation is off. I take the phone off the hook and change the machine from a 90-degree to a 45-degree rotation. I am vaguely aware of the kids screaming what sounds like "Jelly!!" from the other room. Only two machines to go now. I wonder if that stripe there is a medium or a thick stripe. I decide on medium. The final rotation. I think I've done it!

I did it!

The program pats me on the back for a good job done and wants to know if I want another challenge. How can I resist?

That evening, as my eight year-old is working on his umpteenth factory and my five year-old and I clean grape jelly off of all exposed kitchen surfaces, the phone rings.

It's my business partner. He says he tried to reach me all day. Did I finish the last revisions on the documentation for our program? Should he set the appointment at the printers for tomorrow or Friday? I tell him Friday. I just couldn't get to it today.

I had to take care of some equipment configurations at....*The Factory*.

C

IEA

Continued from page 34

interface with any BASIC programs.

Disassembled monitor listings are similar to the source text generated by "IEA/SYS," except you are not allowed to use labels or comments to make the source easier to read and follow. The exclusion of this program would not have been catastrophic, but having as useful a monitor as "Micromon" lets me sleep at night without worrying about my programs.

Walk

The last of the main programs available on the *IEA* disk may prove to be the most useful and valuable to you. "Walk" is a debugging program that allows a programmer to trace a machine language program while keeping track of all of the status registers. If your program uses graphic displays, don't worry. "Walk" uses only the top two lines of the screen to display all of the important status registers used in assembly language programming.

Like "Monitor," "Walk" has two versions on the disk, allowing you to locate your programs at either $4000 HEX or $C000 HEX. Using "Walk," you may trace your program at any speed—in single steps or at a near lightning pace—by using the F1 key.

At the beginning of this review, I mentioned that there are nineteen sub-files and programs on the *IEA* disk. These files and programs explain things that did not make it to the publisher of the documentation in time to be included in the book. There are also examples illustrating the use of the editor commands and the pseudo op-codes.

When I listed all of the files supplied on the program disk, I found something unexpected. On the disk are several long programs illustrating some of the more difficult operations done using assembly language. The author of the package explains that you may use any of these subroutines in your own programs and tells you which variables to change for your programs.

As an added attraction, Robin's Software provides good customer support that features a replacement of the original disk if it gets damaged and a hotline for questions about assembly language programming. **C**

COOKBOOK

Continued from p. 18

into the kitchen either. The print function allows you to print individual recipes or a list of recipes, ingredients or classifications. You can also enter the recipes you plan to prepare during the week and print a shopping list of ingredients.

Micro Cookbook offers the chef or would-be chef an easy way to plan meals and store recipes. Next time you find yourself dialing your local pizzeria, think twice. *Micro Cookbook* may be the answer to the daily question, "What's for dinner?" **C**

EXPANDO VISION

Continued from p. 30

contains nine messages that cycle. You can break the cycle at any time with the push of a button, choose another message and return to your TV viewing. Another function allows you to view the subliminal messages in slow motion, so that your conscious mind can see what you are getting for your money!

During use, you will be subjected to such positive phrases as, "I see me calm," "I am free of smoking," and the ever popular, "I am OK". The programs are well-written and make it quite simple to view and/or choose the message you want. The software packages sell for $39.95 each.

I am very impressed with the overall completeness of the system, which appears to be well thought out. It is easy to set up and use and isn't inconvenient to leave hooked up to your computer/television system. Stimutech provides more than adequate support for both the product itself and for the theory of subliminal suggestion.

As for the effectiveness, well, I'm not a trained clinical psychologist and I really don't know if *Expando-Vision* did the trick, but I tested the system using program package number eight. Boy, I'll tell you, I've never been more satisfied.

Stimutech is researching the possibility of new subliminal suggestion packages for the future. I am certainly looking forward to their next endeavor in this fascinating field of micro-psychology. **C**

 Continued from page 69

of a real-life situation. The familiar game *Lemonade*, which can be found on the Commodore 64 Bonus Disk or Bonus Tape, is a simulation of the economics of running a business. Students must make choices involving the amount of supplies they buy and the amount they charge for a glass of lemonade, given a set of business conditions (temperature and humidity). The object is to become independently wealthy during the course of the ten-week summer, but the child who plays this game cannot help learning something about business common sense.

Educational programs can provide computer-aided instruction in many areas. There are many typing tutor programs like the one that taught our friend Charlie to type. There are programs that teach music, science, spelling, graphic design, mathematics, biology, geography, history, government, speed reading, vocabulary building, shape and color matching, the alphabet and even computer programming. But use extreme care in the selection of educational software to be sure that the program you choose really meets your needs.

Telecommunications

One of the interesting things Charlie found he can do with his equipment is communicate with other computers. Why would he want to do that? For several reasons.

The company Charlie works for has a minicomputer to handle most of its accounting, word processing and data-handling chores. This minicomputer, which is huge compared to Charlie's microcomputer, has some outside phone lines connected to it through a modem, which is a device used to translate audio signals from the telephone line into digital signals for the computer and vice versa. Charlie has a user account on the minicomputer, and he enters his sales orders and expense account information whenever he gets back to the plant.

In the coming years more routine chores will be done by the home computerist using a modem—banking, shopping by mail, transferring any kind of data and researching virtually any kind of subject.

Charlie's boss is pressuring him to come into the plant more often to enter his data. But Charlie finds that he wastes valuable customer contact time going to the plant, waiting for a terminal and entering his data. So Charlie's boss has agreed to let Charlie enter his data from home, using his own microcomputer and an inexpensive modem. Now Charlie can spend more time calling on customers and making sales.

Charlie does a lot of traveling for his job, too. Before he got his computer and modem, he had to wait for his secretary to get the flight schedules from the airline, make his reservations and send him his tickets. This took a lot of time, not to mention many phone calls back and forth, mostly from pay phones while he was on the road. And if Charlie's plans had to change, the cycle would start over again.

Now, through his subscription to CompuServe, Charlie can look at the flight schedules, make his own reservations and arrange for ticket pick-up, all from his home.

Charlie also owns some stock. He has always relied on his stockbroker to advise him on which stocks to buy and sell, and he usually checks the newspaper to see how they are doing. But it's hard to remember what nine or ten different stocks have done over the past several months. Again, Charlie uses his computer and modem to access the Dow Jones News/Retrieval service, which brings him up-to-the-minute information any time he wants it.

Clark sometimes hooks up the computer and modem and uses it to talk to some of his friends, who also have computers and modems. Of course, it would be simpler to talk on the phone using his voice, but using the computer and modem is more fun and it improves his typing and computer skills, too. Besides, Mom and Dad can't listen in on his conversation—all they'll hear is a bunch of computer-generated tones!

On a more serious note, Clark uses the computer and modem to access database services for research he needs to do for school reports. In fact, any material he needs can be pulled right into his word processing program, eliminating the need for retyping and the increased possibility of typing errors!

In the coming years, more and more routine chores will be done by the home computerist with a modem. Already, all the services mentioned exist, as well as shopping by mail (an electronic mall); transferring any kind of data, including computer programs, games and recipes; and researching virtually any subject. In some areas of the country, banks are experimenting with allowing home computer users to access the bank's computer for an instant readout of account balances (your own, of course), transfer of funds between accounts and payment of bills. These services will soon be available nationwide.

To use telecommunications, you will need a modem and software, in addition to your computer and a modular telephone. The VIC Modem is currently selling for about $65.00, and includes software for both the VIC 20 and Commodore 64 computers on cassette tape. These programs are transferable to disk, if that's what you have. The modem plugs directly into the computer and the telephone, so no expensive interfaces

are needed.

For more advanced communications, including the ability to store the information you receive or print it out, a more advanced software package is needed. These vary in price, but good software can be purchased for about $40.00. The cost of telecommunications, Commodore-style, is low indeed.

(For more information on home telecommunications, see "Be Your Own Travel Agent" and "The Electronic University" in this issue.

Other Home Uses

There are many other uses for the home computer and a lot of fine software is on the market for almost any application. Charlie uses Commodore's *Easy Finance*, a home finance package, to help figure out loan balances and amortization tables. There are even hardware/software packages to control the lighting, heating and air conditioning in your home, operate a home burglar alarm, help with your shortwave radio hobby and, yes, even predict the weather. Depending on what your interests are, you can find limitless uses for your computer.

But the one area of home computering we haven't yet discussed is . . .

Fun and Games

Whether or not we want to admit it or not, one of the reasons we bought a home computer is for the games. Even Charlie, in between his calls to the office computer and lamentations over the excesses of the family budget, likes a good game of *Satan's Hollow* every now and then. And with the selection of games on the market, from adventure games to space games to chase games to climbing games to intellectual games to music games to educational games, it's hard to believe that we're just a few short years beyond the time when the only computer game known to man was a ping pong ball floating across the TV screen!

Let Me Entertain You . . .

All in all, the home computer can be a source of entertainment for the entire family. Even though Charlie, Charlene and Clark know nothing, yet, of writing their own programs or even of modifying those they have, they find a myriad of uses for their "Little Wonder." They can do things that couldn't be done before, and can do other things much more easily and quickly. This leaves them more time and money for all kinds of entertainment and enjoyment, both on the computer and off. **C**

DOCTOR

Continued from page 77

putting the technology out of reach is the answer. I think the answer is to educate people about the dangers of self-diagnosis—and that leaves them free to have the information."

Dr. Richard Kotomori, an Albuquerque, New Mexico, pediatrician who works with the bureau of Indian Health Services, supports the concept of *Childpace*.

"The tests that are given using the program seem to follow the Denver Developmental Scale exactly," he points out. "This program will allow parents to give accurate information to their pediatrician and probably make it easier for the pediatrician to assess their child."

Dr. Kotomori also believes that using the program could help foster a closer parent-child relationship. University of Wisconsin's Pat Dickson, on the other hand, thinks the time could be just as well spent on reading to or playing with the child.

Dr. Dickson, who is the parent of young children himself, said that he would rather purchase one of the many books on child development—books that often contain charts with which to gauge your child's progress. How are such books different from a computer program?

"The books are likely to have somewhere in the neighborhood of 300 pages of text accompanying these charts," he explains, "text that puts the test results in some kind of perspective and gives the parents information about the things they can do to enrich their child's learning experiences."

An Albuquerque parent who purchased *Childpace* said she bought the program in addition to the usual books because she likes the idea of administering the tests herself to her two year-old son, Justin.

"I also hoped that it would help get my husband more involved with the baby, since he spends so much time on the computer," she added.

This parent, who said she and her husband had "a lot of fun" going through the tests with their young son, also suspected, however, that her opinion of the program might have been different if it had revealed that her child was developing more slowly than expected.

"Actually, one reason I was inter-

ested in using *Childpace* was because once when Justin was tested by our pediatrician, he had seemed to be a bit behind," she explained. "My husband and I felt that it might have been because he just wasn't comfortable with the doctor—he's going through a shy stage.

"But even if we had gotten different results with *Childpace*, we certainly wouldn't panic," she went on. "I suppose we would have discussed it with our doctor and taken it from there. In fact, we told her about the program and she said it seemed to be a perfectly good example of the DDST—and that, in fact, she often doesn't have the time to give the entire test to her patients because she has so many to see each day."

Sam Barklis, chairman of Computerose, the company that produces *Childpace*, says he had several reasons for marketing the program.

"I think this generation of parents want as much meaningful involvement with their children as they can get. A testimony to that is the speed with which educational programs for children have taken center stage in the home software market. We feel we are giving the parent the opportunity to do some evaluation during a period when they have enormous interest in the child's development."

Barklis' wife and co-worker, Allison—a registered nurse—points out that there was quite a controversy surrounding the release of a book with a similar topic some years ago. The author of that book was Dr. Benjamin Spock and its title was *Baby and Child Care*.

"One of the most radical things Spock did," she comments, "was to give parents confidence in themselves. I think that before that, nobody had said, 'Hey, parent, you have some knowledge and good instincts when it comes to your own child—apply them.'

"I think *Childpace* takes something that has so far been somewhat esoteric—almost mystical—out of that realm and puts it into the hands of the people who, if they are given enough information, can do it accurately themselves."

Pat Dickson at the University of Wisconsin, on the other hand, has a different opinion about putting such information into the hands of non-professionals.

"Most of us who imagine that we are relatively normal would not let a computer program change our behavior toward a child. But many people feel that American parents are unduly neurotic about achievement and put too much pressure on their children early on," he says.

In Dr. Dickson's estimation, applying this kind of pressure to achieve on a child age three or younger is "risky business."

Linda Grilli, however, feels that *Childpace* is a safe home application program, since the DDST is straightforward, requiring little interpretation. In contrast to this straightforwardness, she points out that an application such as the Rorschach inkblot test, for instance, would be highly inappropriate for home use, because interpretation of that kind of psychological test requires a high degree of professional training. She nevertheless recommends that parents discuss the *Childpace* test with a professional, if possible.

Albuquerque pediatrician Richard Kotomori thinks a program like *Childpace* can be extremely useful, particularly to parents who live in outlying areas where there are few medical providers to keep tabs on a child's development. But he also cautions parents against taking negative results too seriously before discussing them with a pediatrician.

The bottom line seems to be that, just as with any other tool, *Childpace* and the programs like it must be used wisely and possibly in conjunction with other materials such as books. Those contemplating purchase of this type of program should examine their motives. Proving, for instance, that little Billy is developing more quickly than the Jones' kid should not be considered a valid motive. In the specific case of *Childpace*, parents should also take care not to equate motor development (which the program measures) with intelligence (which it does not).

Are *Childpace* and programs like it the forerunners of a new movement in software? Many people think so.

Pat Dickson, for example, points out, "Self-help books have for the last 75 years occupied ten percent of the total books sales in the United States. We are increasingly going to see the same kind of figures in the software marketplace whether we like it or not. Professionals—and non-professionals—are going to be writing and selling software that will purport to help you lose weight, feel better, deal with stress and so on. Over the long haul, I think it will get better. In three or four years, we will see much better examples of this kind of software than we are seeing now."

Psychologist Linda Grilli is already using stress reduction software on the Commodore 64 with one of her patients. An enthusiastic user of the CompuServe Information Service, Dr. Grilli also points out that much medical information is already available on-line right now to computer users with modems. And, she says, large corporations are turning more and more to personal computers for services once provided by stress-reduction consultants and employee relations counselors, since the one-time cost of hardware and software is so much less than the fees charged by professionals to give seminars.

It seems that doctors and others in related health fields are among the last experts to be "demystified" by the consumer revolution of recent decades. Yet the demystification is happening. Our parents would never have dreamed of questioning the judgment of their local GP, let alone that of a highly paid specialist. Yet, in 1985, we, their children, are carefully reading labels, questioning the medicines doctors prescribe and demanding explanations of treatments doctors recommend. We no longer are so willing to accept at face value the opinions of experts, and are more likely to trust our own judgment on topics ranging from raising children to choosing vitamins.

Add to this the continuing American love affair with youth and health and it is not surprising that we have found a way to combine two popular national pasttimes—health and home computers. It is also not surprising, however, that both users and experts approach this new software with a healthy degree of skepticism—a skepticism natural to a generation of label readers and socially aware, informed adults. **C**

ORGANIZED

Continued from page 81

equal search—not to be confused with the not-equal search—with which you can look for records containing data that is either greater than or less than some indicated value; the any-match search, which allows you to simply browse through the entire field of records; and, lastly, the key-field search, which uses the name/description field to display all the items in alphabetical order.

In all of these different types of searches, you can also specify more than one search criteria. You want to see everything you have on file that is manufactured by Commodore, is the color beige and located in the computer room? Enter those specifications into the appropriate fields and, voila! just about every piece of hardware in your Commodore system will be displayed on your screen.

Still another marvelous offering by the *Home Organizer* programs is their printer reports. "Home Inventory" offers two different hardcopy report formats. The first prints in neatly laid out columns the item name, serial number, purchase price and insurance amount of every item in your file. At the bottom of this report, it tabulates the total number of items and the total calculated purchase and insurance values.

The second report available from "Home Inventory" prints out all the fields, each on a separate line, of all the records in your entire file. Depending on the size of the file or files you are printing out, this report can take anywhere from forever to eternity to finish printing.

I ran every kind of search, with both single and multiple criteria and printed out a columnar report of all the stuff I had on my "Home Inventory" data disk so far. I must admit, I did this not only to test the program, but also, seeing as I still had another two days' work ahead of me, I suppose I needed to be totally convinced that it was all worth the mammoth effort. It was.

Even if you have not got quite as magnified and terminal a case of stuff-itis as I do, you will find that the programs in the *Home Organizer* series are invaluable helpmates and timesavers that make life with stuff much more fun and much less frenzied. **C**

The programs which appear in this magazine have been run, tested and checked for bugs and errors. After a program is tested, it is printed on a letter quality printer with some formatting changes. This listing is then photographed directly and printed in the magazine. Using this method ensures the most error-free program listings possible.

Whenever you see a word inside brackets, such as [DOWN], the word represents a keystroke or series of keystrokes on the keyboard. The word [DOWN] would be entered by pressing the cursor-down key. If multiple keystrokes are required, the number will directly follow the word. For example, [DOWN4] would mean to press the cursor-down key four times. If there are multiple words within one set of brackets, enter the keystrokes directly after one another. For example, [DOWN, RIGHT 2] would mean to press the cursor-down key once and then the cursor-right key twice.

In addition to these graphic symbols, the keyboard graphics are all represented by a word and a letter. The word is either SHFT or CMD and represents the SHIFT key or the Commodore key. The letter is one of the letters on the keyboard. The combination [SHFT E] would be entered by holding down the SHIFT key and pressing the E. A number following the letter tells you how many times to type the letter. For example, [SHFT A4,CMD B3] would mean to hold the SHIFT key and press the A four times, then hold down the Commodore key and press the B three times.

The chart on this page tells you the keys to press for any word or words inside brackets. Refer to this chart whenever you aren't sure what keys to press. The little graphic next to each keystroke shows you what you will see on the screen.

SYNTAX ERROR

This is by far the most common error encountered while entering a program. Usually (sorry folks) this means that you have typed something incorrectly on the line the syntax error refers to. If you get the message "?Syntax Error Break In Line 270", type LIST 270 and press RETURN. This will list line 270 to the screen. Look for any non-obvious mistakes like a zero in place of an O or vice-versa. Check for semicolons and colons reversed and extra or missing parenthesis. All of these things will cause a syntax error.

There is only one time a syntax error will tell you the 'wrong' line to look at. If the line the syntax error refers to has a function call (i.e., FN A(3)), the syntax error may be in the line that defines the function, rather than the line named in the error message. Look for a line near the beginning of the program (usually) that has DEF FN A(X) in it with an equation following it. Look for a typo in the equation part of this definition.

ILLEGAL QUANTITY ERROR

This is another common error message. This can also be caused by a typing error, but it is a little harder to find. Once again, list the line number that the error message refers to. There is probably a poke statement on this line. If there is, then the error is referring to what is trying to be poked. A number must be in the range of zero to 255 to be poke-able. For example, the statement POKE 1024,260 would produce an illegal quantity error because 260 is greater than 255.

Most often, the value being poked is a variable (A,X...). This error is telling you that this variable is out of range. If the variable is being read from data statements, then the problem is somewhere in the data statements. Check the data statements for missing commas or other typos.

If the variable is not coming from data statements, then the problem will be a little harder to find. Check each line that contains the variable for typing mistakes.

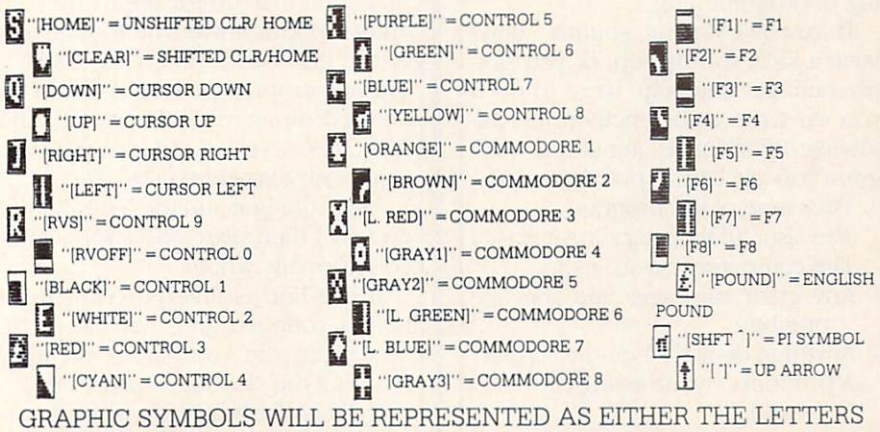
OUT OF DATA ERROR

This error message is always related to the data statements in a program. If this error occurs, it means that the program has run out of data items before it was supposed to. It is usually caused by a problem or typo in the data statements. Check first to see if you have left out a whole line of data. Next, check for missing commas between numbers. Reading data from a page of a magazine can be a strain on the brain, so use a ruler or a piece of paper or anything else to help you keep track of where you are as you enter the data.

OTHER PROBLEMS

It is important to remember that the 64 and the PET/CBM computers will only accept a line up to 80 characters long. The VIC 20 will accept a line up to 88 characters long. Sometimes you will find a line in a program that runs over this number of characters. This is not a mistake in the listing. Sometimes programmers get so carried away crunching programs that they use abbreviated commands to get more than 80 (or 88)

CHART OF SPECIAL CHARACTER COMMANDS



GRAPHIC SYMBOLS WILL BE REPRESENTED AS EITHER THE LETTERS SHFT (SHIFT) AND A KEY ("[SHFT Q,SHFT J,SHFT D,SHFT S]") OR THE LETTERS CMDR (COMMODORE) AND A KEY ("[CMDR Q,CMDR G,COMDR Y,CMDR H]"). IF A SYMBOL IS REPEATED, THE NUMBER OF REPITITIONS WILL BE DIRECTLY AFTER THE KEY AND BEFORE THE COMMA ("[SPACE3,SHFT S4,CMDR M2]").

characters on one line. You can enter these lines by abbreviating the commands when you enter the line. The abbreviations for BASIC commands are on pages 133-134 of the VIC 20 user guide and 130-131 of the Commodore 64 user's guide.

If you type a line that is longer than 80 (or 88) characters, the computer will act as if everything is ok, until you press RETURN. Then, a syntax error will be displayed.

THE PROGRAM WON'T RUN!!

This is the hardest of problems to resolve; no error message is displayed, but the program just doesn't run. This can be caused by many small mistakes typing a program in. First check that the program was written for the computer you are using. Check to see if you have left out any lines of the program. Check each line of the program for typos or missing parts. Finally, press the RUN/STOP key while the program is 'running'. Write down the line the program broke at and try to follow the program backwards from this point, looking for problems.

IF ALL ELSE FAILS

You've come to the end of your rope. You can't get the program to run and you can't find any errors in your typing. What do you do? As always, we suggest that you try a local user group for help. In a group of even just a dozen members, someone is bound to have typed in the same program.

If you do get a working copy, be sure to compare it to your own version so that you can learn from your errors and increase you understanding of programming.

If you live in the country, don't have a local user group, or you simply can't get any help, write to us. If you do write to us, include the following information about the program you are having problems with:

The name of the program
The issue of the magazine it was in
The computer you are using
Any error messages and the line numbers
Anything displayed on the screen
A printout of your listing (if possible)

Send your questions to:

Commodore Microcomputers
1200 Wilson Drive
West Chester, PA 19380
ATTN: Program Problem **C**

How to Use the Magazine Entry Program

The Magazine Entry Program on page 123 is a machine language program that will assist you in entering the programs in this magazine correctly. It is for use with the Commodore 64 only and was written by Mark Robin using the IEA Editor/Assembler. Once the program is in place, it works its magic without you having to do anything else. The program will not let you enter a line if there is a typing mistake on it, and better yet, it identifies the kind of error for you.

Getting Started

Type in the Magazine Entry Program carefully and save it as you go along (just in case). Once the whole program is typed in, save it again on tape or disk. Now RUN the program. The word POKING will appear on the top of the screen with a number. The number will increment from 49152 up to 49541, and just lets you know that the program is running. If everything is ok, the program will finish running and tell you to type NEW. If there is a problem with the data statements, the program will tell you where to look to find the problem.

Once the program has run, it is in memory ready to go. To activate the program, type SYS49152 and press RETURN. When the READY prompt is displayed, type TEST and press RETURN. You are now ready to enter the programs from the magazine.

Typing the Programs

All the program listings in this magazine that are for the 64 have an apostrophe followed by four letters at the end of the line (i.e., 'ACDF). The apostrophe and letters *should* be entered along with the rest of the line. This is a checksum that the Magazine Entry Program uses.

Enter the line and the letters at the end and then press RETURN, just as you normally would.

If the line is entered correctly, a bell is sounded and the line is entered into the computer's memory (without the characters at the end).

If a mistake was made while entering the line, a noise is sounded and an error message is displayed. Read the error message, then press any key to erase the message and correct the line.

IMPORTANT

If the Magazine Entry Program sees a mistake on a line, it *does not* enter that line into memory. This makes it impossible to enter a line incorrectly.

Error Messages and What They Mean

There are six error messages that the Magazine Entry Program uses. Here they are, along with what they mean and how to fix them.

NO CHECKSUM: This means that you forgot to enter the apostrophe and the four letters at the end of the line. Move the cursor to the end of the line you just typed and enter the checksum.

QUOTE: This means that you forgot (or added) a quote mark somewhere in the line. Check the line in the magazine and correct the quote.

PARENTHESIS: This means that you forgot (or added) a parenthesis somewhere in the line. Check the line in the magazine again and correct the parenthesis.

KEYWORD: This means that you have either forgotten a command or spelled one of the BASIC keywords (GOTO, PRINT..) incorrectly. Check the line in the magazine again and check your spelling.

 # OF CHARACTERS: This means that you have either entered extra characters or missed some characters. Check the line in the magazine again. This error message will also occur if you misspell a BASIC command, but create another keyword in doing so. For example, if you misspell PRINT as PRONT, the 64 sees the letter P and R, the BASIC keyword ON and then the letter T. Because it sees the keyword ON, it thinks you've got too many characters, instead of a simple misspelling. Check spelling of BASIC commands if you can't find anything else wrong.

UNIDENTIFIED: This means that you have either made a simple spelling error, you typed the wrong line number, or you typed the checksum incorrectly. Spelling errors could be the wrong number of spaces inside quotes, a variable spelled wrong, or a word mispelled. Check the line in the magazine again and correct the mistake. **C**

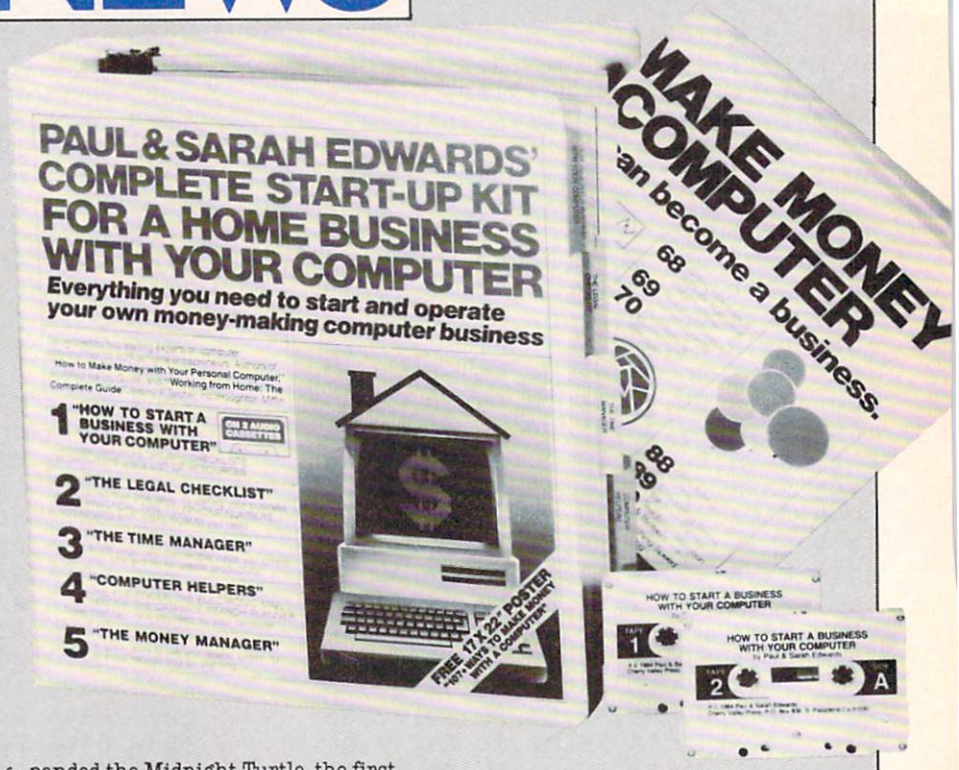
Magazine Entry Program

```
1 PRINT "[CLEAR]POKING-";
5 P=49152 :REM $C000
10 READ A$:IF A$="END"THEN 80
20 L=ASC(MID$(A$,2,1))
30 H=ASC(MID$(A$,1,1))
40 L=L-48:IF L>9 THEN L=L-7
50 H=H-48:IF H>9 THEN H=H-7
60 PRINT"[HOME,RIGHT12]"P;
70 B=H*16+L:POKE P,B:T=T+B:P=P+1
   :GOTO 10
80 IF T<>103233 THEN PRINT"MISTAKE IN
   DATA --> CHECK DATA STATEMENTS":END
90 PRINT"DONE":END
1000 DATA 4C,23,C0,00,00,00,00,00
1001 DATA 00,00,00,00,00,00,00,0D
1002 DATA 00,58,C1,5E,C1,66,C1,76
1003 DATA C1,83,C1,8F,C1,EA,EA,EA
1004 DATA 4C,83,C0,A2,05,BD,1D,C0
1005 DATA 95,73,CA,10,F8,60,A0,02
1006 DATA B9,00,02,D9,3C,C1,D0,0B
1007 DATA 88,10,F5,A9,01,8D,10,C0
1008 DATA 4C,1F,C1,60,A0,03,B9,00
1009 DATA 02,D9,38,C1,D0,E0,88,10
1010 DATA F5,A9,00,8D,10,C0,4C,1F
1011 DATA C1,60,A0,03,B9,00,02,D9
1012 DATA 34,C1,D0,E0,88,10,F5,A0
1013 DATA 05,B9,A2,E3,99,73,00,88
1014 DATA 10,F7,A9,00,8D,18,D4,4C
1015 DATA 1F,C1,E6,7A,D0,02,E6,7B
1016 DATA 4C,79,00,A5,9D,F0,F3,A5
1017 DATA 7A,C9,FF,D0,ED,A5,7B,C9
1018 DATA 01,D0,E7,20,5A,C0,AD,00
1019 DATA 02,20,A3,C0,90,DC,A0,00
1020 DATA 4C,EA,C1,C9,30,30,06,C9
1021 DATA 3A,10,02,38,60,18,60,C8
1022 DATA B1,7A,C9,20,D0,03,C8,D0
1023 DATA F7,B1,7A,60,18,C8,B1,7A
1024 DATA F0,35,C9,22,F0,F5,6D,05
1025 DATA C0,8D,05,C0,AD,06,C0,69
1026 DATA 00,8D,06,C0,4C,BD,C0,18
1027 DATA 6D,07,C0,8D,07,C0,90,03
1028 DATA EE,08,C0,EE,0B,C0,60,18
1029 DATA 6D,0A,C0,8D,0A,C0,90,03
1030 DATA EE,09,C0,EE,0C,C0,60,0A
1031 DATA A8,B9,11,C0,85,FB,B9,12
1032 DATA C0,85,FC,A0,00,A9,12,20
1033 DATA D2,FF,B1,FB,F0,06,20,D2
1034 DATA FF,C8,D0,F6,20,54,C3,20
1035 DATA 7E,C3,20,E4,FF,F0,FB,A0
1036 DATA 1B,B9,3F,C1,20,D2,FF,88
1037 DATA 10,F7,68,68,A9,00,8D,00
1038 DATA 02,4C,74,A4,4B,49,4C,4C
1039 DATA 54,45,53,54,41,44,44,91
1040 DATA 91,0D,20,20,20,20,20,20
1041 DATA 20,20,20,20,20,20,20,20
1042 DATA 20,20,20,20,20,20,91,0D
1043 DATA 51,55,4F,54,45,00,4B,45
1044 DATA 59,57,4F,52,44,00,23,20
1045 DATA 4F,46,20,43,48,41,52,41
1046 DATA 43,54,45,52,53,00,55,4E
1047 DATA 49,44,45,4E,54,49,46,49
1048 DATA 45,44,00,4E,4F,20,43,48
1049 DATA 45,43,4B,53,55,4D,00,50
1050 DATA 41,52,45,4E,54,48,45,53
1051 DATA 49,53,00,C8,B1,7A,D0,FB
1052 DATA 84,FD,C0,09,10,03,4C,C7
1053 DATA C1,88,88,88,88,88,B1,7A
1054 DATA C9,27,D0,13,A9,00,91,7A
1055 DATA C8,A2,00,B1,7A,9D,3C,03
1056 DATA C8,E8,E0,04,D0,F5,60,4C
1057 DATA F2,C2,A0,00,B9,00,02,99
1058 DATA 40,03,F0,F2,C8,D0,F5,A0
1059 DATA 00,B9,40,03,F0,E8,99,00
1060 DATA 02,C8,D0,F5,20,D7,C1,4C
1061 DATA 56,C2,A0,0B,A9,00,99,03
1062 DATA C0,8D,3C,03,88,10,F7,A9
1063 DATA 80,85,02,20,1B,C3,A0,00
1064 DATA 20,9B,C1,20,CA,C1,20,31
1065 DATA C2,E6,7A,E6,7B,20,7C,A5
1066 DATA A0,00,20,AF,C0,F0,CD,24
1067 DATA 02,F0,06,20,D7,C0,4C,12
1068 DATA C2,C9,22,D0,06,20,BC,C0
1069 DATA 4C,12,C2,20,E7,C0,4C,12
1070 DATA C2,A0,00,B9,00,02,20,A3
1071 DATA C0,C8,90,0A,18,6D,09,C0
1072 DATA 8D,09,C0,4C,33,C2,88,A2
1073 DATA 00,B9,00,02,9D,00,02,F0
1074 DATA 04,E8,C8,D0,F4,60,18,AD
1075 DATA 0B,C0,69,41,8D,0B,C0,38
1076 DATA AD,0C,C0,E9,19,90,06,8D
1077 DATA 0C,C0,4C,60,C2,AD,0C,C0
1078 DATA 69,41,8D,0C,C0,AD,05,C0
1079 DATA 6D,07,C0,48,AD,06,C0,6D
1080 DATA 08,C0,8D,0E,C0,68,6D,0A
1081 DATA C0,8D,0D,C0,AD,0E,C0,6D
1082 DATA 09,C0,8D,0E,C0,38,E9,19
1083 DATA 90,06,8D,0E,C0,4C,96,C2
1084 DATA AD,0E,C0,69,41,8D,0E,C0
1085 DATA AD,0D,C0,E9,19,90,06,8D
1086 DATA 0D,C0,4C,AB,C2,AD,0D,C0
1087 DATA 69,41,8D,0D,C0,A0,01,AD
1088 DATA 0B,C0,CD,3C,03,D0,20,C8
1089 DATA AD,0C,C0,CD,3D,03,D0,17
1090 DATA C8,AD,0D,C0,CD,3E,03,D0
1091 DATA 0E,AD,0E,C0,CD,3F,03,D0
1092 DATA 06,20,64,C3,4C,7A,C0,AD
1093 DATA 10,C0,D0,11,98,48,68,4C
1094 DATA F7,C0,AD,10,C0,F0,01,60
1095 DATA A9,04,4C,F7,C0,A4,FD,A9
1096 DATA 27,91,7A,A2,00,C8,BD,0B
1097 DATA C0,91,7A,C8,E8,E0,04,D0
1098 DATA F5,A9,00,91,7A,20,64,C3
1099 DATA 4C,7A,C0,A0,00,B9,00,02
1100 DATA F0,11,C9,28,D0,03,EE,03
1101 DATA C0,C9,29,D0,03,EE,04,C0
1102 DATA C8,D0,EA,AD,03,C0,CD,04
1103 DATA C0,D0,01,60,A9,05,4C,F7
1104 DATA C0,A9,20,8D,00,D4,8D,01
1105 DATA D4,A9,09,8D,05,D4,A9,0F
1106 DATA 8D,18,D4,60,20,41,C3,A9
1107 DATA 81,20,77,C3,A9,80,20,77
1108 DATA C3,4C,71,C3,20,41,C3,A9
1109 DATA 11,20,77,C3,A9,10,20,77
1110 DATA C3,A9,00,8D,04,D4,60,8D
1111 DATA 04,D4,A2,70,A0,00,88,D0
1112 DATA FD,CA,D0,FA,60,END
```

Continued from page 12

Start Your Own Business

Paul and Sarah Edwards' **Complete Start-Kit for a Home Business with Your Computer**, published by Cherry Valley Press of South Pasadena, California, includes two audio cassettes on how to plan and operate a business with your computer, a large loose-leaf manual and guide with sections on legal requirements and how to solve them, a time manager, forms and guides to use with your computer (including a database search planner) and a money manager, complete with a simple bookkeeping plan that includes preprinted envelopes for receipts.



LOGO Exchange Network

The Young Peoples' **LOGO** Association has expanded the Midnight Turtle, the first worldwide on-line **LOGO** Informational Exchange. Now operating from 36MB hard disk, the new system features electronic mail, chatting, uploading and downloading of software and text files, a library of more than 200 **LOGO** procedures, a **LOGO** reference library, a resource list for the disabled, and two new bulletin boards. The system is currently in operation fourteen hours per day weekdays and 24 hours on weekends.

Revolutionary Information Transmission Service

Telentry Systems has introduced Telentry, a data communications service network designed to transfer information between previously incompatible word processors and personal computers.

The system's dataDRIVER has a sophisticated proprietary translation algorithm which is programmed so that word processors or PCs from different manufacturers can communicate. The dataDRIVER is installed at no cost and customers pay a minimal per-document page transmission charge. Prices for Telentry Service will vary according to the subscriber's instructions for priority service.

Ideal for all word processing needs, Telentry can store documents up to 1,000 pages in length. The documents will be stored automatically and can be called up by the recipient for reading, editing or printing.

A unique feature of Telentry is a document encryption process which the service applies during transmission. Telentry encodes and decodes all documents and supports this with an error detection and correction process.

European Software Available

3R Import and Export Corporation of Syracuse, New York, announces its involvement in the importing and marketing of European software.

3R is currently operating as the exclusive importer and representative of seven British software manufacturers offering a selection of over 30 recreational, personal and educational programs for the Commodore 64 and VIC 20.

NEWS

MARCA Computer Fair

BY ELIZABETH DEAL

The Mid-Atlantic Regional Commodore Association Users' Fair held in Hershey, Pennsylvania, featured an abundance of new products. Here are just a few of the notables:

Brady Company has published a book on machine language for all Commodore computers. It's by Jim Butterfield and has got to be the best book on the subject around. It is meant to take a beginner from the first difficult steps in machine language to some fairly advanced concepts. The title is **Machine Language for the C64 and other Commodore Computers.** (Rather odd, considering that all the machines get equal treatment.)

The book is lucid, great fun to read, correct (of course), educational, motivating... what more can I say. About the only complaint I have is that it hasn't existed for the past three years. But now it does and all of you out there who know little or no machine code will find this one of the most valuable books you can get your hands on.

Don't want to learn machine code? That's OK. There are chapters in the book which tell how BASIC and Machine code can function together. Everybody has got to know that sort of information. And they can learn it from Jim's book.

Datamost has released **Inside the Commodore DOS** by Richard Immers and Gerald Neufeld which is about Commodore disk drives, mostly 1541 and the 4040's. Half of the book contains heavily annotated disk ROM disassembly; the other half, detailed explanations of the DOS. The book elaborates on Commodore's disk manual. And it provides secrets about the drives (new features!) Commodore never told anyone about. It is fairly technical, but for the curious, it is a gold mine of information.

Just as R. West's book, **Programming the PET/CBM,** has become an unofficial bible for Commodore users, this book will undoubtedly become the bible for disk users. A floppy disk that can be ordered separately, incidentally, has all the BASIC programs from the book on it. The disk also includes machine code programs, both in the loadable format and in the PAL assembler format.

The book **Disk Drive Maintenance** by David Peltier was a big hit at the MARCA convention. It contains schematics of the 1541 drive. It has all the engineering aspects described, plus all the maintenance procedures. Advanced, technical material of this sort isn't for everybody (not me!), but the rumor mills tell me it is correct and contains good stuff.

On the software line, Pro-Line introduced **WP64,** a sequel to the original, famous **WordPro** series. It is a new program, made just for the 64 and supports numerous printers. It has features undreamed of earlier (nondestructive directory, 80-column video output, 160-column video output, an ooops! buffer, wordwrap and two-column output).

It is one of the best word processors on the market, worth your serious consideration. Just as the **WordPro** series was a state of the art system, so is this one. It has many features of the largest word processing systems.

INDUSTRY NEWS

Okidata Conquers Mount Everest

An Okidata printer recently became part of perhaps the most grueling computer application ever—running the logistics program for an all-out assault on Mount Everest by a team of American climbers.

The printer, an **Okidata Microline 92**, withstood temperatures as low as −20 degrees Fahrenheit and survived rough handling by Tibetan porters and teams of yaks, as the mountaineers came within 800 feet of the 29,028-foot summit.

Software Available for Multi-Level Marketing

MLM Manager, new Commodore 64 software for distributors, is now available from GF Enterprises, of Novi, Michigan. At $199, **MLM Manager** is low-cost business software for multi-level marketing. Multi-level marketing, with its 20 million member base, is one of the largest vertical markets in the U.S.

MLM Manager can be used by virtually any multi-level distributor who maintains sales records of purchasers. A System Setup module is used to define the particular marketing plan. This data is retained on diskette for calculation of bonuses, discounts, overrides and other marketing plan features. **MLM Manager** allows easy modification of the marketing plan should it change. The marketing plan definition allows up to six different marketing levels, each having a unique name, qualifications, bonus ranges and/or discount levels. Also included is a Price List Update module, Price List Print Module, a Sales Report module and an Invoice/P.O. module.

Studies indicate a time savings of ten up to as much as 35 hours weekly. Minimum equipment required includes a 64, 1541 disk drive and a printer.

Over 25 Programs For The 64 On Disk

The **Commodore 64 Programmer's Library**, newly released by Baker Enterprises, is a three-disk package containing utilities, programmer's aids, productivity programs and games, all written by Robert W. Baker, author of **Microcomputing** magazine's "PETpourri" column. The programs themselves are contained on one disk. The second two disks contain complete documentation for all the programs, along with a simple utility program so you can print your own copies of the documentation.

The package includes utilities such as Disk Master, Compactor II, Uncompactor II, Hex Dump, Sim 6502 Simulator, Disassembler, Assembler/Editor, Program Finder and Tape Reader; productivity programs House Inventory, Date Book and Finance; and games such as Solitaire and Black Friday. In addition it contains word counters, source file printers and similar utilities for use with **Word Pro** and **Easy Script** word processors.

U.S. and Canadian price is $25 for the package, which is available from Baker Enterprises, 15 Windsor Drive, Atco, New Jersey 08004.

Energy Control System

Savergy of Fort Collins, Colorado, has unveiled a new product called **POWERPORT.** It regulates such things as lighting, heating, cooling and sprinkler systems in the home and business.

The **POWERPORT** can help users save up to 25% on energy bills. The system plugs into the user port of either a Commodore 64 or VIC 20 to control eight AC or DC loads. All output functions can be programmed in BASIC and stored to memory.

The cost of **POWERPORT** is less than $100 and can be fully recovered through savings on utility bills. Tax credits may be available through solar use.

INDUSTRY NEWS

SuperPET Language/Manual Kit Available from Commodore

Commodore is now offering a unique language and manual kit for SuperPET owners. The kit contains: Systems overview manual, APL manual, FORTRAN manual, COBOL manual, Pascal manual, BASIC manual, 6809 Assembler manual, update sheets on all the manuals above, language diskette containing all the above languages, tutorial diskette containing programming examples for all languages.

Order the kit direct from Commodore Parts Department, part number 900030, or from your local Commodore dealer. Suggested retail price is $49.95.

BASIC Conversion

HPBooks, of Tucson, Arizona, has released the book **BASIC Program Conversions** by Bill Crider. It features detailed, practical conversion information for eight of today's most popular computers.

The alphabetical listing of over 250 BASIC commands and statements is arranged in a dictionary format for quick location and easy comparison. Every important BASIC command and statement is included, from ABS to XOR.

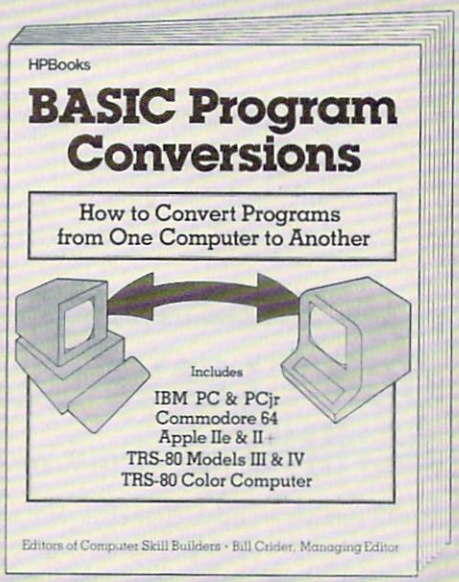
Introductory chapters also discuss conversion strategy, practical solutions to programming problems and why converting programs is a great programming skill.

Voice-Controlled System for the Handicapped

Cascade Graphics Development of Santa Ana, California, has combined computers and voice activation to create the **CASH III** system.

The **CASH III** system enables an individual with a physical disability to function in a normal working environment. A person with limited or no use of their hands can operate the programs by voice, enabling the person to do work they could not do before.

The **CASH III** consists of a microcomputer system utilizing voice control, a dot matrix printer, hard disk drive, modem and CASH system software.



Double Capacity Microwafer Drive

Entrepo Inc. of Sunnyvale, California, manufacturer of the Microwafer storage system, has added a 256-kilobyte (Kbyte) Microwafer drive to its family of products.

The new Model 201 drive uses the MFM encoding/decoding scheme, allowing it to store 256 Kbytes of formatted data. The Model 101 uses the FM encoding/decoding scheme and has a formatted capacity of 128 Kbytes.

The read/write and motor control circuitry are housed within the transport mechanism of the Model 201, making the entire unit smaller than a man's wallet—3 by 1½ by 1 inches. In addition, the Model 201 can operate off a single five-volt power supply.

The data rate of the Model 201 is 34 kilobits (Kbits) per second, compared to 21 Kbits per second for the Model 101. Average access time for a 64 Kbyte program using the Model 201 is less than eight seconds. This compares to ten minutes for the best audio or data set recorders commonly used with low-cost microcomputers. Both the Model 201 and Model 101 Microwafer drives uses Entrepo's endless-loop Microwafer data cartridges. A write-protect mechanism built into the data cartridges and drive ensures data integrity.

THAT DOES NOT COMPUTE

July/August 1984

Grade Master 64

If you are still interested in ordering a copy of "Grade Master" on disk, please note that author Rick Jeandell's address has changed. His new address is: 4 Fairway Road, Newark, Delaware 19711.

November/December 1984

Plus/4 Memory Maps

Somewhere in the production process we dropped the names of the two Commodore people responsible for producing this memory map. Credit goes to Andy Finkel and David Street of Commodore software.

November/December

Get Creative With New Commodore-Compatible Peripherals

Those who wish to find out more about the Chirpee voice recognition module mentioned on page 16 can contact Eng Manufacturing at 3212 S. Fair Lane, Tempe, Arizona 85282. Their toll free number is 800-431-3331 (in Arizona 602-431-0400).

ADVERTISERS' INDEX

*NO READER SERVICE NO. GIVEN

CARDCO "NOW" SOFTWARE

. . . available now for your Commodore-64™ and more!

A fine line of software developed by CARDCO for your Commodore-64 computer with all the features you should expect in much more costly software. CARDCO's "NOW" Series provides many unique and exclusive features and are packaged for easy reference, simple storage, instant recognition.

"WRITE NOW" . . . WORD PROCESSOR SOFTWARE . . . An excellent time saver, CARDCO offers the "Write Now" C/Ø2 word processor program with built-in 80 column display. You see exactly what will print. All special codes can be transmitted to printers maintaining justification. Easy full-screen editing; works with any printer.

"MAIL NOW" . . . MAILING LIST SOFTWARE . . . CARDCO's D/Ø1 "Mail Now" quickly (in memory) sorts by zip, category, name and state; fully compatible with "Write Now". Other fine features include: user-oriented; menu-driven operation; each disk supports 600 entries. Format can print single, double or triple labels across.

"SPELL NOW" . . . Cardware D/Ø4 . . . a fine program designed as a spell checker for use with "Write Now" on the Commodore-64. A 34,000 word dictionary with two additional user constructed dictionaries. Menu-driven operation for ease of use. And "Spell Now" allows you to see each misspelled word in the context of your document for correction.

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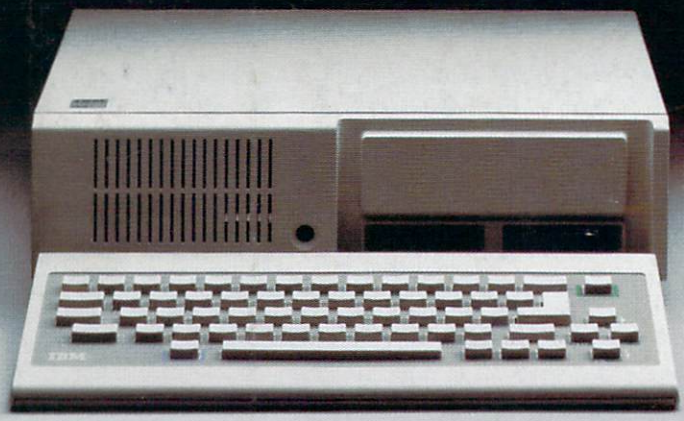

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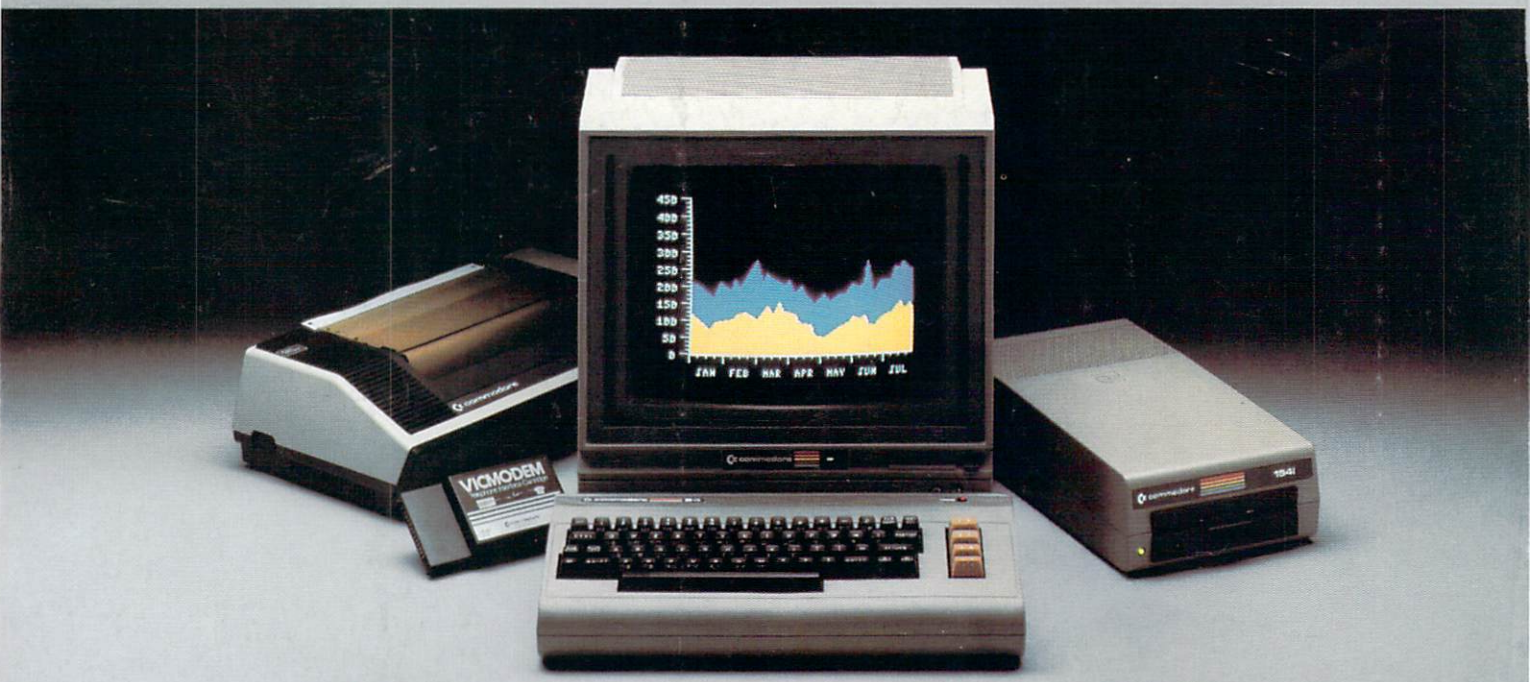

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